ABSTRACT

This thesis investigates Plato's views on the nature of the natural world, and how we ought to investigate and explain it. Critical questions are whether Plato was antipathetic to the investigation of nature, whether his views were overly teleological, whether his methodology was anti-empirical and discouraged careful observation and the effects, beneficial or otherwise, of his emphasis on mathematics. A central contention of this thesis is that there were significant changes to Plato's views on the stability of the cosmos and the relationship of mathematics to the physical world, and that these changes were significant events in the history of science. It is argued that there are also important co-ordinate ontological and epistemological changes from the middle period, and that Plato produced philosophically and historically interesting answers to many of the questions that must be faced by any realist conception of science. In this the status of the Timaeus is a critical. It is argued that Plato's style of writing philosophy is based on his views on knowledge, and that he is not so much concerned to present us with dogma as to puzzle us, offer us frameworks for the solution of problems and draw us into considering these problems for ourselves. This approach is applied to the Timaeus and it is argued that it presents a series of hypotheses about cosmology, mind and the epistemetic status of the physical world for us to judge the worth of, many of these representing advances on the middle period views. One result here is greater epistemological optimism and greater stability in the natural world than some accounts of the Timaeus allow. It is argued that this approach enlivens the Timaeus, allows it a late dating, narrows the gap in style with the other late works and has important implications for our appreciation of Plato's philosophy of science.
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7) Owen's Arguments Concerning Cosmology and Politics.</td>
<td>126</td>
</tr>
<tr>
<td>8) Conclusions.</td>
<td>129</td>
</tr>
<tr>
<td>Notes.</td>
<td>130</td>
</tr>
<tr>
<td>06: World Soul, Human Souls and Epistemology in the Timaeus.</td>
<td>140</td>
</tr>
<tr>
<td>1) The World Soul's Opinions.</td>
<td>140</td>
</tr>
<tr>
<td>2) Innate Abilities and Common Notions.</td>
<td>143</td>
</tr>
<tr>
<td>3) The Theaetetus and Sophist on False Judgement.</td>
<td>147</td>
</tr>
<tr>
<td>4) The Timaeus on Concrete False Judgement.</td>
<td>151</td>
</tr>
<tr>
<td>5) The Timaeus on Abstract False Judgement.</td>
<td>154</td>
</tr>
<tr>
<td>6) Conclusions.</td>
<td>156</td>
</tr>
<tr>
<td>Notes.</td>
<td>158</td>
</tr>
<tr>
<td>07: Flux and Language in the Timaeus.</td>
<td>165</td>
</tr>
<tr>
<td>1) Flux, Stability and the 'Stoicheic' Triangles.</td>
<td>165</td>
</tr>
<tr>
<td>2) The Stability of the Heavens.</td>
<td>168</td>
</tr>
<tr>
<td>3) Objection 1 - The Theory of Ageing.</td>
<td>169</td>
</tr>
<tr>
<td>4) Objection 2 - The Gold Example.</td>
<td>172</td>
</tr>
<tr>
<td>5) Language and Stability.</td>
<td>175</td>
</tr>
<tr>
<td>6) Flux in the Theaetetus and Cratylus.</td>
<td>176</td>
</tr>
<tr>
<td>7) Other Interpretations of the Gold Example.</td>
<td>178</td>
</tr>
<tr>
<td>8) 'Two Worlds' and Stability in the Timaeus and Philebus.</td>
<td>180</td>
</tr>
<tr>
<td>9) Conclusions.</td>
<td>184</td>
</tr>
<tr>
<td>Notes.</td>
<td>185</td>
</tr>
<tr>
<td>08: Metaphysics in the Sophist and Timaeus.</td>
<td>191</td>
</tr>
<tr>
<td>1) Space, Time and Self-Predication.</td>
<td>191</td>
</tr>
<tr>
<td>2) Participation and Predication in the Sophist and Timaeus.</td>
<td>196</td>
</tr>
<tr>
<td>3) Relational Change in the Sophist.</td>
<td>200</td>
</tr>
<tr>
<td>4) Stylometry.</td>
<td>203</td>
</tr>
<tr>
<td>5) Conclusions.</td>
<td>206</td>
</tr>
<tr>
<td>Notes.</td>
<td>207</td>
</tr>
<tr>
<td>09: Mathematics and Knowledge in the Timaeus and Philebus.</td>
<td>214</td>
</tr>
<tr>
<td>1) The Generation of Numbers in the Parmenides.</td>
<td>214</td>
</tr>
<tr>
<td>2) Limit, Unlimited and the Stoicheic Triangles.</td>
<td>217</td>
</tr>
<tr>
<td>3) Physical Entities in the Timaeus and Philebus.</td>
<td>220</td>
</tr>
<tr>
<td>4) The Receptacle, Predication and Explanation.</td>
<td>225</td>
</tr>
<tr>
<td>5) Knowledge of the Physical in the Philebus.</td>
<td>229</td>
</tr>
<tr>
<td>6) Knowledge in the Theaetetus.</td>
<td>231</td>
</tr>
<tr>
<td>7) Knowledge of the Physical in the Timaeus.</td>
<td>234</td>
</tr>
<tr>
<td>8) Conclusions.</td>
<td>236</td>
</tr>
<tr>
<td>Notes.</td>
<td>240</td>
</tr>
<tr>
<td>10: Plato's Philosophy of Science.</td>
<td>244</td>
</tr>
<tr>
<td>1) Plato's Teleology and Realist Conceptions of Science.</td>
<td>244</td>
</tr>
<tr>
<td>2) Observation and Experiment.</td>
<td>254</td>
</tr>
<tr>
<td>3) The Mathematisation of Nature and Investigation.</td>
<td>256</td>
</tr>
<tr>
<td>4) The Goals of the Investigation of Nature.</td>
<td>258</td>
</tr>
<tr>
<td>5) Conclusions.</td>
<td>260</td>
</tr>
<tr>
<td>6) Further Prospects.</td>
<td>263</td>
</tr>
<tr>
<td>Notes.</td>
<td>264</td>
</tr>
<tr>
<td>Bibliography.</td>
<td>269</td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENTS

Thanks in due proportion are owed to M.M McCabe, who read and commented on earlier versions of chapters two and three, Bob Sharples who read and commented on earlier versions of chapters three and five, and my supervisor, Piyo Rattansi, for his work on this project.
REFERENCES AND ABBREVIATIONS.

References to Plato are to the page numbers of the Stephanus edition (Paris 1578). Quotations of the Greek are taken from the Oxford Classical Text edition (Oxford, 5 vols 1900-1907), unless otherwise indicated. References to Aristotle are to the page numbers of the Bekker edition (Berlin 1831).

I use the following abbreviations;

LSJ = Liddel, Scott and Jones, a Greek - English Lexicon, 9th edition, Oxford 1940.

OCT = Oxford Classical Text.


For Platonic and pseudo-Platonic works;

Alicibiades I, II Alc.I, II.
Apology Apol.
Charmides Chm.
Cleitophon Clt.
Cratylus Cra.
Critias Cri.
Crito Cro.
Epinomis Epin.
Epistles I-XIII Ep.I-XIII.
Eristai Er.
Euthydemus Etd.
Ruthyphro Etp.
Gorgias Grg.
Hipparchus Hpc.
Hippias Major H.Maj.
Hippias Minor H.Min.
Ion Io.
Laches La.
Laws Le.
Lysis Ly.
Meno Men.
Menexenus Mnx.
Minos Mi.
Parmenides Pm.
Phaedo Pdo.
Phaedrus Pdr.
Philebus Plb.
Politicus Plt.
Protagogas Prt.
Republic Rep.
Sophist So.
Theaetetus Tht.
Theages Thg.
Timaeus Tim.

The E.S is the Eleatic Stranger and the A.S is the Athenian Stranger.
INTRODUCTION

Plato's views on the nature of the natural world and how we ought to investigate and explain it have provoked some sharply divergent evaluations. He has received much criticism, the main accusations being that he was antipathetic to the investigation of nature, feeling that it could produce no worthwhile results, that his views were overly teleological, that his methodology was anti-empirical, that he discouraged careful observation and that he effectively substituted mathematics for physics. Others have praised him, largely for what they see as his role in the mathématisation of nature and of science, while some have sought to strike a balance. My aim in this thesis is to produce a re-appraisal of Plato's philosophy of science, and I shall attempt to clarify the basis, nature and justification of these various evaluations. While these matters have of course received due attention in the literature, I employ three strategies which will hopefully bring a fresh perspective to these debates.

Firstly, a central contention of this thesis will be that there were significant changes in Plato's cosmology between the Republic and the Timaeus. In short, the cosmos becomes stable, and at least some aspects of it, including the motions of the heavenly bodies, become amenable to precise mathematical description. Behind this move are some important metaphysical realignments. The debate concerning the development of Plato's thought has often centred on the theory of forms. I argue that there are indeed changes here, but shall be at least equally concerned with the development of Plato's ideas concerning physical entities. Issues here are their provenance, their nature, their stability, their ability to behave regularly and the nature of the accounts that we can have of them. So too I shall be concerned with ways in which the [technai] and Plato's conception of the Good become more technical and mathematical in their orientation. Modifications to Plato's views on these issues have considerable implications for his philosophy of science, and later period Plato may well be immune to many of the criticisms that might be aimed at a middle period work like the Republic.

The second strand of my interpretive strategy concerns the relation
of Plato's thought to modern realist positions in the philosophy of science. Such positions require that we make certain assumptions about the nature of the world and the nature of investigation. Whether these assumptions can ultimately be justified is not a question I shall be concerned with in this thesis. Neither shall I argue that Plato was himself a realist, as I believe it is both historically and philosophically unhelpful to attempt to characterise ancient thinkers in the terms of modern debates. Rather, I shall argue that Plato is concerned with exploring some of the assumptions that are required to get a realist philosophy of science off the ground, and provides interesting answers to key questions concerning the comprehensibility of the universe, the relation of mathematics to the world, and the reasons for the regular (or otherwise) behaviour of physical bodies. So to Plato is interested in important methodological questions such as the processes by which we form hypotheses and any criteria beyond empirical adequacy that we might employ to choose between competing hypotheses. Obviously, there are irreducible differences between Plato's hypotheses and those of modern science, but what Plato has to say here may still be relevant to modern debates and historically interesting in itself. The point of this approach is not to assimilate Plato to modern science, but rather to narrow what some commentators have argued is a yawning chasm between the two. For while Plato's views are perhaps a long way removed from positivist, instrumentalist or Bayesian conceptions of science there are certain interesting affinities with some modern realist positions. If, in a positivist frame of mind, we dismiss Plato's discussions of some of the central questions for a realist view of science as irrelevant or metaphysical, we risk missing much of philosophical and historical interest.

The success of this strategy is partially dependent on the success of my arguments concerning changes in Plato's thought outlined above. In each case it is the position that Plato moves too that shows greater and more interesting affinities with modern realist positions. There is also great historical interest in the positions that Plato moves from, especially where those positions where commonplace in ancient thought, or where Plato has been highly influential in subsequent developments.

The third part of my interpretive strategy concerns the way in which Plato writes philosophy. I argue Plato's views concerning knowledge, understanding and writing generate a specific style of
writing philosophy, where literary and dramatic factors interact with the arguments his characters give to achieve a specific overall effect. Recognition of this 'philosophy of writing philosophy' (PWP) explains many aspects of Plato's written work, and provides a vital key to interpreting the texts. The importance of this is that as yet very little work on these lines has been done on the Timaeus, on any account a central text for the assessment of Plato's philosophy of science. Here I shall attempt to counter a common view, succinctly expressed by Sayre, that

"The major dialogues of the later period (with the exception perhaps of the Timaeus and the Laws) were constructed to serve as dialectical instruments rather than as repositories of doctrine."  

I argue that there is evidence in the introductory pages of the Timaeus, consonant with Plato's PWP, that we should not take what Timaeus has to say as set doctrine, but rather as a set of hypotheses concerning the nature of the world, our relation to it, and, more radically, the sort of accounts we can have of it. Here I argue that we should be suspicious of treating the epistemological views that Timaeus expounds at 27c-29e as Plato's own, and that the analogy subsequently developed between the world soul and the human soul functions as a critique of these views. The intended effect of this I suggest is to draw the reader into a debate concerning flux, the nature of physical entities and their relation to language, and the sort of accounts we can have of the physical world. The result may be a considerable revision of some middle period views, and far more optimism toward the results of an investigation of the natural world. This approach considerably enlivens our reading of the Timaeus, and helps to link its discussions with those concerning the nature of mind and false judgement in the Theaetetus and Sophist, with the worries concerning flux, stability and language of the Theaetetus and the Cratylus, and with the mathematical and ontological concerns of the Parmenides and Philebus. I believe my work here solves several long-standing puzzles concerning the interpretation of the Timaeus and Plato's attitude to the physical world, and indicates that the Timaeus is considerably more sophisticated and better integrated into the general programme of Plato's later thought than is usually allowed.

A further problem with the Timaeus is its dating relative to Plato's other works. Here I hope to produce two new criteria based on
the changes in cosmological stability and the relation of mathematics to
the world that I argue for. These indicate that a group comprising of
the Timaeus, Critias, Philebus, Laws and Epinomis are all later than the
Politicus, perhaps the last work advocating the old cosmology.
I also
re-assess other arguments for dating relative to my interpretation of
the Timaeus. For the works that directly concern this thesis, this gives
a relative ordering as follows:

Protagoras
Gorgias
Meno
Lysis and others.

Phaedo
Symposium
Republic
Phaedrus

Parmenides
Cratylus
Theaetetus
Sophist
Politicus

Timaeus
Critias
Philebus
Laws
Epinomis

Chapter one discusses the generation of Plato's FWP and its implications
for the interpretation of his works. Chapter two discusses methodology
in the early and middle period works, while chapter three looks at the
role envisaged for observation in the astronomy of the Republic. Chapter
four discusses how we ought to read the Timaeus and will attempt to give
an account of its structure. In chapter five I argue that there are
important changes in Plato's cosmological thinking, particularly in relation to the heavens, between the Republic and the Timaeus, and investigate their use as dating criteria. Chapter six will discuss changes in epistemology and philosophy of mind, and chapter seven will discuss the relationship between flux, language and cosmology in the Timaeus and will compare this with the ideas of the Cratylus and Theaetetus. Chapter eight will investigate changes to the theory of Forms suggested by the Sophist and Timaeus. Chapter nine discusses mathematics and ontology in relation to the second part of the Parmenides, the Timaeus, the Philebus and the various reports on Plato's Lecture on the Good, while chapter ten discusses the implications of my arguments for the assessment of Plato's philosophy of science.

All translations from the Greek are my own, unless otherwise indicated. Greek words will appear transliterated within square brackets, e.g [aitia]. Notes are arranged at the end of each chapter. Unless otherwise stated, all references to Socrates are to the character of Plato's dialogues and not the historical figure. The relation between the two is unclear, and will not be a major concern of this thesis, though it must be said that I am probably more sceptical than most about identifying the opinions and life history of the Socrates of the dialogues with the historical figure.
NOTES FOR THE INTRODUCTION

01) A point agreed on by both realists and anti-realists; see respectively e.g Maxwell (1993a) and Van Fraassen (1989).

02) One might argue that much of the severe criticism of Plato's views earlier in this century, e.g Neugebauer (1947) has come from a positivist perspective, while Plato's defenders in this period, e.g Whitehead (1933) have advocated more realist views.


04) Usually, the debate about the dating of the Tim. and the development of Plato's thought divides into two camps; unitarian/late dating, revisionist/early dating. In this thesis I explore the possibility that the Tim. is late and that it contributes to an ongoing revision of Plato's thought as part of a coherent programme with the 'transitional' and other late works.

05) The authorship of the Epin. and the Ep.VII are of course disputed. I do not propose to discuss these matters in detail, but feel I should indicate my position here. I accept that the Le. was 'on the wax' when Plato died and was subsequently published (and edited?) by Philip of Opus, who also published the Epin. Whether he had a greater hand in the creation of the Epin. is an open question, but the work is clearly meant as an appendix the Le. It may well be that the Epin. is 'less Platonic' than the Le, and so should be treated with due care, but in my view is reasonably reliable. The philosophical digression of the Ep.VII I believe to be a forgery (see e.g Tarrant (1983)), by someone who did not know of, or did not appreciate developments in Plato's thought after the Republic. It constitutes interesting evidence concerning Plato's middle period, but should not be treated as genuine. For discussion see Morrow (1962), Edelstein (1966), White (1976), Tarrant (1983) Brumbaugh (1988) and Sayre (1988a).

06) See De Vogel (1955) for discussion here.
A recent growth area in Platonic scholarship has been the question of Plato's literary style. The main aim of this chapter is to argue that underlying the use of various literary tools is a coherent 'philosophy of writing philosophy' (IWP), itself generated by Plato's views on knowledge, understanding and learning, which can account for the use and function of each of these tools. If it is possible to identify such an IWP, then we ought to be in a much better position to consider the relation of literary form to philosophical content in Plato's works.

On one account, when philosophers write, they ought to create treatises that express their views in the most clear and forthright manner possible. While they might strive for elegance and wit their work should not be literary in the same sense as, say, Sophocles or Shakespeare. No further illumination of the content should be available from an analysis of the literary framework in which it is set. Murdoch summarises this view of the gulf between literature and philosophy, saying that

"These two branches of thought have such different aims and such different styles, and I feel that one should keep them apart from one another... I am tempted to say that there is an ideal philosophical style which has a special unambiguous plainness and hardness about it, an austere unselfish candid style. A philosopher must try to explain what he means and avoid rhetoric and idle decoration. Of course this need not exclude wit and occasional interludes; but when the philosopher is as it were in the front line in relation to his problem I think he speaks with a certain cold clear recognisable voice."}

We might consider though whether all philosophy, regardless of its attitudes to knowledge, language, or communication ought to be written in this manner. One might argue that this supposed stylistic neutrality is not in itself something that is neutral between different approaches to philosophy, but is something generated by the nature of the modern analytical tradition. The emphasis on the minute analysis of arguments requires that as far as possible we divorce literary form from analytical content such that we can concentrate on that analytical
content. Other conceptions of the nature of philosophy, though, have led to different styles of presentation. Spinoza's views led him to express them in the style of geometrical theorems, while the later Wittgenstein commented that a good philosophical work could consist entirely of jokes or of questions without answers. Those who have taken a more radical view might be said to include Nietzsche, Kierkegaard and Sartre among the moderns and Heraclitus and Parmenides among the ancients. The fundamental concern here is that any philosophy that generates views concerning the expression of philosophy faces the reflexive problem of how best to express itself.

Our question is where Plato fits into this, as he gave us dialogues rather than treatises, and dialogues in which he paid great attention to literary factors. It would be highly anachronistic to presume that the assumptions that underpin the stylistic neutrality that analytical philosophy advocates are shared by Plato. On such an account Plato writes philosophy dressed incidentally in some literary and dramatic finery, which can be stripped off and ignored by the analytical interpreter. That is a possibility, but it needs to be argued for on the basis of some account of Plato's views on the expression of philosophy.

Any account of the way that Plato writes will have to resolve the following questions. We need to know whether we can take any of Plato's characters to speak directly for him, or whether what he intends to express depends on a large number of complex literary and dramatic factors as well. If the latter is so, then the painstaking logical analysis of the speeches of Plato's characters may tell us much about the nature of the premisses, conclusions and the validity of the arguments they use, but there may be much more work to do before we can attribute any of this to Plato.

A further related difficulty here is whether Plato's works are repositories of doctrine, or are meant to challenge and educate their readers. We might also consider whether Plato has a specific answers to all the problems he raises, or whether his works are more open ended explorations of a topic, rejecting some views as inadequate, providing criteria for prospective answers and frameworks to pursue them within without arriving at anything concrete.

An account Plato of style should also be able to explain its major features. We need to know whether the dialogue form is something intrinsic to the way in which Plato writes, why Plato uses myth,
allegory and metaphor rather than straightforward exposition, why he uses irony so extensively, why so many of his works end aporetically, why he is so fond of paradox, and why he denigrates writing as a medium for philosophy.

What I shall argue as this chapter develops is that Plato's views on knowledge, understanding and learning generate a PWP. Basing itself on a model of oral dialectic, this PWP generates a series of recommendations concerning how philosophy ought to be written if it is to avoid the pitfalls that Plato associates with the written word.

II

For Plato, having knowledge at least involves being able to give an account of what is known. This is so for the Meno, where we simply need to give a proprietary 'explanatory account', and for the later works, where we may have to 'weave together' many accounts. Burnyeat has suggested that much of what Plato has to say concerning knowledge and its relation to opinion is more congenial to the modern eye if we reckon him to be pushing beyond a theory of knowledge for a theory of understanding. I would agree with Burnyeat here, and would add that much of Plato's PWP makes better sense if we consider his problem to be the transmission of understanding rather than of knowledge. As Burnyeat comments, it is one thing to be told, and so in one sense know, that root 3 is irrational, but quite another to understand why that should be so and be able to produce an explanation. To understand we need to 'see' for ourselves. Merely listening to (or indeed reading) an explanation will not produce understanding in the same way that being told that root 3 is irrational will produce knowledge. Plato's problem with writing, I want to suggest, is how it can best create some understanding in its readers. For Plato, the best way to 'come to know', is by the process of question and answer involved in dialectic. Indeed, in the Phaedrus Socrates goes as far as to say that

"Only [monois] in oral teaching for the sake of learning are really written in the soul things which are distinct, complete and worthy of great trouble concerning justice, beauty and goodness." (Pdr.278a)

We can compare this with what he has just said, that

"Nothing [oudena] ever yet written, whether in metre or in prose, is worth great pains." (Pdr.277e)

What is it about the written word that worries Plato? There are
initially two problems referred to in the tale of Theuth, the inventor of writing and Thamus, king of Egypt at Phaedrus 274c ff. Theuth claims that his invention will improve the memories and the wisdom of the Egyptians. However, Thamus replies that firstly, the invention will rather promote forgetfulness, as men will look to recollect from the external signs of writing rather than use their own internal resources. Secondly, he complains that

"You offer students the appearance of wisdom, not the true thing. For they may arrive at this point without proper instruction, appearing to you to be well-versed, but in fact ignorant of many important matters and difficult to be with, as they have come to be wise in their own conceit and not truly wise." (Pdr.275a)

Why does writing have these shortcomings? Socrates tells us that

"Writing has this strange property, in which it is very like painting. For the products of painting stand before us as if alive, yet if you ask them something, they are altogether solemnly silent. And so it is with written words. You might believe them to speak with some understanding, but if you should question them wishing to learn their account, they always point out one and the same thing." (Pdr.275d)

So books are incapable of entering into the sort of dialectic with their readers required for learning. They can give no account of what they have to convey if asked for further elucidation, and can give no defence of their position if challenged. These inabilities mean that books can only be purveyors of fact and doctrine rather than of understanding.

Assuming that Plato wishes to generate some understanding in us, is writing then a singularly unhelpful medium for him? The fact that Plato wrote so much, and with so much care suggests not. Perhaps then there is a via media between treatise writing and oral dialectic, a style that attempts to create a form of dialectic between reader and text, making writing a worthwhile philosophical activity for Plato. It may be that he believed that if the text is written in a sufficiently subtle manner, it can provide answers to our initial questions which lead to further questions on our part rather than to mere passive acceptance. If the text is so structured that it has layers of increasing philosophical sophistication, perhaps produced by the complex interplay of literary, dramatic and philosophic factors, then successive questions may elicit further more sophisticated and still provoking answers. As we refine our questions, the text may give us answers that were not apparent on a cursory reading, and so may be able to give an
account of the initial positions it presents. Thus the text may give us differing answers, of increasing levels of philosophical complexity, rather than merely saying the same thing over again, if we have been provoked into some more perceptive questions.

In the next section I shall attempt to show how Plato employs some literary/philosophic tools to achieve this objective. A common factor with all these devices is their ability to act as a challenge or a philosophical irritant to the readers, forcing them to go away and do some thinking for themselves, and to return to read the text at a different level of sophistication.

III

It is typical of Plato to force an apparently exhaustive dilemma, and then to show that none of its arms are acceptable, leaving us with an impasse, in [aporia].\(^{15}\) That leaves us with several questions to ask; is the dilemma truly exhaustive, are the arguments from the premisses valid, and are the conclusions really unacceptable? Paradigm cases here are the Laches, with Laches' and Nicias' physical and intellectual conceptions of courage, and the Cratylus with its conventionalist and naturalist accounts of naming.\(^{16}\) Plato often achieves aporiai by presenting somewhat extreme and overdrawn alternatives, resulting in paradox or other difficulties.\(^{17}\) The aporetic conclusion throws the onus onto the reader to sort out the hidden assumptions in the arguments as given, to refine our concepts and to return to the argument of the text with a more sophisticated view to try out. The task of the reader is then perhaps to steer a course between the presented alternatives hoping to arrive at a theory which meets the objections raised against both.\(^{18}\) If we care about philosophy, aporia will not let us rest, and will not let us accept the initial reading of a work.

So too there is paradox. As McCabe has argued, one might contrast the sort of paradox that points to an unlikely truth (no-one does wrong willingly) with those that are logically vicious, perhaps due to their self-reference, such as the liar paradox.\(^{19}\) Both have their uses for Plato, the first in challenging our intuitions and requiring us to formulate exactly what is wrong with either the paradox or our intuitions. The second type has two important features he can employ. Firstly, such paradoxes appear capable of defending themselves; assert that the liar paradox is true and it will tell you that it is false, and
vice versa. A second important aspect of these paradoxes is that if they are genuine, they force a shift in philosophical level in order to resolve them, as the liar paradox requires a move to metalanguages. In both cases the readers are forced to do some work to sort out their own opinions.

There is also Plato's use of irony, and the discussion here has often been hamstrung by the tendency to treat it as a binary, on/off phenomenon. Taken to an extreme, one could characterise this in terms of the two masks of the theatre. When Socrates wears the tragic, non-ironic mask, he gives us Platonic doctrine. When Socrates wears the comic, ironic mask, all he says is tongue-in-cheek and is not to be believed. Now of course it is possible for irony to operate in this manner, but Plato's irony is often more subtle and complex, rarely being a simple denial of the evident, and can have a definite philosophical purpose. It can focus our attention on the ambiguities of certain words and phrases, and may be the literary analogue for provoking philosophical reasoning of Republic 523a ff. There, when we look at the three fingers, we are forced to use reason to resolve our perception of what is large in one context and not so in others. When irony focuses our attention on am biguities, we are forced to reason in order to resolve the ambiguities, doing some philosophical work in order to be able to produce a consistent account. Thus irony can be a philosophical irritant, something that provokes us to philosophical enquiry.

Much has been written about Plato's use of myth and allegory, but here I shall focus on just two aspects. Firstly, myths are not bound by truth. We do not expect them to be literally true, but to be entertaining tales, or in more serious contexts, to be illuminating. Plato can exploit this to present suggestions which require our active participation to decide just how close to the truth they are. Another aspect of myth is that it is not bound by principles of economy, as are philosophical arguments. Myths can have as many outlandish beasts as they like, and Plato's philosophical myths are often profligate in their ontological commitment. As McCabe has argued, the parsimony of the arguments of the main text and the ontological generosity of the myths may function as critiques of each other. The question we the readers may be provoked into asking is whether the parsimony of the main text is adequate to provide explanation and understanding, and whether the myth's generosity, while providing more illumination, is in some ways otiose. One problem here is the Timaeus,
which is virtually all myth, but Plato's devices work at many levels and it may be that the Timaeus as a whole offsets other works. In particular, one might contrast the Timaeus's profligacy concerning Forms and teleology with the absence of both from the Theaetetus.30

It will be up to us, the readers, to decide how much ought to be salvaged, and up to us to pare down extravagances into a more economical form. This process will perhaps draw us into some sort of dialectic with the text, and with Plato's work overall as we ask different questions of it in sorting out how myth, allegory and metaphor relate to the arguments presented in the main body of the text and to our own views.

Allegories and metaphors too will always challenge our philosophical sensibilities as one must always ask where and why these representations break down. With the allegories of the Republic, or the 'fish's eye view' of the myth of the Phaedo,31 we can also ask how these relate to the structure of the argument in the work as a whole. Does Plato use the methods he proposes, and what is to be learnt from this?32 That again involves examining the text at a different level.

We also need to consider the contrast which Plato often draws between [spoude], 'zeal, earnestness, seriousness' (LSJ) and [paidia] 'child's play, sport, pastime' (LSJ), along with its cognate verb [paizein].33 If my analysis of Plato's EWP is correct, a work should not be written seriously at a prima facie level, but should be sporting, playful and suggestive such that it draws its readers into contemplation of its deeper levels, to consider the serious thought behind the playful written word.

Now while Plato does not have a fixed philosophical terminology, some terms tend to build up certain resonances. [paidia] and its cognates is one of these, I would suggest. Note for instance how the myth of the Politicus is introduced. It is a road that may afford us some amusement, [paidian] (Plt.268d8),34 and the Eleatic Stranger tells young Socrates

"But give your full attention to this story, just as children do; for you have not entirely outgrown such games [paidias]35." (Plt.268e)

Given the use of myth outlined above, there is a further contrast to be drawn between the relatively serious nature of the main text against the more playful extravagancies of myth, as I suggest is signposted here. This is important as the [paidia] description occurs several times in
later Plato. It is possible to relate all of the literary tools discussed above to this contrast of seriousness and playfulness. The use of irony fits well, playfully giving us ambiguities to sort out for ourselves, and Plato could be thought to be playfully teasing his readers by leading them into serious aporia and testing them with paradoxes. This play, though, has a serious intent, to lead us into philosophical enquiry in pursuit of an adequate theory that will allow us to maintain our intellectual integrity.

All this is by way of suggesting that there are two dialogues going on when we read Plato, between the characters in the dialogue, and between Plato and his readers. By various playful stylistic devices, Plato hopes to provoke us into the serious business of investigating the thought that lies behind the initial positions that his characters adopt in the text, so generating some dialectic between the reader and the text and hopefully helping to generate some understanding in his readers.

IV

Opposing the point that Plato seems to take great care in composing his dialogues is the seemingly irreconcilable fact that Plato states, in writing, that nothing written is worthy of great pains. How should we approach this paradox? Consider the way in which Plato's 

\[ \text{IV} \]

\[ \text{Opposing the point that Plato seems to take great care in composing his dialogues is the seeming}
\]

\[ \text{ly irreconcilable fact that Plato states, in writing, that nothing written is worthy of great pains. How should}
\]

\[ \text{we approach this paradox? Consider the way in which Plato's} \]

\[ \text{\textit{Phaedrus}. In line with the dilemma strategy, Plato overdrews the contrast between oral dialectic and writing to the point where paradox occurs, leaving the reader in aporia. Note the qualifiers Plato uses at 277e ff; nothing ever written, only oral dialectic, and that the contrast is thoroughly steeped in the [paidia]/[spoude] terminology, the wise man only writing as a 'pastime'. The resulting book paradox is self-referential and heavily ironic. In order to resolve it we need to shift levels, and this should provoke us into consideration of the nature of Plato's writing. We might well feel that some books are indeed like paintings, but others are more helpful in giving an account of themselves; but what is it about them that allows this? The challenge to the reader is to sort out the relationship between the written and the spoken word such that the written word can have some merit in the right circumstances, and so avoid the book paradox, while not being the equal of oral dialectic. The} \]
closest the Phaedrus comes to openly stating this is in the following passage, where Socrates says

"If he has composed these things with some knowledge of the truth, and is able to support what he has written in discussion, and has the power to demonstrate in his own speech the triviality of these writings, then one must say that it is not from these writings that such a man should receive his name, but from the enquiries which have underpinned them."40 (Pdr.278c)

This passage is still paradoxical (it is trivial without oral support), and Plato still holds apart writing and oral dialectic. If the author can create some dialectic with his reader however, and in that way transmit something of the enquiries that have underpinned his writing, then his work becomes non-trivial.

The great elegance of Plato's EWP is then the reflexive manner in which it is expounded. The theory which says not to trust the written word but to examine the thought that lies behind it is itself not to be trusted as a written theory but only as the thought behind the resolution of the written paradox that expresses it. So while writing will never be the equal of oral dialectic, it is not necessarily a worthless activity. One implication of this is that we cannot attribute the book paradox in its fully-fledged form to Plato. Like the views of Nicias and Laches or Hermogenes and Cratylus, it is employed as a tool to provoke the reader to investigate the text at a different level.

One question that we can now attempt to answer is whether the dialogue form is intrinsic to the way that Plato feels he ought to write philosophy. The key question is that of dialectic between reader and text. In relation to this, the dialogue form may not be necessary, as there may be other literary genres which will allow the creation of the sort of effect that Plato requires.41 There are though aspects of the dialogue form which are cleary very amenable to Plato's designs.

One minor point is that the interlocutors are often asked for their assent or dissent to certain stages of the argument, allowing the readers to agree or disagree with them and so to become to some extent personally involved in the outcome.42 This device is also useful in highlighting what the crucial admissions in any argument are by involving the interlocutor at the key points, and much can also be conveyed by the character and the reaction of the interlocutor.43 So too Plato's frequent use of the second person can resound beyond the
page and directly challenge us to give our replies and to bear the consequences of our admissions.44

The real advantage of dialogue, though, is that it gives free rein to devices such as setting, characterisation and dramatic interplay between the characters that Plato uses to create further depths of meaning and insight. He often makes the characters of the dramatis personae relevant to what they argue for and to the arguments they use.45 Laches, the bluff, simple soldier argues for a 'gut-reaction' account of bravery, while the weak-willed intellectualist Nicias argues for a purely intellectual account.46 Running beneath the surface is an assumption of personal integrity: not merely the intellectual integrity that prevents someone holding two opinions which conflict,47 but a more holistic personal integrity which demands that a person's 'words and deeds' be in accord.48 This complementarity is common both in Greek literature and in Plato, and sets the reader a challenge; formulate a theory where words and deeds are in harmony, including your own.49 This applies to the way that Plato constructs his dialogues, too; does the deed of presentation match the words of a theory? In the Phaedo, recollection must be recollected, and the method of hypothesis is presented as an hypothesis.50 In the Theaetetus, character gives examples; if Theodorus is an expert, and Theaetetus is able to learn and to make false judgements, then any adequate theory of knowledge must cater for these phenomena.

Another important feature of the dialogue form is that the internal dialogue can serve as a model for the external one. That is, the effects that Socrates has on his interlocutors may be a model for the effect that Plato is trying to have on us. In the Theaetetus, Socrates states in his closing speech that Theaetetus will be a gentler person for having some of his naive conceptions of knowledge refuted, and we might suppose that Plato wishes to have this effect on his readers too.51 As a general heuristic, we might look for ways in which the interlocutors are affected and consider if the text is intended to effect us similarly. Given the Socratic emphasis on intellectual and personal integrity, it should not surprise us that Plato writes in a way that integrates and harmonises philosophical content with literary and dramatic form - his work has an analogous artistic integrity.52
V

We might wonder how far this approach to writing philosophy pervades Plato's works. At Phaedo 102d3 Socrates says "But this is to talk like a book". This has caused some puzzlement among the commentators. However, consider what talking like a book is in the Phaedrus. It is to inflexibly return the same answer over and over again whatever the question, not explaining yourself any further. Here Socrates has spent the last twenty lines telling us over and over that people are short or tall because of shortness or tallness, in a repetitive manner which does no further explaining as it proceeds. In the Protagoras, Socrates criticises Pericles and other Sophists, saying that

"If you put some question to one of them, they are just like a book, lacking the ability either to answer your question or to ask questions themselves, and if you question even a small point of what they have said, just as things made of brass ring for a long time when struck, unless you seize them, these orators stretch out their speech for a wearisomely long time upon being questioned." (Prt.329a)

Now while I would not want to suggest that Plato had the fully articulated theory of the Phaedrus at this stage of his development, it is clear that some of the same themes are here.54

A further question we need to address is the matter of Plato's supposed 'unwritten doctrine'. In order to account for Plato's denigration of writing, his Lecture on the Good, and Aristotle's report of Plato's ontological views at Metaphysics 987b ff, for which there does not appear to be any counterpart in Plato's written work, the Tubingen school and others have suggested that Plato had an organised oral doctrine which he taught in the Academy but at no time committed to writing.55

Firstly though, my analysis of Plato's FWP would suggest that any 'unwritten doctrine' (if doctrine it be) is to be found in Plato's written works.56 Not at the prima facie level, but at a secondary level and beyond where a deeper analysis of the argument and the interaction of literary, dramatic and philosophical factors act as a critique of the ideas aired at the prima facie level. It is the use of this facet of writing, I have argued, that allows Plato to escape his own written strictures against the written word.

Secondly, I would agree with Sayre that the views to be found in the reports of Plato's Lecture on the Good and Aristotle's Metaphysics
may be found, if we look carefully enough, in the Philebus.57 This is a matter I shall take up in greater detail in chapter nine. Further, I would agree with some points made by Cherniss concerning the sole unambiguous reference to the 'unwritten doctrine' in Aristotle.58 Firstly, if Plato believed his oral communications to be paramount, one would expect Aristotle to refer to these rather than the dialogues in his reports on Plato. However, in contrast to many references to the dialogues, there is only one to the 'so-called' unwritten teachings,59 which is made in a way that suggests the reference was in some way odd. It may, as Cherniss suggests, simply be a reference to the Lecture on the Good,60 or perhaps Aristotle was conversant with what I have argued is Plato's PWP.61 Secondly, where oral and written views are supposed to diverge, Aristotle calls attention to a point of agreement between the 'unwritten doctrine' and the Timaeus. Thirdly, one would expect, although we do not find that there would be a general agreement among those who had access to the nature and content of the oral teachings.62

That we can find the gist of the 'unwritten doctrines' within Plato's works is an important point. It meshes well with my analysis of Plato's PWP, and it allows us to treat the evidence of Aristotle in a much more even handed manner. We are not forced to say, with Cherniss, that while Aristotle was a close associate of Plato he completely misinterpreted crucial areas of Plato's thought.63 Nor are we forced into the position that if Plato reserved his real philosophy for oral discussion, that we can only really study Plato through the reports of Aristotle and others who may have had access to the oral doctrine.64 We can in fact take the middle ground here and accord Aristotle's evidence some weight while taking the usual care to guard against Aristotle's tendency to interpret other peoples views in terms of his own system of thought.65

VI

I have argued that Plato's real interlocutors are his readers, and that effects experienced by his characters are often effects that Plato intends to have on us. If so, then the following passage sets some problems for the interpretation of Plato. Socrates has been describing the views of Protagoras and Heraclitus, and goes on to say

So "These views, Theaetetus, do they seem pleasant to you, and do you find their taste gratifying?"
"I, at least, don't know, Socrates. For I am not able to understand you, whether you say these things from your own belief or to test me."
So "You forget, my friend, that I know nothing of these things and nor do I claim any of them as my own, as I am barren of theories, being merely a midwife singing over you, providing for you so that you may taste for yourself each of the theories of the wise, until I can help lead your own opinion out into the light." (Th.157c)

If the purpose of the dialogues is mneumonic, then perhaps the question that Plato would have us ask is what do we think rather than what does Plato think. Merely to possess Plato's opinion would be of no help in coming to understand; we would be no better off than some of Plato's characters who are mere collectors of other people's opinions.

This leaves us with the difficulty of deciding how we should read his texts. On the one hand, we might read them as aids in a process of coming to understand. Following Cohen and Keyt we might call this the prospective model of interpretation. They focus on a slightly different problem, of how we can supply the premisses which are missing from some of Plato's arguments. Some of these we might be able to supply by 'extending the context', from elsewhere in the Platonic corpus or from Greek culture. Some we may not be able to supply at all, and so Cohen and Keyt distinguish between apparent and real enthymemes. If we are confronted with a real enthymeme, ought we to supply the best premisses which are available to us, or ought we to attempt to find out what Plato would have considered the missing premiss to be? Similar considerations apply when Plato leaves his readers in aporia. The prospective model of interpretation accepts the challenge and continues the process of philosophical investigation that Plato begins and effectively treats the dialogues as pieces of contemporary philosophy. There is no question of a right or a wrong interpretation here, merely stronger and weaker ways of supplementing the dialogues and so improving our own understanding.

On the other hand, we might want to know what Plato thought, as far as we can reconstruct such a thing. Following Cohen and Keyt we might term this the retrospective model, and it might be thought to function in an analogous way to the reconstruction of a damaged text. There may be epistemological difficulties with this reconstruction, but we do not doubt that there was something written which renders our conjectures true or false. It would be wrong to reckon that this analogy applies
exactly, however. It is unlikely that Plato was aware of every missing premiss, and it may well be that in some cases where Plato leaves his readers in aporia he was in aporia himself. In these cases, it would seem that we have to construct rather than reconstruct. However, Cohen and Keyt argue that any real enthymeme, by definition, is one that cannot be supplied from extending the context. They conclude that we therefore have no guide apart from our own conception of what is reasonable. I agree with Cohen and Keyt that one cannot avoid the difficulties here by suggesting that Plato's writings are entirely non-assertoric, or by denying that there are real enthymemes or aporiai in the sense that we can always supply a specific, determinate answer by extending the context. However, this does not entail that we have nothing to guide us on what sort of answer Plato might accept.

Firstly, Plato has some high level beliefs which will allow us to generate a set of constraints on candidate answers. At the highest level one might begin with non-contradiction, either as expressed in the Republic or in the many comments on intellectual integrity. One can then apply more of Plato's general beliefs to limit the field of candidates. As these beliefs will apply to all propositions, I suggest that there are no real enthymemes or aporiai in the sense that there are none which will leave us entirely to our own devices in interpretation. Secondly, when Plato leaves his readers in aporia, he does not leave them without resources. There will often be rejected positions, criteria for any candidate answers to satisfy, phenomena to be accounted for, and frameworks for further investigation. So for any 'real' enthymeme or aporia we can at the very least severely limit the possibilities and discover some of Plato's structural thinking. This may entail looking beyond what his characters say, and to the thought that underlies it. Such things are accessible though; if we can determine Plato's FWP, this gives us a large clue to determining other parts of his thought.

It should be evident that Plato's FWP does not license a deconstructionist reading where the reader creates the meaning of the text. The FWP might be likened to the analysis of truth in the Sophist. There, Plato steers a course between the twin perils of the rigid account of the late learners and an outright relativism where anything is true. So too with the effect he tries to create with his dialogues. If Plato constrains their range too tightly they will become inflexible and non-explanatory like the paintings of the Phaedrus, while if any reading is allowed there will be no discrimination between
readings and hence no coming know, if we cannot judge one reading to be better than any other.

So, when attempting to determine what Plato thought, we must extend the context as far as possible, and generate as many constraints as we can on the type of position that Plato might have held. These strategies may still underdetermine the range of possibilities. We might then invoke a principle of charity, allowing Plato the best position constructable on the evidence available to us. This charity, though, must be tempered with some parsimony and we must take care to distinguish between the best position that could be held and the best we might reasonably attribute to Plato. This then is the general interpretive strategy that will be followed by this thesis.

When we attempt to assess anyone's contribution to the history and philosophy of science, it is well to distinguish three sorts of questions. Firstly, how well did they address and react to the problems of their age and those they set themselves? Secondly, did they influence later thinkers and was this a beneficial influence? Thirdly, what did they have to say that is of use to us today? In this thesis I shall largely but not exclusively concerned with the first of these questions, and so in Cohen and Keyt's terms with a retrospective analysis. Plato, though, sees one of his problems as influencing other people via his dialogues, so this question too will be given some consideration, as will the relation between Plato's thought and certain realist positions in modern philosophy of science.

VIII

Plato, then, has a highly distinctive FWP. This is generated, I have argued, by the desire to create a form of dialectic between the reader and the text, modelled on oral dialectic, such that the reader may come to understand through proper dialectical education rather than be the mere possessor of other people's opinions. Plato's thought may often have to be teased out from behind the positions that he gives to his characters. Paying due attention to Plato's FWP will prove to be highly fruitful in relation to many passages concerning Plato's philosophy of science. So too I shall argue that it has a critical role to play in assessing the nature of the Timaeus. In the next chapter I shall discuss some of Plato's earlier views on methodology, as expressed in the Phaedo, where we will find the FWP to be highly pertinent.


04) Another question is my own position. While I hope to reach some understanding of Plato's style, his is not a view that I ultimately share. This chapter is an attempt at a 'cold, clear' analysis of the reasons Plato may have had for adopting his style. My position throughout this thesis is that of an analytical philosopher taking on board some of the techniques of hermeneutics and literary criticism because of the specific nature of the subject matter.

05) Cf. Nussbaum (1986) p16, "Plato, the main creator of the style that Murdoch describes... believed that the 'plain', 'hard' style expressed a definite ethical conception and that fairness to a different conception required a different style." While I agree with Nussbaum here, I attempt a more general account of Plato's position.

06) None of these possibilities need be exclusive of the others.

07) Others might disagree, citing the [arche anupothetos] of the Rep. or the elements of Socrates' dream of the Tht. as things known but [alogos]. I shall argue against these views in ch.2, 6 and 7.


09) I.e come to understand.

10) A general principle running throughout Plato's writings, and emphasised in the Pdr; cf. 276e and 278c, and So.230d. See Chr.166c and Grg.482a ff on the impersonal nature of this approach. Note also that at Pdr.268c a man is not a doctor merely because he has read something from a book; a knowledge (understanding) of the nature of the subject is required rather then mere snippets of information.

11) Following Macenzie (1982a), I term this the 'book paradox'. Although this is the most explicit formulation, other passages echo the difficulty, e.g Pdr.275d.

12) See my ch.2 for the importance of relying on one's own resources.

13) Otherwise true judgement would constitute knowledge, if all that were required for knowledge were an acquaintance with the facts; cf. Tht.187a-201c, Men.97a ff.

14) If we are to believe Dionysius of Halicarnassus in his On Literary Composition, Plato painstakingly wrote and re-wrote each of his works.

15) The following accounts of aspects of Plato's style are not intended to be exhaustive either of these aspects or of Plato's style, merely picking out the features which are relevant to the sort of effect that
Plato wishes to create given his PWP.

16) These examples are on a dialogue level, but this strategy occurs frequently in individual arguments as well.

17) An interesting instance here is Plb.28c3 where Socrates admits to 'overplaying his own candidate'; cf. my discussion of [paidia].

18) Cf. So.251a, where we must fend off both arguments at once, and force a passage between. Owen's 'Parity Assumption' (see his (1970) p108), that a solution here must illuminate both, can be usefully employed in relation to other such Platonic cruxes.

19) See Mackenzie (1982a) p64.


21) One might compare such a shift of levels with Plato's various metaphors for the cognitive ascent of the philosopher, esp. in the Sym. and Rep.

22) Cf. e.g Burnet (1911) p108 and Murphy (1936) p41.


24) Via the Rep. we might again link an aspect of Plato's PWP, here irony, with cognitive ascent.

25) We might expect some myths simply to be entertaining tales (see e.g Tolkien's repudiation of any allegorical meaning in his work in the preface to the second edition of Lord of the Rings), and others to carry some meaning (e.g Biblical parables). Some might be both and can be read on several levels (e.g Orwell's Animal Farm). I use myth here very broadly to cover several genres of fiction.

26) See here esp. Socrates' comments at Rep.506e ff; his account of sun, line and cave will 'resemble a child of the good', and will 'owe an account of the parent'; but beware, he says, lest he 'inadvertently cheat you of the interest due on the account'.


28) One might consider here how the myths of the Pdo, Rep, and Plt. 'flesh out' the bare bones of the philosophy and cosmology of the main parts of those dialogues, or how the Tim. presents us with several conceptions of teleology.

29) One might link this to the dilemma strategy outlined above; on the one hand, Plato gives us the overly parsimonious account that fails to explain, on the other he gives an overly generous account.

30) There is a question here as to whether the Tim. (with the Cri. etc) is in effect an abandoned project containing rejected theories (so Owen), or is a coherent part of an integrated later period strategy. As indicated in the introduction, I favour the latter view, which I shall argue for in later chapters.

31) See Pdo.109d ff. Again, Socrates denies knowledge of these matters
(cf. Rep.506e ff), saying that "To confidently state that all these matters are such as I have described them, is not fitting for a man of intelligence" (Pdo.114d), and comments that 'this or something like it' is true.


33) Important examples of the [paidia]/ [spoude] contrast are at Rep.545d, So.241a ff, Plb.28c, 30e, Le.688bc.

34) Cf. So.234c and 242c, which will be discussed more fully in ch.4.

35) Reading [paidias] with Burnet, Campbell, Dies and Skemp against various alternatives; cf. Skemp (1952) p144.

36) Esp. at Tim.59cd, as I shall discuss in detail in ch.4.

37) One might note how often Plato uses 'shame' and related terms when an argument runs into difficulties; cf. Chr. 169c and La.196b.

38) Pdr.276d "Fittingly, it is for the sake of a pastime [paidias charin] that that he will sow seeds and write in the garden of letters, when he writes... Much better is the serious [spoude] treatment of these matters, that is whenever someone employs the method of dialectic"; cf. Pdr.276bc, 277e, 278a.

39) Ironic in the sense argued for earlier, rather than as a simple negation of what is said; cf. Ferrari (1987) ch.7.

40) One might compare passages at Tht.152c, 155d, 180c, 184a which suggest that the writings of Protagoras do not have some hidden meaning while those of Heraclitus, the ancient poets and Parmenides do; see my ch.4.

41) E.g the Tim. is hardly a dialogue, although as I argue in ch.4, it certainly displays many aspects of Plato's PWP.


43) The first part of the Prm. is perhaps a good example of this. Another advantage of dialogue is that there is no compunction to immediately state what you believe and then defend it. It is possible to begin with naive but plausible positions held by the characters, when much may be learnt by a detailed discussion of why such positions are inadequate; cf. Burnyeat's reading of the Tht, esp. (1991) p234.


45) The Plb. has Philebus ('love boy') and Protarchus ('for order') taking sides in a discussion of pleasure.

46) See La.181d ff and 182d ff respectively, and the ensuing discussion.

47) This is possibly most forcibly expressed at Grg.482b, where Plato has Socrates say "I at least, my good sir, believe it much better to have my lyre or any chorus I might lead out of tune and discordant, and for most men to disagree with me and to contradict what I have to say,
rather than that I, who am but one, should disagree with or contradict myself"; cf. Robinson (1950) p15/6. See McKim (1988) p36 ff for discussion of the idea that some of the arguments given to Socrates are psychological rather than logical in nature and are intended to prey on the beliefs of the interlocutors rather than be water-tight proofs.

48) Note for instance how Iaches' assessment of Stesilaus (Ia.183d ff) and Socrates (Ia.188e ff) are based on their deeds not their words, and vice versa with Nicias (cf. Ia.187e ff). Cf. Ia.193e for the importance of harmony between words and deeds.

49) The contrast of [logos] and [ergon] was common in Greek literature as well as in Plato, either as words vs deeds or claim vs fact; cf. Aeschylus, Prometheus Bound 338, Sophocles, Electra 59, 358, 625, 1360, Oedipus Tyrannus 517, 864, Euripides, Alcestis 339, Electra 893, Orestes 287, Herodotus, History 2.65, Thucydides 1.128.3, 2.40.1, 2.43.2. In Plato, cf. Crt.52d, Mnx.244a, Grg.461d, Prt.325d, Pdo.100a, Rep.382a, 382e, 492d, 498e, 563a, Pdr.240e, Tim.19e, Le.679d, 717d, 769e, 885b, 907d.

50) See Pdo.72e ff esp. 73b, and 96a ff respectively, and my next chapter for a full discussion.

51) See Tht.210b ff.

52) I would agree with e.g O'Brien's (1963, p135) assessment of the Iaches, where he says that it is "A balanced work of art, in which character and action illuminate the thought, and the thought is in turn a judgement on the characters." Cf. Pdr.264c on literary unity.

53) Alternatively 'over a long course' if we take [dolichon] in its other sense of a long-distance race course.

54) The [paidia]/[spoude] contrast for instance crops up at Rep.545d.


56) See above on whether Plato's works are didactic or maeutic.


58) See Cherniss (1944) p71 ff.


60) I am happy to accept with Cherniss (1944) p10 and Sayre (1983) p80 that there was a Lecture on the Good, but there is no evidence that there was more than one lecture or that there was an organised oral doctrine.

61) See here Aristotle's comments at Rhetoric 1409.


64) See here Sayre (1983) p78.

65) Here I would agree with Fine (1992) that it is false to assume that Aristotle "Aims to record and criticize arguments to which Plato is straightforwardly committed" (p13). Rather, he gives a natural and literal reading to some of Plato's comments and reconstructs arguments with the aid of Aristotelian assumptions; we get then, not a simple record of Plato's views but what Aristotle takes to be a natural construction of his views.

66) Given Plato's FW it would be of little or no help if someone called Plato occurred as a character, as we would have to treat his views with just as much suspicion as everyone else's; cf. Frede (1992).

67) Cf. Meno and Phaedrus in their eponymous dialogues.


70) There is nothing for our hypotheses to correspond to and to be correct or incorrect in virtue of such correspondence.

71) That is, behind all the arguments that a dialogue presents us there may be no doctrine for us to ferret out, no definite position that a dialogue is trying to guide us towards.


73) With every thinker there are real gaps in their thought, where they are genuinely unaware of or unclear on some matter, and we have no grounds for excepting Plato.

74) See Rep.436b for (something like) a law of non-contradiction (though see Jordan (1984) for an extended discussion), and Grg.482b for integrity involving not contradicting oneself.

75) As I shall argue in the next chapter, in reply to Meno's paradox Plato has a great deal to say on how we should conduct our enquiries.

76) This might be argued for on other grounds, of course.

77) This may also be constrained by hypotheses concerning Plato's development.

This chapter will examine the methodologies proposed in the Meno and the Phaedo for enquiry in general and their implications for the investigation of nature. A central question here will be whether Plato adheres to the theory of [anamnesis] or recollection, for if so, there will be important ramifications for the investigation of natural phenomena. Recollection is introduced in the Meno, further explored in the Phaedo, and mentioned again in the Phaedrus. Two views on its lifespan are firstly that Plato never abandoned recollection, there being no explicit argument against it or statement of its rejection,¹ and secondly that while anamnesis is initially important, its influence wanes and it is tacitly forgotten in the more sophisticated discussions of epistemology of the critical period. Here I shall argue for a more radical position, that anamnesis is argued against and rejected in the latter part of the Phaedo, and that the method of hypothesis, which is sometimes supposed to be compatible with recollection, aims to remedy some of its deficiencies.² I shall first discuss the nature of Socrates' 'autobiography' and the [deuteros plous], the 'second voyage'. I examine the idea that these passages present us with criteria with which to judge philosophical theories, and invite us to apply these to a choice between anamnesis and hypothesis. I then explore this application, in conjunction with some of the hints and examples that Plato gives us in his text, and discuss the methodological ramifications of the argument.

I

At Phaedo 96a ff, Plato has Socrates recount his experiences of enquiring into the question of why things should come to be and pass away. Socrates first tells of his youthful infatuation and subsequent disenchantment with [peri phuseos historian], the 'enquiry concerning nature'.³ He then hears of the works of Anaxagoras, and hoping to find teleological explanations, rushes to read his books, but is disappointed. Unable to find or be taught the sort of explanations he requires, Socrates sets out on his deuteros plous.⁴ There are some standard questions concerning the deuteros plous that I shall be interested in here. Does teleological explanation play any part in it,
is it a second best approach, and what does Plato have in mind as the [protos plous], the 'first voyage'?

The protos plous has been identified with the views of the [physiologoi] which interested Socrates in his youth. This interpretation immediately runs into a major difficulty, however. The deuterons plous appears to involve both the method of hypothesis and the theory of Forms. It would seem unlikely that Plato would have Socrates describe these as a second best to the philosophy of the physiologoi. There are two standard strategies for dissolving this tension. The first is to suggest that the deuterons plous description is ironic and so is not to be taken seriously. The second is to postulate that the protos plous is some unattainable ideal, relative to which the deuterons plous is a second best.5

What I want to suggest instead is that Socrates' autobiography is primarily a discussion of ontology and explanation.6 The question that I believe is being posed is, What is the minimum number of entities we must postulate in order to have a theory that will do all the explaining that we require of it?7 The issue is a balance between ontological parsimony and explanatory richness. The deuterons plous may then be a second attempt at this balance - one that is explanatorily richer, but requires a greater ontological commitment.

If this balancing act is proposed as a philosophical programme, one way of proceeding is to begin with a minimum number of entities, to examine how they are explanatorily deficient, and then to build a richer ontology specifically designed to remedy these inadequacies. This, I suggest, is what we find in Socrates' autobiography.8 Firstly, we are given the parsimonious ontology of the physiologoi. Their world consists of physical objects and proximate causes only. The puzzles which Socrates cannot solve at Phaedo 96d ff may seem a rather odd collection. Undoubtedly, part of the function of these puzzles is to help us formulate what is an adequate explanation.9 Why, though, does Socrates mention some clearly inadequate explanations in each case? One factor that ties these deficient attempts together is that they are all couched solely in terms of physical objects or causes, and are the only sort of explanation available if we are restricted to the ontology of the physiologoi. This then is an argument from the explanatory deficiency of such an ontology for some more entities that will enable us to produce adequate explanations.

34
It is also interesting to note the parsimonious nature of the account of mind that is on offer here. Among the questions that Socrates asked himself in his youth are

"Is it blood with which we think, or air, or fire, or is it none of these? Is it the brain [ho engkephalos] which grants the sensations of hearing, sight and smell, are memory and opinion produced from these, and is it from memory and opinion acquiring stability that knowledge is produced?" (Pdo.96b)

Note the use of [ho engkephalos], brain, rather than Plato's usual [he psuche], mind/ soul here. In line with the physiologoi's ontology, all the proposed solutions here are physicalist ones. They are also external and causal explanations; knowledge here is a state that occurs due to the causal effect of perceptions eventually creating stable opinions. For Plato though, as we saw in the previous chapter, such a process could only account for the acquisition of information rather than of understanding, a state which requires a more active and independent account of mind. So too Plato will not accept that stable 'memory and opinion' is to be equated with knowledge, unless perhaps that stability is one created by the mastery of explanatory accounts, again requiring a more active account of mind. Given the physiologoi's ontology though, these are the only sort of explanations that they can offer. Some sort of empiricism is going to fit well with this programme, and this is alluded to when Socrates refers back to his youthful experiences and says that

"I was afraid that I might totally blind my soul, looking at things with my eyes and endeavouring to grasp them with each of my senses." (Pdo.99e)

We might expect more generous accounts in all these areas when some new entities are postulated. Firstly, however, the discussion takes a detour via Anaxagoras. Socrates is excited by the prospect of teleological explanations on hearing that Anaxagoras believes that intelligence orders everything. He is disappointed though, and says

"My wonderful hopes came to ruin, since proceeding with my reading I perceived a man neither making use of (his) intelligence, nor assigning to it any reason for the order of things, but giving the reason as air, aether, water and many other absurd things." (Pdo.98b)

I take it that Plato has two objections to Anaxagoras here. Firstly, Anaxagoras gives explanations couched in the same inadequate, entirely
physical terms as those of the physiologoi. Secondly, he postulates an entity which does no explaining. This might be seen as a proto-Ockhamite objection, that Anaxagoras is multiplying entities beyond necessity.

This has an important function as a contrast to the lessons of the physiologoi's ontology. The reader has now been armed with the criteria with which to judge any future proposals; are they too parsimonious and explanatorily deficient, or are they too profligate, with entities that are inefficient or even non-explanatory? In line with Plato's FWP, the coming deuteros plous may be Plato's proposed balance of entities and explanations, but the readers are being given the tools to judge this matter for themselves, and to extend this programme to other related questions raised in the Phaedo.

Socrates makes it clear in discussing Anaxagoras that he is interested in teleological explanations

"Considering these things, I was delighted to think I had found in Anaxagoras a teacher of the reason for things in accordance with my own way of thinking. I thought that firstly he would tell me, whether the earth is flat or round, and having told me this, he would explain the reason and the necessity, stating the nature of the better and why it is better for the earth to be as it is." (Pdo.97d)

The point here is that explanations couched solely in terms of physical entities and causes are also deficient in that they are incapable of generating teleology. Let us call the puzzles at 96d ff concerning addition, tallness, etc, the formal puzzles and the above problem at Phaedo 97d the teleological puzzle.

It is important to recognise which entity will produce the possibility of teleological explanations. Closing the first part of his autobiography, and having bemoaned the fact that no-one has given him proper teleological explanations, Socrates says

"They do not truly believe that it is the good [agathon] and proper which binds and holds everything together. I would most gladly become anyone's student concerning such a reason and how it prevails; but since I was deprived of this, neither able to find it myself nor to learn it from any other, would you like, Cebes, for me to demonstrate how I worked out and created for myself a second voyage in search of explanation?" (Pdo.99c)

What one would expect if Plato is following the programme I have suggested is that some more entities will now be postulated, designed to
remedy the deficiencies of the views already examined, and this that we find right at the beginning of the deuteros pious. Socrates says

"I hypothesize there to be something beautiful itself by itself and similarly a good [agathon] and a large and all the others." (Pdo.100b)

That these new entities are designed to help solve the formal puzzles is uncontroversial. At 100c ff, Socrates goes through the difficulties introduced at 96d ff and shows how we can now have some adequate explanations which cite Forms as explanatory entities. In addition though, an entity that might help with the teleological puzzle, the [agathon], is also hypothesised. It seems that, contrary to the view of some commentators, teleological explanations are immediately back on the agenda. What I contend here is that just as the formal puzzles of 96b ff are given solutions in terms of the newly hypothesised entities of 100b at 100d ff, so the teleological puzzle of 97d ff is given a solution in terms of the [agathon] at 108e ff. This is a claim which I shall defend in detail later in this chapter. For the moment, all I require is that the deuteros pious hypothesizes a richer ontology in order to provide some better explanations, and whatever the case with the [agathon], this is so with formal explanations.

Now consider the relation of the deuteros pious to the proposed protos pious. The deuteros pious is more profligate of entities than the protos pious, but is also more explanatorily sufficient. This is the key to the ambiguity of the deuteros pious description. When we consider the nature of the deuteros pious, there is a sense in which it is a second best relative to the protos pious, in requiring greater ontological commitment, but also a sense, in terms of explanatory adequacy, in which it is better. The deuteros pious is also secondary in terms of exposition in terms of the programme that I suggest Plato is engaged in here, and secondary in terms of the chronology of the metaphor of Socrates' autobiography, without necessarily being a second best.

Now let us consider irony in relation to this passage. In chapter one, I argued that Platonic irony is not a binary, on/ off phenomenon and that the dichotomy of the serious Socrates giving us Platonic doctrine against the ironic Socrates who is not to be believed is too simple. Rather, Plato's irony can focus our attentions on ambiguities, forcing us to do some reasoning for ourselves in order to arrive at a consistent account. If this is so, then it fits my analysis of the deuteros pious very well. The deuteros pious is presented as
simultaneously a best and a second best, and the irony focused on this description forces us to sort out in exactly which separate respects the deuteros plous is best and second best.\textsuperscript{19} We are led to consider the ontological cost of explanatory adequacy.

II

Now let us take up a second strand of interpretation, by examining the deuteros plous description as an epistemological metaphor. One meaning of the phrase is to take to the oars when there is no wind to move the ship.\textsuperscript{20} Thus when the easy methods which we hope will bring us to our destination without doing any work ourselves fail, we must make headway by our own active efforts, 'row our own boat' if you like. It is worth noting that when Socrates introduces the deuteros plous at 99c ff he uses the middle voiced verb [poiesomai] at 99d, carrying this sense of creating for oneself. This philosophy of self-reliance when external authorities fail has important implications for anamnesis and hypothesis, I shall argue.

The deuteros plous metaphor can be cashed in several different but related ways. One sense might be that when we cannot be taught, we must actively seek knowledge ourselves, and here again we ought to bear in mind Plato's views on the transmission of understanding. This has deep resonances throughout Plato's work, from the relation of the Socratic elenchus to the experts, to the Apology, to Meno's paradox, through to the Theaetetus and the criticism of Protagoras.\textsuperscript{21} Like using the sails, being taught is easier, but should this fail to provide understanding, then we must take to the oars and play an active part ourselves. Note the relative ontological commitments here; being taught requires only a passive account of mind and a causal account of the transmission of knowledge, like that of the physiologoi at Phaedo 96b, while the deuteros plous requires a more active account of mind.

One can also consider this metaphor in the following manner. If sense perception is inadequate for what we require, then we must have recourse to reason.\textsuperscript{22} This can be thought of both in terms of a definition of knowledge and methods for the acquisition of knowledge. Again, this has deep resonances with Plato's other works, most notably with the middle books of the Republic and the Theaetetus.\textsuperscript{23}

The framework that the deuteros plous gives us then looks something like this. We need an epistemology and an account of mind that will allow
us access to the Forms. If a parsimonious account should fail, then we must look for a richer account, justified by its greater explanatory richness, or failing on grounds of profliqacy. In the first instance, we might take this as an assault on the empiricism of the physiologoi, as such an approach will not allow us access to the Forms. However, we might also be led to compare the relative merits of recollection and the method of hypothesis.

Anamnesis could be thought to have three functions. Firstly, it might be a theory of concept acquisition, giving an explanation of how we come to have ideas which are not given in, or are not directly derivable from sense experience. Secondly, it could be thought of as a means of arriving at some basic unimpeachable truths, such that it is a means of foundation. Thirdly, anamnesis is explicitly introduced as a resolution of Meno's paradox.

In all these cases recollection purports to explain how it is that the mind acquires some of its contents. Consider, though, the way in which recollection functions. In the Phaedo, anamnesis explains the mind's contents externally and causally; we have sense perceptions and then recollect what we acquired in our pre-carnate existence. There is no creative role for mind here, as what we acquire comes to us pre-formed. Nor does it seem that the mind makes active judgements about what is recollected; recollection then requires only a parsimonious account of mind. The method of hypothesis on the other hand suggests that we create and judge some of the contents of our minds ourselves. In terms of the deuteros plous metaphor, anamnesis is the easier, given path which explains the contents of the mind by external action on a relatively passive mind. If this sort of explanation should fail to be adequate, then we might look to the method of hypothesis which requires a more active account of mind. If my analysis of Socrates' autobiography and the deuteros plous is correct, then there should be a balancing of the ontological commitment of these theories against their explanatory adequacy. This may not be explicit in the text; it may be up to the readers, primed with the parsimony and profliqacy criteria to do much of the work themselves.

We might expect this to be the case for several reasons. Plato's EWP suggests that in order to come to know, we must work things out for ourselves, rather than passively accept what is given us by the text. Here then is a challenge for us; given the criteria presented, which is
the better theory and why? Another factor here is the harmony of words and deeds in the way in which the two theories are presented to us. If all learning is recollection, then the only way we the readers can learn about recollection is by recollecting it. Plato is quite aware of this, both in the Meno and in the Phaedo. Similarly, in presenting a method of hypothesis which relies on an active mind making self-reliant judgements, Plato presents us with an hypothesis which we must pass judgement on ourselves. The fundamental question for us to decide upon is whether anamnesis is explanatory adequate, and if not, whether the move to hypothesis and a richer account of mind is justified by its ability to produce better explanations.

Is there some further indication, though, that we are meant to read the text in this way? Having stated that certain knowledge is either impossible or very difficult to acquire in this life, Simmias says that

"It is necessary to do one of the following things concerning this matter; either to learn or find out the way of things, or, if this is impossible, taking the best and least refutable of human accounts, to embark on it as if on a raft and sail through life's dangers, if it is not possible to pass through safer and less troubled on some more stable vessel, some divine account." (Pdo.85c)

What is this divine account? Most commentators suggest some form of Orphic or Pythagorean doctrine. Another possibility though is anamnesis, which could be thought in some ways to function like divine revelation. If so, then Simmias poses what I have argued is the key question; Can we rely on anamnesis or must we take the harder, more self-reliant route of hypothesis? Earlier in the Phaedo we have been specifically reminded of the discussion of anamnesis in the Meno. There, it is one of [ta theia pragmata] (Men.81a6), and Socrates has heard of it from certain priests and priestesses, who have

"Given thought to their affairs and are alone able to give an account of them. So speak Pindar and many other poets, as far as they are divine." (Men.81ab)

The 'divine account' description may then be an allusion to the way that anamnesis is described in the Meno.

Another view might take it that Phaedo 99d ff is an example of recollection, that having been given the conditions for recollection the deuteros pious then gives us an answer (Forms) and proceeds in the terms of the Meno to give us some sort of [aitias logismoi]. On this account
hypothesis and recollection are not separate theories, but our hypotheses either lead to an act of recollection or constitute recollection. If so, though, the commitment to pre-carnate knowledge carried by recollection must give us something more than the method of hypothesis does alone, or recollection would be otiose. As I shall argue in the next section though, hypothesis actually gives us rather more than recollection, and all the functions of anamnesis are taken over and performed better by the method of hypothesis. I shall also argue that the text helps the reader to pose some of the key questions by giving examples of phenomena that must be accounted for by both theories.

III

One major problem with anamnesis is that it cannot give an account of error in concept formation. If anamnesis is the recollection of the set of concepts acquired during the pre-carnate existence of the soul, and is an exhaustive account of concept formation, then no-one should acquire an incorrect concept, there should be no disagreement about concepts, and no-one should have two formulations of a concept. Yet all of these seem to be undeniable phenomena, and one might push this a little further and suggest that we should have no conception of what an incorrect conception might be, and certainly no example of one. One of the interesting aspects of the Phaedo is that we are given several examples of these difficulties. At Phaedo 84c ff Socrates, Simmias and Cebes discuss three conceptions of the soul, immortality, attunement and cloak and weaver. Each understands the other’s conception, and two of these views must be wrong. Note also that Simmias and Cebes are fervent supporters of the theory of recollection and so must believe themselves to have recollected the concepts of soul that they are defending.

One attempt to avoid these difficulties is to suggest that we form some concepts by hypothesis and abstraction, but that correct concepts are formed by anamnesis. The trouble with this is that anamnesis is already looking otiose. If we can hypothesise, we can presumably hypothesise correct conceptions as well as false ones. Once we postulate an active faculty of mind that can form concepts we have no need of anamnesis, though it may still be a means of verification, and I shall discuss the difficulties with this shortly.

If anamnesis involves not only the recollection of concepts such as equality but also explanations which cite these entities, further
difficulties arise. Meno 98a tells us that our opinions become knowledge when they are bound by an [aitias logismos], an explanatory account, and that this process is recollection. If recollection is an exhaustive account though, how is it that we acquire incorrect or multiple competing explanations, and how is it that disagreement occurs? Another difficulty becomes apparent at this stage. Perhaps one might be able to construct a theory in which anamnesis remained infallible and error was located elsewhere for simple mistakes. We might recollect correctly, but through some other mental error mis-match the explanans and explananda. Errors in producing badly formed explanations, such as those of the physiologoi, seem to be far more difficult to give any account of, as they cannot be recollected. To explain the existence of such explanations we will require some mental capacity for their invention, one that would also be able to produce well formed explanations and so render anamnesis otiose. I take it that one of the points of Socrates' autobiography is to show that we do indeed produce badly formed explanations. At Phaedo 96b ff, Socrates in his youth, Anaxagoras and the physiologoi all consistently produced such inadequate explanations, and believed them to be true, even when given all the proper conditions for recollection.

The question of why one person recollects and another does not is also a serious theoretical worry. If anamnesis is something which happens to us, it should happen equally to all of us in any given situation. Presumably we have all seen many instances of justice, some of us have thought hard about the nature of justice, but only a very few have actually recollected the correct concept. Anamnesis then also requires some sort of account of the different structures and/or activities of our minds, in order to account for these phenomena.

Here we must address the question of a possible gap between the contents of our minds and the world. Anamnesis has the built in advantage that our recollections are going to match the world precisely. Hypothesis may explain how we err in acquiring concepts and explanations, but is it by anything more than luck that we ever hypothesise correctly? The price for an explanation of a misfit between our minds and the world is that we now require an explanation of how they could ever come into accord. I shall argue later that Plato has a great deal to say about this in relation to theories of truth and to Meno's paradox. For the moment, let us note something common to both
anamnesis and hypothesis, that for Plato qualities inhere in things and
impinge upon us. With anamnesis in the Phaedo, this is used as an
initiator of the process; we perceive particulars and are reminded of
the knowledge we had in our pre-carnate existence. Hypotheses are not
created ex nihilo, the active mind having a good starting point in our
perceptions from which to construct hypotheses which have a reasonable
chance of being correct.

IV

Let us now consider the second function of anamnesis, as a means of
foundation. The problem of founding a philosophical system on some basic
indubitable truths is how one justifies these truths. If the
justifications are not to be regressive or circular, then the
foundations must be intuitively correct or self-verifying. What is it
then that guarantees the truth of what we have recollected? The ability
of the recollector to give an explanatory account will not do as we will
always require an account of the account to make it known, creating a
regress. Any criterion appealed to by anamnesis will have to be
something intrinsic, as anything extrinsic could equally well be
appealed to by hypothesis.

The difficulty now is not how we acquire false concepts and
explanations, but how we can distinguish them from the correct ones.
Initially, one might try to account for this by suggesting that all our
false beliefs occur pre-anamnesis, and that the process of recollection
sorts our hypotheses, verifying the correct ones. The problem is deeper,
though, in discriminating between pre- and post-recollected states.
What is it that tells us that we have successfully recollected?

Process considerations will not help here. If all change of opinion
were anamnesis, we might have a criterion, the move from pre- to post-
recollected states being so signalled. Yet this cannot be so, as not
every change of opinion moves to a correct opinion. Neither will the
ability to give an account distinguish pre- and post-recollected states, as we can give a plausible account of many false beliefs,
believing them to be true. The fundamental problem here is that we
cannot tell from the nature of the process of recollection when that
process is complete.

Perhaps, though, there is something intrinsic to the content of
what we recollect that tells us we have successfully recollected. That
which we recollect may act upon us to create a special state of certainty. However, we may be in error about this state, and we can give no justification of our position, or we slip back into the regress; and how do we know that we are in a final state of certainty, if previous states have betrayed us? An example which appears to address this problem is the interjection at Phaedo 88c ff. Phaedo had been completely convinced by the argument that the soul is immortal, i.e believed himself to have recollected it. Yet now the arguments of Cebes and Simmias seem stronger, and Phaedo wonders if he is a competent judge, as his supposed state of certainty has been betrayed. Echecrates is also worried as he was convinced by Socrates, despite the theory of soul as attunement having a 'strange hold' on him, i.e being one that appeared to him to be recollected, and is now worried by the objections of Simmias and Cebes. However, Socrates is about to demolish the attunement theory and reinstate the immortality of the soul. What is shaken here is the notion that anamnesis can provide any foundation, if we cannot trust our special states of certainty. In the previous chapter I argued that the effects that Socrates has on his interlocutors are effects that Plato wishes to have on us. So here; if we the readers had a special state of certainty concerning any of the positions that now seem in doubt or have been refuted, then our faith in special states of certainty should have been shaken too. That leaves us having to decide upon the truth of any theory for ourselves, similar perhaps to the position of Socrates at Phaedo 93d when he introduces the deuteropious as a result of his own mental creativity.

Anamnesis does purport to provide a foundation though, however flawed. Does the method of hypothesis manage to provide any foundation at all? Socrates says that

"When it is necessary to give an account of this hypothesis, you could do so in a similar manner, hypothesising again another hypothesis, whichever of the higher ones seems best, until you arrive at something adequate [ti hikanon]." (Pdo.101d)

The question here revolves around the strength of the [ti hikanon]. Adequacy can be ad hominem, that is sufficient to see off whoever you happen to be arguing against at the time, or simpliciter, immune to all arguments that might possibly be brought against it. What I want to suggest here is that Plato wants more than ad hominem sufficiency from the method of hypothesis, in order to produce an alternative method of
foundation to anamnesis, and that this is closely linked to the reasons why Plato requires teleological explanations. Let us begin by asking why Plato might want this teleology. Firstly, one might suggest that it has something to do with the Platonic/Socratic ethical programme, that if we can have 'for the best' explanations which relate to real aspects of the world, this might open a route towards ethical absolutes. Secondly, Plato certainly believes that people do in fact act for the best and that this is something that cannot be explained away in terms of some sort of physicalist reductionism. Teleological explanations might then 'save the phenomena' of our intentional and moral actions. Thirdly, 'for the best' explanations might be able to produce the basis for a coherence theory of truth. Reference to the line allegory of the Republic is possibly the best way of explicating this. Here I follow Fine in labelling the four sections L1–L4, ascending. At L3 we form hypotheses based on the originals of the physical world and proceed to deduce conclusions from these. Fine has argued that there are at least two conditions for knowledge for Plato, what she terms KL, that knowledge must be based on the ability to give a [logos], and KBK, that knowledge must be based on something known, that we must also know the explanatory account. For Fine, Plato is a coherentist at L3. To satisfy KL and KBK, she argues, we have a large, virtuous and explanatory circle of hypotheses and conclusions. These hypotheses and conclusions mutually support each other, and we come to know both simultaneously. At L4 we reach the terminus; there is nothing more fundamental for the [arche anupothetos] to be explained in terms of. It is now that we must have recourse to coherence and systematic explanation to satisfy KL and KBK. The first principle and everything that is ultimately explained by it can now lean on each other for mutual support, forming an explanatory circle as large as the world. The reason that L4 gives us something better than L3 is that L3 gives us piecemeal accounts ranging over individual branches of knowledge, while L4 offers a synoptic account. Furthermore, the usual interpretation is that the [arche anupothetos] is the [idea tou agathou], the Form of the Good. We are then attempting to generate coherence and systematic explanation by showing how everything relates to the good. Now, if we are talking of participation in the Form of the Good, we are talking of 'for the best' or teleological explanations. Against the foundationalist view that the KL/ KBK regress must terminate with some basic beliefs
that are not justified in terms of other beliefs, but are self-justified or self-evident, there is the coherentist view that accounts may circle back on themselves, but that if the circle is large enough and explanatory, then it is virtuous. One important reason why Plato wants teleological explanations then is in order that they might form the basis for a coherentist alternative to foundationalism.

V

Now, one might say, this is all very well for the Republic, but where is the evidence for teleological explanations and a coherence theory of truth in the Phaedo? Earlier, I suggested that Plato hypothesises the entity required for such explanations, the \[agathos\], as the deuterospious gets under way. One might argue that if Plato makes no use of this \[agathos\], then he is prey to the same objection that he deploys against Anaxagoras, that of postulating an entity which does no explanatory work. One might reply that perhaps Plato leaves this on one side for the moment, to employ it in the Republic and later in the Timaeus. However, it may be that just as the formal puzzles were given solutions in terms of the newly hypothesised entities, so the teleological puzzle is resolved at Phaedo 108e ff, and so the Phaedo lays the basis for the more developed position of the Republic. Socrates says that

"I am now persuaded that, firstly, if the earth is round and in the centre of the heavens, then it requires neither air to prevent it falling nor any other necessitation of this sort, but the uniformity of the heaven itself in every way and the equipoise of the earth itself is sufficient to restrain it. For something which is equipoised and is placed in the middle of something homogenous cannot yield to being moved aside in any way, but will remain steadfast." (Pdo.108e)

Concerning the Phaedo passage, Sedley has argued that Plato gives only a teleological explanation, dispensing with any material or mechanical compulsion, while Lennox has argued that this passage tells us only how the earth is kept stable. Here I argue that Plato gives us both teleological and material explanations.

That Socrates discusses the shape, position and stability of the earth, the three things mentioned for explanation at 97d ff can hardly be a coincidence, especially as Socrates also comments that his theory has no need of air to prevent the earth from falling, perhaps a reference back to 99b where he attacks the vortex and 'kneading-trough'
Note that at 97d Socrates expected to hear "The reason and the necessity [ten aitiai kai ten ananken]" (Pdo.97d). The language here is strikingly similar to that of the Timaeus which is quite clear on whether teleological explanations ought to replace all others or work in harmony with them. Having described how human eyesight functions, Timaeus then says

"All these are among the auxiliary aitiai [sunaition], which god uses in the service of instantiating the idea of the best, as far as is possible. Yet they are supposed by a great number of people to be not the auxiliary aitiai but the aitiai of all things, but it is not possible for these things to have reason or intelligence... necessarily, the lover of intelligence and knowledge must first pursue the aitiai which have an intelligent nature, and only secondly those which are changed by others. (Tim.46c)

One can find several other statements of this position in the Timaeus, where these two types of aitiai are referred to as the 'necessary' (N-aitiai) and the 'divine' (T-aitiai). After the passage at 46c Timaeus then goes on to tell us why it is for the best that human beings have eyesight. The two types of aitiai then answer to two different sorts of questions. If we ask how it is that physical phenomena occur, the appropriate reply, according to the Timaeus, will be to cite N-aitiai. If we ask why it is best that physical phenomena occur, or why the universe is arranged in a certain manner, we ought to reply with T-aitiai. It is this last question that the Phaedo is specifically interested in. At 99c, Plato's complaint is that the physiologoi may have attempted to explain how the earth remains stable, but they have done so inadequately and have not explained why the universe should be arranged in that manner in the first place.

Now, as Sedley has argued, the position and shape of the earth jointly constitute sufficient conditions for its stability. If the stability of the earth is something good, which would seem clearly to be the case, then we can explain its position and shape by reference to this end; the earth is so shaped and so placed because that allows it to be stable and that is a better state of affairs than any other. Whether there are some N-aitiai on offer here too depends on how strongly we take 'It requires neither air... nor any other necessitation of this sort' at Phaedo 108e5. This might rule out N-aitiai altogether. However, it may merely rule out any necessitation other than the
equipoise of the earth and the uniformity of the heaven. If so, that leaves us free to take these factors as N-aitiai and as an explanation in terms of the physical properties of the earth and of space of how the earth retains its stability. The job of intelligence working with the good in mind is to explain the providential ordering of the universe and not how it functions, such that neither intelligence nor the good have any ongoing causal efficacy. If we wish to take the comments concerning the role of intelligence in ordering the universe literally, then what we are given is an explanation of why intelligence arranged the matter of the universe such that the earth was equipoised and in the centre. This was so in order that the earth could be stable, as the N-aitiai would now function in such a way that the earth would be unable to move in any direction. If this is so, then Plato does provide a solution to the teleological puzzle, and does employ teleological explanation and the [agathon], in the first step that will lead him to the full blown teleological cosmology of the Timaeus.

If it is the case that Plato advocates a coherence theory of truth in the deuteros plous, then this may shed some light on one of the perennial difficulties associated with the method of hypothesis, the meaning of [sumphonein] at Phaedo 100a5 ff. Socrates says that "Therefore this is the way I have begun, hypothesizing in each case whichever account [logos] I consider to be the healthiest [erromenestaton], and whatever seems to me to agree [sumphonein] with this, I posit as being true, and whatever does not, as not true, whether concerning the reason for or any other entity." (Pdo.100a)

The problem here is that the logical relation which [sumphonein] denotes will work well for one arm of this procedure, but not the other, whether we take this relation to be entailment or consistency. With entailment, all that is entailed by a true hypothesis is true, but many things not so entailed are also true. Further, as Gentzler points out, the set of propositions not entailed by our hypothesis will contain pairs of negations, and it cannot be reasonable to posit both members of these pairs as false. With consistency, all that is inconsistent with a true hypothesis is false, but many things that are consistent with it are also false. It may also be the case that while B and C are consistent with our hypothesis A, they are not consistent with each other. Socrates also says that he can demonstrate the immortality of the soul using this method; but consistency will merely leave us with a set
of assertions, not a proof. Such considerations have led some to conclude that we cannot read \([\text{sumphonein}]\) univocally through Socrates' account. Robinson comments that

"Both our interpretations of the metaphor of accord and discord have run into grave paradox... There is no third interpretation. We have to choose between consistency and deducibility as the meaning of 'accord'. The better is consistency, as the paradox to which it leads is much less than to which deducibility leads." However, if Plato has in mind a coherence theory of truth then the problem dissolves. \([\text{sumphonein}]\) simply means 'coheres', and it is definitionally true in a coherence truth system that whatever coheres is true and whatever does not is not. Gentzler gives the following definition of coherence:

"A proposition \(P\) coheres with \(Q\) if and only if \(P\) is consistent with \(Q\) and stands in a suitable inductive or deductive relation to \(Q\)." Gentzler then raises the worry that there will be an infinite set of propositions that are consistent with \(P\) but which do not stand in a suitable inductive or deductive relation to \(P\), and so must (unreasonably) be reckoned false. However, this may ignore an important teleological dimension to coherence for Plato. If the world is teleologically structured, and our explanations are to be isomorphic with this structure, then only explanations which reflect this teleology will eventually find their way into a fully systematised explanatory structure. This would rule out many of the propositions that Gentzler is concerned about. We will see the importance of this in relation to Meno's paradox in the next section, and in later chapters I shall argue that one of the tasks that the Timaeus and Philebus are engaged in is explicating precisely what the implications of Plato's teleology are for the sort of hypotheses we ought to accept. Of course, there may be some accounts which are consistent, seemingly suitably teleological and have not yet been shown to stand in a suitable relation. Here Gentzler may be correct in suggesting that \([\text{sumphonein}]\) and \([\text{diaphonein}]\) are contraries and not contradictories, such that we only reject as false those accounts which do not suffice teleologically or do not stand in a suitable relation, reserving judgement on others.

There are two points of translation which bear on the arguments here. One issue could be put like this. The broader the conception of that which has to do the cohering, perhaps the easier it is to see how
such coherence could work. While it is possible to argue that propositions may cohere, it is perhaps easier to see how accounts might generate coherence. The question then posed is how we should translate [logos] at 100a4. The narrow translation, given by Robinson, is 'proposition', where I have favoured the broader 'account'. There is of course a problem of circularity here, of translation and philosophical interpretation. However, it may be possible to tilt the scales in favour of my reading by reference to other relevant usages. If one thinks in terms of the Meno, then knowing something means being able to [logon didonai], generally rendered 'to give an account', which suggests more than a proposition. Similarly, at 101d6 in the Phaedo, when one has to [logon didonai] of a hypothesis, one would expect more than a single further proposition. It may well be that hypotheses are complex too, involving more than one proposition. If so, then Phaedo 101d, where we are meant to examine the consequences of an hypothesis, whether they agree with one another or not makes more sense. While one proposition cannot have contradictory consequences, complex hypotheses can, as evidenced by the first part of the Parmenides. Here is a further point on which I disagree with Gentzler, who restricts her discussion of coherence to propositions.

A related point is how to translate and interpret [erromenestaton], also at 100a4. Robinson here translates 'strongest', which working within a correspondence theory of truth is fair enough. However, LSJ give 'in good health, vigorous, stout', and I have translated 'healthiest'. Within a coherence theory of truth based on relationship to the [agathon], this has important connotations, of selecting the account most likely to cohere with 'for the best' explanations. One might try to justify a reading of 'healthiest' by reference to the proliferation of [agatho] and its derivatives in Plato's discussion. Put together, these two points of translation provide a sharp contrast, between the 'strongest proposition' and the 'healthiest account', the latter according well with the a coherence truth reading of this passage.

To summarise the main theme of this argument. If Plato employs teleological explanations in the deuteros plous, and these explanations are used to produce a coherence theory of truth, then he has no need of anamnysis either as a criterion of truth or as a means of foundation.
Let us now consider the third proposed function of anamnesis, as a solution to Meno's paradox. The paradox is set out as follows:

(Meno) "How will you search for this thing, Socrates, not knowing at all what sort of thing it is? For what sort of thing that you do not know will be proposed in your search? Or even supposing that you should meet with this thing, how will you know that it is this thing which you do not know?"

(Socrates) "I understand the sort of point you make, Meno. But don't you see what a contentious argument you introduce here, that it is not possible for a man to search for either that which he knows or that which he does not know? It is not possible for him to search for what he knows, as he knows it, and there is no need to search for such a thing. Neither can he search for what he does not know, as he does not know what sort of thing he seeks." (Meno 80d)

How good a solution to this paradox is anamnesis relative to the method of hypothesis? The first difficulty is that recollection merely pushes the process of learning de novo back one stage, without explaining it. All we are told is that somehow our disembodied soul communes with the Forms in our pre-carnate existence. Secondly, much of Meno's original challenge is still unanswered. Anamnesis does not tell us which of the things we do not know to propose in our search. Nor does it tell us how we will know that something is the answer we want when we come across it. The implication seems to be that we will make some sort of intuitive leap; the problems with this have been discussed above.

Here we might also discuss a problem which Gentzler finds in the Phaedo. She is worried that there will be an infinite number of consequences of our hypotheses that we ought to check, and that

"Perhaps Plato did not assume a clearly defined decision procedure for restricting them to a manageable number; rather he took it for granted that his audience would have an intuitive, if rough idea of the difference between the logical consequences of our hypotheses that were worth considering and those that were not."77

The problem here lies with Gentzler's account rather than with Plato, for as I suggested in the previous section, Gentzler overlooks the crucial teleological dimension to coherence in the Phaedo. It is this teleology that provides the decision procedure here, allowing us to identify the crucial consequences of any hypothesis. This is important,
for as Gentzler notes, a similar problem arises in modern science as any theory has an infinite number of empirical implications and clearly we cannot be expected to test all of them. So too one might suggest that there are problems in modern philosophy of science that are related to Meno's paradox. Scientists form and select for testing hypotheses which are mathematically simple and elegant. Can this procedure be rationalised and justified? If we have competing hypotheses is there a justifiable decision procedure for choosing between them beyond empirical adequacy? Scientists in all fields, but in theoretical physics especially, seek the unification of hypotheses into a systematic and coherent grand theory; can this process be justified? I shall return to these questions later when I have further discussed some of the assumptions that Plato investigates concerning the comprehensibility of the physical world. I shall also discuss the relationship between the teleological sort of answers Plato suggests for the allied problems raised by Meno's paradox and those advocated by realist conceptions of science. For the moment though, let us consider what hypothesis has to say in answer to Meno's paradox.

Hypothesis appears to take the problem of learning de novo seriously. A coherence theory of truth allied to teleological explanation generates criteria for knowing that one has the right answer when one comes across it. Equally importantly, hypothesis has something to say about what sort of thing that we do not know we should propose in our investigation. If my interpretation of Phaedo 100a is correct, then we should be putting forward 'healthy accounts', that is suggestions which are likely to cohere with other 'for the best' explanations. A good example of this is Phaedo 108e and the question of the earth's shape and position. Plato does not have Socrates propose any shape or position here, but ones which are likely to produce coherence, 'healthy' suggestions framed with 'for the best' explanation in mind. Think back now to my earlier discussion of the fit between the mind's contents and the world. There I suggested that the price for the precise fit given by anamnesis was the inability to account for any misfit. The converse problem for hypothesis was that any fit it might generate seemed to be a matter of extreme good luck, but that the perception of inherent qualities would give an initial guide to our theorising. So too there would be a problem with knowing when we have achieved a fit. Here we can add an important heuristic for bringing the contents of our minds
into a fit with the world, namely that we can initially narrow our hypotheses down to those that are 'healthy' and seem likely to cohere with our other 'for the best' explanations, and eventually make decisions on their truth by how well they cohere with our system. The method of hypothesis is then a far better solution to Meno's paradox than anamnesis.

If McCabe is correct in arguing that the conclusion of the Lysis is aporetic, and that the teleology there fails because the telic object cannot be explained and so chains of explanation cannot be properly terminated, then perhaps we can sketch the development of Plato's thought on these matters like this. Having recognised some of the shortcomings of recollection as an answer to Meno's paradox, in relation to the termination of enquiry and of what we ought to propose in that enquiry, Plato turns to teleology. The Lysis then examines teleology within the framework of a correspondence theory of truth, but comes to an aporetic conclusion. The Phaedo then begins to investigate teleology within the context of a coherence theory of truth, and provides the first shoots of the full-blown theory of the Republic. Having found an answer to Meno's paradox that is vastly more promising than recollection, anamnesis is then jettisoned. Given the framework of the Phaedo, of balancing extra ontological commitment against explanatory adequacy, this will be so even if hypothesis costs more ontologically. The difference between the two theories in this respect is probably not large. Indeed, viewed in isolation, one might feel that as anamnesis commits us to the pre-existence of the soul, that hypothesis is a more parsimonious theory. Here we need to take a broader view, though and to distinguish between what could be called 'specific' and 're-usable' commitment, depending on whether the entities postulated are useful elsewhere. For instance, anamnesis is committed to the pre-carnate existence of the soul and to some sort of mechanism by which we could be said to recollect. However, as the pre-carnate existence of the soul may be something that Plato wants irrespective of the debate between anamnesis and hypothesis, this cannot count against anamnesis in the same way that something specific to it can. Specific commitments that the method of hypothesis can pare away are the mechanism by which anamnesis works and any sub-conscious part of the mind that acts as the repository for the knowledge lost to our conscious mind at birth. On the other hand, one might suggest that virtually all of the commitment of
hypothesis to a more active conception of mind will be re-usable. The point about the Phaedo, perhaps, is that this is where such a concept of an active mind is first argued for. The difference in commitment between anamnesis and hypothesis may be relatively small; the gain in explanatory richness though is large, and anamnesis is not seen again in a favourable light in Plato's works.

VII

One might object that although it has been shown that on the criteria offered in the Phaedo hypothesis is the better theory, Plato makes no explicit statement of this matter, and does not even have any explicit discussion of this in his text. Is it then proper to attribute this change of opinion for the reasons given here to Plato? If my analysis of Plato's PWP in the first chapter was correct, then this is probably so. We must look to the thought that lies behind the written word and to the challenges it may be setting its readers. One of the challenges of the Phaedo is that Plato presents us with two radically different theories of how the mind acquires its contents and with the criteria with which to judge these theories, and then leaves it up to us to do the further thinking. For once, the arguments come down clearly in favour of one alternative, and Plato's shunning of anamnesis in later dialogues would seem to show that this is his conclusion too.

One might object that my strategy imports the concerns of the Phaedrus back into the Phaedo. However, I think it is uncontroversial that Plato was in the business of creating dialectic between reader and text long before he explicitly discussed the matter in the Phaedrus. As argued in the previous chapter Phaedo 102d3 with its reference to 'talking like a book' may indicate that some of the worries aired in the Phaedrus were already concerning Plato when he wrote the Phaedo, and my analysis of the place of irony in Plato's PWP seems to fit the Phaedo very well. It is quite possible then that Plato is asking us to choose between anamnesis and hypothesis independently of his own conclusions. After all, unless we work out the reasons to prefer one theory for ourselves, we will not really understand which theory to prefer. That fits the dramatic frame of the Phaedo perfectly. Just as it is emphasised that we should not accept recollection unless we recollect the theory, Plato presents the method of hypothesis as a hypothesis that we must judge the worth of ourselves.
One might also object that some of the arguments used to create difficulties for anamnesis import matters which only surface in the Theaetetus and Sophist, particularly a concern with error and false judgement. We might distinguish though between a concern with the logical structure of false judgement itself and with producing an epistemology where false judgement is a possibility. The Phaedo, I suggest, is concerned with the latter but not the former. The later dialogues have a far more sophisticated position, and while it would be wrong to import this sophistication or concern with the structure of false judgement back into the Phaedo, this does not mean that Plato was not concerned in that dialogue with accommodating error.

An allied objection might be that my approach to the Phaedo leaves the 'critical' dialogues with too little to be critical of. Certainly my view narrows the gap in style and concerns between the Phaedo and the Theaetetus and Sophist, but does not close it. This I take to be a positive move, as I believe that the distinction between the 'critical' and 'dogmatic' dialogues has often been overdrawn. It seems unlikely that Plato suddenly ex nihilo found a concern with falsehood and error in the Theaetetus, or suddenly began to view writing as a means to challenge his readers in the Phaedrus. There is more positive theorising in the Phaedo, but this is not to say that there is none in the Theaetetus and Sophist, nor to say that there is not critique and challenge to the reader in the Phaedo. The difference in sophistication is another matter, and is undeniable.

A different objection to the demise of anamnesis in the Phaedo might be concerned about the damage such a rejection would do to some of the arguments for the immortality of the soul presented prior to 96 ff. As long as the final argument goes through though, perhaps this is not too much of a worry as the ultimate conclusion of the immortality of the soul is reached. That both of these theories can explain the immortality of the soul is perhaps a criterion of their explanatory adequacy.

Finally, one might object that anamnesis is mentioned in the Phaedrus, and this is surely a later dialogue than the Phaedo. My contention here though is that again anamnesis is effectively argued against. The argument, which runs under the surface of the discussion of writing, goes as follows. As we saw in the previous chapter, in order for someone to properly be said to come to understand, they must undergo a process of dialectic, and be able to give an account of what they know. Otherwise, they will only appear to be knowledgeable when in
fact they are not. Either recollection is a leap from this process, or it gives us nothing more than dialectic and hypothesis does, and is thus otiose. If we are to give an account of what we leap to recollect, then again recollection does not provide us with anything that hypothesis and dialectic do not. If not, then when we recollect, we will not be wise but will merely have the appearance of wisdom. The Phaedrus comes to bury anamnesis, not to praise it.

VIII

One worry we might have about Plato's attitude to science is that his Socrates is highly critical of the whole of [peri phaseos historian]. However, is it the investigation of nature that Plato objects to, or is it the way in which the physiologoi go about such a task? My argument has been that Plato considers the physicalist ontology of the physiologoi to be incapable of producing adequate explanations of the phenomena. In order to have adequate explanations we need to postulate some more entities, and in order to explain how our minds came by these entities and the explanations they allow, we need richer accounts of knowledge, epistemology and the mind than the physiologoi will permit. The complaint then is about explanation rather than subject matter or interest; note that many of the natural phenomena that the physiologoi attempt to explain are given new, and on Plato's account, adequate, explanations in the new scheme. It might be argued, though, that while Plato may be interested in explaining some natural phenomena, he proposes to do so in a thoroughly unscientific manner and in this way turned his back on science. Socrates says that he tired of

"Looking at things with my eyes and endeavouring to grasp them with each of my senses. So I thought I must take refuge in accounts, and investigate in these the truth of realities." (Pdo.99d)

Is this then to be an investigation devoid of empirical input? That would be a very strong reading of this passage, to which there are plausible alternatives. Plato's objection has been to the ontology of the physiologoi, and the empiricism that he believes goes along with it. We might then read this as an objection to a purely empiricist approach, such that what is advocated is that while we might begin with observation we move on to theorising, and it is in that theorising that we discover the truth or otherwise of our hypotheses. This is something that I shall argue for in the next chapter. In this chapter though I hope to have established that the theory of recollection had a short
lifespan, being rejected in the Phaedo. We can now concentrate on the implications of the method of hypothesis for scientific method.
NOTES TO CHAPTER TWO

01) See e.g. Cornford (1935) p5, "Anamnesis is accepted by all parties and later reaffirmed (92a); nor is any doubt ever cast upon it in Plato's other works"; cf. p129.


03) Burnet (1911) p99 comments that "This is the oldest name for what we call 'natural science'"; cf. Gallop (1975) p234 n.56 and Hackforth (1955) p122.

04) See Pdo.99d. Throughout I shall translate [aitia] as 'reason' or 'explanation' rather than 'cause'; on this see Vlastos (1969a) p76 ff, the literature on cause/because and the relation of [aitia] to [to dia ti] in Aristotle, e.g Hocutt (1974), Moravscik (1974), Sorabji (1980), Annas (1982a), and note that Plato too uses [aitia] and [to dia ti] interchangeably, e.g Pdo.96a "I was very interested in the kind of wisdom known as natural science; it seemed to me to be excellent to know the reasons [aitias] for each thing, why [dia ti] each should come to be, why [dia ti] it should cease to be, and why [dia ti] it exists", so also Pdo.98c, 99a, 100c and 101b. See too Frede (1980) p129 ff on the use of [aitia] generally.

05) Plato's irony though is more complex; see my ch.1 and below. Three possibilities canvassed for the protos plous on a non-ironical interpretation have been Anaxagoras' teleology, teleology of any sort, and divinely revealed knowledge; cf. the discussions of Bostock (1986), Burnet (1911), Crombie (1963), Gallop (1975), Goodrich (1903) + (1904), Hackforth (1955), Huby (1959), Murphy (1936), Robinson (1956), Rose (1966), Sayre (1969), Shipton (1979), Williamson (1904).

06) I cannot demonstrate in a watertight manner that this is Plato's overall strategy in this passage or that he intended the subsequent points I bring forth to be part of that strategy. My interpretation might then be charged with the intentionalist fallacy. My reading though makes good and philosophically interesting sense of the passage, and there are too many points where Plato appears to be following this strategy for it to be mere coincidence. The general strategy also meshes well with Plato's FWP, and the general pattern of argument is one that recurs in Plato's work.

07) One might argue that the first part of the Pm. critically reviews the Pdo.'s answers here, and one might also view the battle of the Gods and Giants at So.246a ff as a replay of Pdo.96c ff.

08) Whether this passage has anything to do with the historical Socrates is another matter; see Hackforth (1955) p127 ff for discussion.

09) Some criteria of adequacy here are that the possession of a property ought not to have two opposite explanations, as when both division and addition are cited as reasons for something being two, nor should a single explanation explain the possession of opposite properties, as when 'a head' is cited as the reason for one person being small and another being large, nor should the explanation cite the opposite of the

10) Cf. McCabe (1993) p52/3. When Plato develops a model of mind in the Tim, a key point is that our mental revolutions should master our perceptions, rather than vice versa; see e.g. Tim.44a and compare the similar moral injunction at Tim.42b that to live justly we should be master of our emotions rather than they of us; cf. Tim.77bc on mental activity and passivity.

11) Cf. Men.97d ff on opinions and Daedalus' statues; opinions need to be 'tied down' with accounts.

12) Earlier in the Pdo, we have had the insistence on the existence of soul and that knowledge requires more than perception. The physiologoi might have increasingly complex accounts of a passive mind, but to grant an active one would go beyond the parsimonious framework of their ontology.

13) [he psuche] returns in place of [ho engkephalos].

14) Throughout I shall translate [nous] as 'intelligence', though it might equally well be translated as 'mind'.


16) Plato is very much a realist about explanation; proper explanation must refer to something real, and explanations must be isomorphic with the structure of the world. So in order for there to be teleological explanations, there must be some good out there in the world. In response to the question how is it that something is beautiful, the Phaedo's safe answer tells us that "If anything is beautiful other than the beautiful itself it is so for no other reason than because of its participation in this beautiful; and this similarly applies to everything" (Pdo.100c). So for anything to be good, or 'for the best', there must be a Good for it to participate in; cf. Grg.506e.

17) Why does Plato postulate Forms, though? Jordan (1984) deals with this question at length. I agree with him that one of Plato's main motivations here is to deal with the compresence of opposites, and also that in other places Plato is worried by the diachronic flux of particulars, a consideration which generates more Forms than the first. The nature of that flux will be a question for later chapters. Although I will argue that one of the important analogues that Plato uses for the participation of particulars in Forms is the relation of geometrical diagrams to geometrical definitions, and that later Plato interestingly rejects this analogue for one of things that have number/number, along with Crombie (1963 vol.II) p284 ff and Nehamas (1975) I do not believe that such considerations led Plato to postulate Forms.

18) I agree with Wiggins (1986) p3 against Vlastos (1969a) p82 n.15 on the translation of Pdo.99c. The aorist tense [esterethen] 'I was deprived' of teleology does not prejudice any future venture - the reading Vlastos argues for, that Socrates is for all time deprived of teleology requires a perfect tense, i.e [esteremai].

19) Plato's other uses of [deuteros plous] also fit with this sort of analysis. At Plb.19c we find that "It is excellent for the wise man to
know everything, but the [deuteros plous] would appear to be not to be ignorant of oneself." That obviously has strong and interesting resonances with much of what I have been arguing for in the Pdo. Less loaded but still worth noting is Plt.300b, where the E.S says "On account of this, for those who establish laws and contracts, the [deuteros plous] is to ensure that neither one nor many people ever violate them".

20) So Menander (frag 241); see Hackforth (1955) p137.

21) A sub-theme here is paying for the tuition of a Sophist against our own active search.

22) As emphasised earlier, e.g. Pdo.65 ff.


24) It also has ontological requirements which mesh well with its other sense of as a second attempt at the balance of ontology and explanation. In order to get the second voyage launched, we need some account of an active, inventive mind which can instigate such an investigation.

25) These are roughly similar to the positions Scott (1987) terms 'K' and 'D'. I am not worried that, as Scott comments, 'tremendous problems are caused by trying to make anamnesis an explanation of concept formation' (p366), as I believe i) 'tremendous problems' are caused by 'D' and by treating anamnesis as a solution to Meno's paradox too, and ii) Plato holds anamnesis only briefly, moving on to the more satisfactory method of hypothesis.

26) See Men.81a ff.

27) It also requires that we create a way of judging truth for ourselves and a way of creating knowledge.

28) Cf. Men.81e and Pdo.73b.


30) Note that from Phaedo 95e-99d Socrates tells us of his negative experiences; how he observed things, canvassed various opinions, and came to realise that none of them were adequate. All the conditions for successful recollection are here, and we might expect Socrates to say at 99d ff what he recollected. What he says though, is that he turned to a method which he 'created for himself' and begins to hypothesise.

31) The key question perhaps is have we, the readers recollected, or do we have to indulge in some activity in judging hypotheses ourselves.

32) Cf. e.g. Burnet (1911) p81, Hackforth (1955) p101.

33) The 'divine account' would be both the theory of recollection and an instance of itself; see above on recollecting recollection.

34) It is worth noting the similarity of the nautical metaphors between Pdo.85c and 99cd; cf. Shipton (1979).
35) See Pdo.73e ff.

36) Cf. Men.81d, Pdo.72e, 76a + 91e where it is explicitly stated that all learning is recollection. I am happy to distinguish different types of learning (i.e. learning how from learning that) and to exclude some from anamnesis, but the implication of these passages is that if something is learned by recollection then it is exclusively so learned.

37) The clearest statement of this is at Pdo.91e.

38) One might rather anachronistically illustrate this in terms of the aviary model of the Tht. Recollection might populate the aviary, and error would then be our grasping of the wrong bird. Note, however, that to produce this putative explanation we must introduce mental structure and activity.

39) As we must have known the correct, well formed explanations in our pre-existence we ought not to be collecting badly formed ones at all.

40) Anamnesis could perhaps explain this in terms of differences in passive mental structure and so avoid conceding the active mind that hypothesis needs. An alternative might be to appeal to differences in the examples or in perception between people, but as each experience is only a 'reminder' and does not have to be entirely accurate this may not get us very far.

41) This is the case at least for the middle period works.

42) If we take the Men. account, the process is arrogance - aporia - recollection, so we might take the resolution of aporia as a criterion of having recollected.

43) E.g., the vacillation of Phaedo and Echecrates at Pdo.88c ff between Socrates' and their own accounts of the soul. Similarly, not every move from a feeling of aporia to euporia can be associated with gaining knowledge.

44) E.g., Simmias and Cebes give accounts of the soul as attunement and as the relation between cloak and weaver.

45) Here we see the importance of the personal nature of Plato's extra-textual dialectic; the reader must first believe and then be disabused to come to distrust special states of certainty.


49) In the next chapter I discuss and reject the view that Plato invokes knowledge by acquaintance at this point.


51) One point of interest here is Plato's use of [piptein] and [klinein]. [piptein] has connotations similar to the English verb to fall. It can be used of a city, of a government, or of a soldier in
It carries then a sense of downfall or demise as well as a sense of dropping. Plato's worries here may go beyond what they are usually interpreted to be, that is the more elementary Milesian problem of why an unsupported earth does not drop, to the more sophisticated problem of why the earth doesn't fall apart, if nothing holds it together. \([\text{klithein}]\) is also interestingly ambiguous as \([\text{klinein}]\) can take the sense of 'decline' instead of 'be moved aside', especially if used in the middle voice.

52) See Sedley (forthcoming) and Lennox (1985).

53) Possibly the theories of Empedocles and Anaxagoras. See Sedley (forthcoming) on these points.

54) There are of course dangers of anachronism in working back from the Tim. to the Pdo, but here I believe the Tim. makes explicit something that is implicit in the Pdo.

55) See Tim.45b ff.

56) See Tim.76d for a similar use and contrast of \([\text{sunaitia}]\), and cf. Plt.281c4-411, 287b9-289c8. Note also that Plato occasionally uses \([\text{hupereteo}]\) and its cognates for \([\text{sunaitia}]\), e.g Tim.46c7, 70d6, 75e4, and cf. Plt.290b2, 290b4, 304e1, 308d5.

57) The Greek of the phrase which follows this passage is quite specific about there being two types of aitia; \([\text{lektemen amphotera taton aiton gene}]\).

58) In particular at Tim.69a ff.

59) One might argue that in the Pdo. N-aitiia are treated as no sort of explanation at all, citing Pdo.99a, where Socrates says "If anyone were to say that without having such things as bones and nerves and so forth, I could not have acted as I thought proper, they would speak the truth. But to say that it is on account of these things \([\text{dia tauta}]\) that I do what I do, and that I act with intelligence but not through a choice of what is best, would be an exceedingly careless way of talking. For that would be to fail to distinguish between something which is a real aitia \([\text{to aition toi onti}]\) on the one hand, and that without which an aitia could be an aitia in the other". This passage is only problematic if it is held to enunciate a general principle of explanation, rather than one that pertains only to intentional actions, as the context here indicates, drawing a parallel between intentional human actions and the teleological ordering of the cosmos (see Pdo.98c), while not enquiring how the cosmos functions (see Pdo.98a ff). Further, elsewhere in the Phaedo Socrates uses aitia to refer to non-teleological explanations; in the myth describing the structure of the underworld, Socrates says that "The reason \([\text{aitias}]\) that all the streams flow in and out of here is that this liquid can find neither bottom nor resting place" (Pdo.112b, cf. Pdo.110e2 for a similar use of aitia). Is Socrates then guilty here of 'an exceedingly careless way of talking'? Only if N-aitiia are insufficient answers to both how and why questions.

60) See Sedley (forthcoming). The earth's equipoise seems to be the key here, rather than its shape; an unbalanced sphere could have reason to move. That the earth is a sphere would seem to be the likeliest reading of \([\text{peripheres}]\) here, but Morrison (1959) raises doubts, though; cf.
Calder (1958), Rosenmayer (1959), and Guthrie vol IV p336 n.1.

61) See here Sedley (forthcoming) for a full discussion, and cf. Lennox (1985).

62) I argue this in more detail in ch.5.

63) Cf. the discussions of Robinson (1953), Sayre (1969), Bostock (1986).

64) See Gentzler (1991) p266.

65) See Robinson (1950) p128.


68) Where Plato wants to express logical consequence he usually employs [sumbainein]; cf. Gr.479c5, 496e5, 508b3, Pm.136a8, 136b3, 142b3, So251.e5, Plb.22a7. In what follows I might be accused of assimilating the Rep. and Pdo. too closely, but note that [sumphonein] and [homolegein] rather than [sumbainein] are used in the Rep. esp in discussion of the line alegory.


71) Here I would disagree with Gentzler (1991) p269 n.10 when she suggests that [sumphonein] denotes a non-symmetrical relation. If what I have argued in the previous section concerning an exhaustive, systematic explanatory circle is correct then [sumphonein] should be symmetrical, though the path of inference from a to b may be different and considerably shorter than from b to a.

72) In particular the consequences for the mathematical structure of our hypotheses relative to that of the world.

73) In the final part of the Tht. one might argue that [logos] means account rather than single proposition; see e.g Fine (1979b) p366 ff.


75) E.g, [ameinon] at Pdo.97e, [beltististos] at 97c + 101d.


79) See Maxwell (1984) ch.9, (1993a) and (1993b) for a realist view of whether empirical adequacy can be the only criteria by which we form, select, test and judge theories.

80) See Mackenzie (1986b).
81) So too the evidence of Prt.329a predates the Pdo; see my ch.1.

82) Pdo.73b, cf. Men.81e.

83) Pdr.278a is the clearest statement of this, and cf. Pdr.270e, 278c and So.230d.

84) I.e they will have knowledge but not understanding.

85) The Tim. of course proposes explanations for virtually all physical phenomena.
CHAPTER THREE

ASTRONOMY AND OBSERVATION IN THE REPUBLIC

The main aim of this chapter is to explore the methodology proposed by the middle books of the Republic and its implications for the investigation of nature. The central question here will be what role any empirical input has in the method of hypothesis, and astronomy in particular, given the remarks at Republic 529c ff. For the purposes of this chapter, I wish to concentrate largely on the evidence of the Republic and some other middle period works. One reason for this is that if Plato did at some stage denigrate or proscribe observational astronomy, then the purported evidence is strongest here, at Republic 530b. As critics often focus on this passage, it is worth investigating whether this charge can be repudiated on the basis of the Republic alone. There are two further reasons for this approach. Firstly, if there is a significant change in the nature of celestial motion between the Republic and the Timaeus, as I shall argue in chapter five, this may also affect the role for observation in the Timaeus and later works. Secondly, there is clearly a serious re-examination of the nature of knowledge in the Theaetetus, which may revise some of the theories of the Republic. Any evidence from the later dialogues then would need to be subjected to detailed scrutiny before it could be adduced in a discussion of the Republic's astronomy.

In the first section of this chapter I consider some theoretical aspects of Plato's science in general, and argue that he envisaged a process which interrelates sensibles and intelligibles, the investigation of each being necessary but not sufficient to achieve the overall aim. I shall be particularly concerned to discuss this in relation to the 'two worlds' (TW) interpretation of Plato. In section two, I analyse the infamous passage at Republic 529c ff concerning astronomy and the education of the guardians. I shall argue that there is no ban on observation here, but instead an affirmation of the need for an initial empirical approach. I contend that this makes good sense of the internal structure of this passage, and of its relations to other parts of the Republic. The result of this discussion is to leave the Republic with a more reasonable conception of astronomy and science than has sometimes been allowed in the literature.

65
I characterise the TW interpretation as the view that for Plato four distinctions are co-extensive, and divide what there is into two disjoint sets.\(^1\) On the one hand there is that which is intelligible, stable, knowable and incorporeal, while on the other there is that which is sensible, changing, opinable and physical.\(^2\) The first set of entities are said to be, while the second are always in a state of becoming. Two positions on Plato's science which have been adopted, and are related to a TW view of Plato, are that science deals solely with intelligible objects,\(^3\) and so excludes observation,\(^4\) or that it deals solely with physical objects, and so aims no higher than opinion or a 'likely story'.\(^5\) These positions have their respective ways of dealing with Plato's comments on astronomy at Republic 530b. The first position reads them as a statement of methodology, attributing an exclusively a priori approach to Plato. We ought to 'proceed by means of problems' and 'leave the things in the heavens alone' if we are to pursue the 'real science of astronomy'.\(^6\) The second position emphasises the problem which Simplicius reports Plato as having set:

"Which hypotheses of uniform, circular and regular motion are able to save the planetary phenomena?"\(^7\)

This is taken as the problem that we are to proceed with at Republic 530b, the rest of that passage being read as an exhortation to study the real and not the apparent motions of the visible heavens.\(^8\)

One way of supporting either of these positions would be to argue that Plato considers there to be a demarcation for scientific enquiry at the border of the two realms. Science for Plato would then have to deal exclusively with one or other of these worlds.\(^9\) My main strategic concern in this section will be to argue that Plato allows and indeed emphasises a continuous progress in the cognitive ascent of the philosopher, from sensibles to intelligibles. So too he believes that subsequently the intelligibles may inform us about the sensibles. If this is so, then there can be no demarcation for investigation between the two worlds, and neither of the types of position outlined above can be correct.\(^10\) Consider following passage from the Symposium, where Diotima is instructing Socrates about love:

"This is the correct way of proceeding or being led in matters of love; beginning with particular instances of beauty, for the sake of the higher beauty one must always ascend, as if employing rising stairs,
from one beautiful body to two, and from two to all, and from beautiful bodies to beautiful ways of living, and from this to the beauty of learning, and from here to the ultimate higher study, which is concerned with the higher beauty itself and nothing else, so that finally one may know what beauty is." (Smp.211b)

Let us call this investigation 'erotics'. The key point here is that the border of the two realms does not form the demarcation between erotics and non-erotics. The investigation begins with sensibles and ascends to the intelligibles as part of the same discipline. This is entirely in accord with the Republic. Concerning investigation thought of in terms of the line allegory, Socrates says

"In one division the mind is compelled [anankazetai] to investigate by using the originals of the visible order in their turn as images, and has to base its search on hypotheses and proceed from them." (Rep.510b)

The force with which this is expressed is interesting. The mind is compelled to investigate in this manner, ruling out any other method of accessing the intelligibles. This strongly suggests that investigation for Plato is the ascent of the line, including the traversing of the border of the two worlds, rather than the exclusive property of any one section. If so, then individual investigations are better conceived of as dynamic, vertical ascents, rather than static, horizontal positions on the line. There can be little doubt that the general epistemology and methodology set out here is intended to be applied to astronomy.

There are several other passages which are helpful here. These can be grouped under two headings; those which show that an empirical approach is insufficient, and those that show it to be necessary. It is often possible to pair these within one work, e.g Phaedrus 268a ff, where we learn that a knowledge of practical medicine, rhetoric and music is necessary, which we can compare with Phaedrus 270b, where we find that to possess a [technē] one must have more than [empeiria], an 'empirical knack', one must in fact understand the nature of what is involved, here the body or the soul.

On this view of investigation for Plato then there is an essential empirical part of the process. Obviously there are restrictions here, for while empirical enquiry is necessary for the initial stages of the line, it is futile for the higher parts. Hence we find passages which decry its use for this latter purpose, but not blanket bans.

Also important is the subsequent descent of the line. Socrates
speaks as if to his fully educated guardians, telling them that they must descend into the allegorical cave, and that they will

"See far better than those in that place, and will know each of these images, what it is and what it is of, because you have seen the truth concerning beauty, justice and goodness." (Rep.520c)

That intelligibles can help inform us about sensibles shows the supposed demarcation to be passable in both directions, 'upwards' from the sensibles and subsequently 'downwards' from the intelligibles.17 This passage also suggests a second strategy by which we might undermine the supposed demarcation, which is to argue that Plato is not in fact committed to TW. In relation to the later dialogues, this may well be a highly profitable line of thought, as I shall argue in later chapters. Whether it can be successful for the Republic though is open to doubt. That we can opine intelligibles does not breach TW strictures, if we take it that it is possible to have knowledge in addition to opinion of intelligibles, but that this is not the case for sensibles. Conversely we can perceive or think about sensibles, but cannot perceive intelligibles. At Republic 506c Socrates has belief but not knowledge of the Form of the Good, while at 523a ff we reason about our contradictory perceptions of our fingers.18 This weaker construal of TW meets all the 'unattractive consequences' of Fine's stronger construal, according to which there can be no belief concerning Forms.19 These consequences lead Fine to reject TW for the Republic. Where cognitive states are correlated with objects (e.g 511de), on my view these are maximal states to which we may progress from lower ones.20 Thus we can come to know intelligibles in the manner of the Meno by attaching an explanatory account, though the Republic has a more sophisticated view of this process, and so the Republic does not 'radically reject the Meno's account of knowledge'.21 Rather than reading Republic 520c as giving us unrestricted knowledge of sensibles, it may tell us no more than that we can know what a particular sensible is (this is an image of Beauty) and what it is of (we can know Beauty itself).22 Knowledge of sensibles themselves might still be elusive. The analogues for the relation of Forms and particulars that Plato employs in the Republic suggest that sensibles are imperfect relative to Forms, and that these deficiencies affect statements about them.23 In astronomy we are told that it would be foolish to seek truth in the visible stars, as they are physical and so undergo deviations with the result that there is no constant relation between their periods.24 If there is no exact and

68
consistent truth, then for Plato there can be no knowledge. What might be possible however is knowledge of the ranking of sensibles in order of their approximation to the relevant known ideal, once we know what that ideal is. This would be important in politics, because if the guardians with their knowledge of abstract justice can correctly rank actions as more or less just, they can derive their right to rule from this ability.\(^{25}\) It is also possible that knowledge of the Forms would allow us improved opinions of sensibles and a better understanding of their functioning, without allowing us knowledge of them.

II

One objection to my position here could be based on the association of the methodologies of astronomy and geometry. If geometry is entirely a priori, then so is astronomy, and if astronomy is at least partly empirical then so is geometry. However, while geometry at the moment is pursued through intelligibles, the line allegory makes it clear at several points (e.g. 510b, 510de) that we access this level in geometry only by ascending from the sensible via the contemplation of diagrams.\(^{26}\) So while for Plato there may be concepts which are not given by perception, these cannot be acquired prior to or independent of experience. Although not directly expressed by Plato, we might also allow him the following consideration. Only a few of the most elementary of perceptions are required to make us enquire into the nature of number,\(^{27}\) while geometry requires more, and more specific perceptions for us investigate the relevant intelligibles, and so on in a continuum via astronomy and harmony.\(^{28}\) So while astronomy and geometry share the same basic methodology it would be wrong to equate the two directly as astronomy will require a much broader empirical base. As astronomy may be at a different stage of its development, it may require a different prescription for its future pursuit, such that we cannot without further consideration impose recommendations for geometry onto astronomy. This is perhaps the key to unravelling Plato's position in the Republic, that many of his comments are dependent on the current state of development of a given discipline. Plato may also have in mind an account of the genesis and development of disciplines. The evolution of geometry from land measuring to abstraction to diagrams and then to intelligibles is something well theorised by the line allegory.\(^{29}\)

A different sort of objection to my position, espoused by Vlastos,\(^{30}\) might cite the following passage from the Phaedrus and
argue that while there are necessary empirical preliminaries, the discipline itself is an a priori matter with intelligible objects. Socrates (hypothetically) says to a man who believes that he has a knowledge of harmony because he can strike the highest and lowest possible notes

"My good sir, anyone intending to become skilled in harmony must know these things, but nothing prevents someone at your stage from being without the slightest knowledge of harmony. You know that which of necessity must be studied before harmony, but not the theory of harmony." (Pdr.268e)

If we were to accept this, we would need to distinguish the discipline name, e.g 'astronomy', referring only to the intelligible part of the investigation, and the whole investigation, including the necessary empirical phase. The nature of the investigation would be unaffected, as merely to give a name to its intelligible part does not establish a demarcation for that investigation. One would then have to discuss which of these we ought to refer to as Plato's astronomy. However, as Plato in general refers to the whole investigation by the discipline name, we should not accept this objection. Symposium 211b and Republic 511b strongly suggest that the whole investigatory process is grouped under the discipline name, and passages at Republic 526e and 530d that we shall examine in the next section will help to confirm this.

According to some accounts, there is a discontinuity in the cognitive ascent of the philosopher in that Plato invokes non-propositional 'knowledge by acquaintance' either for the Forms in general or the Form of the Good in particular. However, I would agree with Sorabji and others that the thinking that the Republic requires is propositional. The critical passage appears to be the following, where Socrates says

"Don't you call a man a dialectician if he can grasp an account of the being of each thing? And isn't anyone in so far as they cannot give an account to themselves or others, lacking in understanding?.. Is this not so for the Good, too? Someone who cannot distinguish the Form of the Good from all other things with an account, and battle through all counter arguments, advancing real rather than apparent counter arguments, holding to his account in the journey through all these things, can such a person really be said to know the Good itself or anything else that is good?" (Rep.534b)
It would seem that propositions are required throughout this account of the tasks of the philosopher. However, there are some objections to be faced. Firstly, while one might readily see why knowledge by acquaintance cannot be transmitted in writing, it is not so apparent why this should be so for propositional knowledge. As argued in chapter one however, Plato's PWP is concerned with the transmission of understanding. One may read a definition in a book, but not really understand that definition until one has been through the process described at Republic 534b. The apprehension of the Good is of course likened to seeing the sun, a non-propositional experience. However, Plato is being metaphorical here, and it may be that, as Sorabji suggests, Plato is describing the feeling of realisation that one has when one finally comes upon a definitional formula that one can give a propositional defence of against all counter arguments.\(^{34}\) In chapter six I shall argue that when Plato develops a model of mind in the Timaeus he does so in a way that allows propositional thought about anything that the mind may encounter. One might also link the propositional interpretation here to my earlier discussion of anamnesis. Vlastos reckons 'the gravest flaw' in the theory of Forms to be the notion that a vision of the Forms provides infallibility.\(^{35}\) Similar problems concerning anamnesis and foundation were discussed in chapter two. On the propositional account though, what provides infallibility is the production of an account which can see off all counter arguments, and as we saw in the previous chapter, we justify claims about the Form of the Good in terms of coherence and explanatory power. Equally importantly, it is the process leading to the comprehension of a whole subject that produces understanding.\(^{36}\)

Finally, one might attempt to justify the view that for Plato science deals exclusively with one or other of the 'two worlds' by applying the demarcation criteria of modern science to a TW interpretation of Plato, and declaring whatever falls on the science side of this application to be Plato's science.\(^{37}\) While such a 'Whiggish' historiography is justly out of favour, such an approach is implicit in some of the older literature. Leaving methodological considerations on one side, a closer analysis shows that this path fails to achieve its objective. While it may initially seem plausible that modern distinctions between physics and metaphysics or scientific knowledge and general opinion would fall at the border of the two
realms, this is not in fact so. The first of these distinctions might be thought to generate the view that for Plato science deals only with the physical and so aims no higher than opinion. Consider though the mathematics which describe the motions of the heavenly bodies. These are clearly within the sphere of modern science and as such are a physical rather than a metaphysical matter. For Plato, however, they are 'accessible to reason and intellect, but not to eyesight' (Rep.529c). The modern demarcation does not then separate L2 and L3, but rather one might argue falls close to Plato's distinction between L3 and L4. It is perhaps when Plato suggests that we should go beyond considering the mathematics of the heavens to consider the relevant teleology, in an attempt to discover why it is good that the heavens should be as they are, that his investigation becomes metaphysical rather than physical in modern terms.

Secondly, we can consider the status of modern science as knowledge. Now while the contents of modern science may well be a privileged set of beliefs, most could not aspire to being knowledge in the sense specified for L3 and L4. Applying Plato's criteria here to modern science would create an absurdly high barrier ruling out much of what is reasonably accepted as scientific knowledge, while applying modern criteria to Plato would admit much of the opinion of L2, rather than separate L3 and L2.

III

Let us now consider Republic 528e-530d. Plato's critics have made much of this passage, while others have held that it is difficult to produce a coherent interpretation of it as a whole. The context here is crucial, and I must disagree with Crombie who suggests that

"If there is anything about scientific method in the Republic, it will be in the curriculum for the further education of his rulers which Plato lays down in book 7." The epistemological allegories have already given us a general methodology, which as we have seen, certainly applies to astronomy. At 521c there is a marked change of direction. Socrates switches to discussing how the guardians of the ideal state might be produced, comments that what is at issue is the conversion of the mind 'from a kind of twilight to the true day' (Rep.521c5), and then says that

"It is necessary therefore to ascertain what sort of studies have the power to effect this." (Rep.521c10)
The question now is how we might employ a discipline for specific educational ends rather than how we might pursue an investigation. This means that we must be very cautious in drawing any conclusions concerning scientific method here. As a shorthand I will refer to 'teaching astronomy' and 'investigating astronomy' respectively. Socrates says

"It is necessary to consider whether the greater and more advanced part of the subject, if taken further, has the effect of making it easier to grasp the Form of the Good... It is useful if it compels the contemplation of being, rather than becoming." (Rep.526e)

The method of Platonic education is then to encourage the guardians to consider the intelligibles. Note that only part of the whole subject has this effect. Socrates also employs a distinction between astronomy as it is used now in philosophical education and how it ought to be so used. At 529b he criticises the current use of astronomy, and a few lines later, Glaucon says

"But how did you say it is necessary to learn [manthanein] astronomy, as opposed to the manner in which they learn [manthanousin] it now, if it is to be useful for the studies we recommend?" (Rep.529c)

It is important here to translate [manthanein] as 'to learn' rather than as 'to study', which would introduce an ambiguity that is not in the Greek. Study is ambiguous between learn and research (i.e teaching and investigating astronomy) in a way in which [manthanein] is not. It is this sentence, in conjunction with 526e, which sets the terms for the discussion that is to follow. The aim is to determine what part of astronomy deals with the intelligible and so ought to be used in philosophical education, in distinction to the current curriculum. How we ought to teach astronomy is to be derived from how we ought to investigate astronomy, and contrasted with how it is taught now. This accords well with the broader relation of the two sections we have examined; how to educate the guardians is being derived from the earlier epistemological discussion.

Firstly, Socrates considers the status of celestial bodies, which though they may be the best and most precise of visible things, are inferior to the true entities, the orbits which the real speeds in true number and pattern move relative to each other, which are accessible to reason but not eyesight. The stars are likened to a diagram, as well drawn as might be, but still having inherent shortcomings, which we
ought to use as in geometry. We do not examine a diagram hoping to discover any precise truths, but consider the intelligibles which the diagrams express. In line with the programme of 526e and 529a, Socrates has separated the sensible and intelligible parts of astronomy. Having set up the appropriate distinctions, he then draws the concomitant conclusion:

"It is by means of problems, then, that we shall proceed with astronomy as we do geometry, and we shall leave the things in the heavens alone, if we propose by really partaking in astronomy to make useful instead of useless the understanding that is by nature in the soul." (Rep.530b)

The key question here is whether 'proceed with astronomy' refers to investigating or teaching astronomy, or both. Consider the structure, wording and placement of this sentence. It is the culmination of the discussion of astronomy in relation to education, and as such should be completing the programme of 526e and 529c. If it refers only to teaching astronomy, then it gives an appropriate answer to the questions raised. If we are to use astronomy properly for education we must use the intelligible part of the investigation, the problems, as opposed to the sensible part, and not divert our students with observations, as philosophical educators do now. The 'if' clause is specifically and exclusively educational, and the conditional structure allows us to draw a contrast with how astronomy is taught now and how it ought to be investigated. Crucially, the attempt to derive how to teach astronomy from how to investigate astronomy in terms of the part/whole relationship implied at 526e makes sense on this reading. For the structure of the passage to work, investigating astronomy must involve something more than teaching astronomy. It may also be significant that Plato uses [ean] here, meaning 'to leave alone, to leave be or to heed not' (LSJ) at 530c1, rather than the stronger phrase [chairein ean], meaning 'to renounce' (LSJ), as he does in other contexts. [Ean] fits the contrasts here perfectly; we leave observation of the heavens on one side for education, but not for other purposes, where one might expect [chairein ean] if Plato were renouncing observation entirely.

The crucial point made by this carefully constructed and placed sentence is that astronomy as it is taught now and as it ought to be investigated do involve examining the physical heavens - this sentence implicitly affirms rather than explicitly denies this - in distinction to how we ought to use astronomy in philosophical education, when we
should leave the physical heavens alone, and only consider the intellectual problems.

If what I have argued in the first two sections of this chapter is correct, then this makes good sense in terms of the methodology suggested by the epistemological allegories just ten Stephanus pages earlier, and Plato has taken great pains to place his comments here in the context of that methodology. It is thus possible to appreciate the distinction between investigating and teaching that Plato is showing us in this passage. If we ignore this, then much of the structure of this passage otiose. An additional advantage of this reading is that it does not require us to attribute any gross exaggeration or overstatement of position to Plato.55

We ought also to consider the section on harmony which immediately follows this passage, particularly as Socrates says that

"As our eyes are framed for astronomy, so are our ears for harmony, and these two are in some way kindred disciplines." (Rep.530d)

This sentence is either heavily ironic or affirms that sense perception has a role in both of these disciplines, if our eyes and ears are framed for them.56 Presumably much of what is said about the methodology for harmony applies to astronomy and vice versa. The key to this section is again the question that is being asked. Socrates says that we must maintain the principles that have already been laid down, and that

"We must prevent those we shall nurture from ever attempting to learn [manthanein]57 in an imperfect manner, one that does not always bring them to where it is necessary for them to go, just as we were saying concerning astronomy." (Rep.530e)

The question then is essentially of the same nature as in the astronomy section. It is not primarily how we should investigate harmony, but what part of harmony is suitable for use in the education of the guardians, although there is naturally some consideration of the former in order to derive the latter, as there was correspondingly in the astronomy section. The comments on harmony are then amenable to the same sort of investigation versus teaching analysis as those on astronomy.

IV

One might argue that while the Republic has a role for observation, because its physical entities do not behave in a regular manner, it discourages careful and prolonged empirical investigation. As Shorey comments though,
"That the stars in their movements do not perfectly express the
exactness of mathematical conceptions is no more than modern astronomers
say." 58
It is important to recognise that there are two explanations as to why
this should be so. According to Plato, physical bodies are not capable
of regular behaviour and are likely to 'deviate' from any ideal
projection. 59 As Sorabji notes,
"If the heavenly motions do not conform to mathematics, this shows
that there is something wrong with the bodies, not the mathematics. This
is contrary to the spirit of those who believe that nature obeys
exceptionless laws." 60
The modern explanation though would state that while bodies do perfectly
obey laws which pertain to them, there are problems of complexity and
isolation. Once we postulate e.g an inverse square gravitational law,
with a force propagating to infinity, then we need to include every
massive particle in the universe in our calculations if we want complete
precision. 61 So while Plato and modern science have differing
explanations of non-ideal behaviour, they agree that it exists, yet
no-one would charge modern science with holding a viewpoint which
discourages careful observation of the phenomena. One might also note
that while Aristotle held that mathematics could not provide perfect
descriptions of massive bodies in motion, this did not prevent him
undertaking detailed empirical investigations. 62 It might be suggested
that the moderns have had great success in closing the gap between
(apparent) anomaly and theory. That is undoubtedly true, 63 but the
ancients too would have had success here, and we have little knowledge
of what they would have regarded as a serious anomaly. One might also
argue that modern chaos theories and recognition of the butterfly effect
actually paint a somewhat bleaker picture of what investigation might
achieve than middle period Plato or the ancients in general might have
accepted, but again we do not take these ideas as a discouragement to
detailed observational work.

These are not matters that I wish to dwell on for long however, as
I shall argue that by the Timaeus Plato had changed his views on the
relation of mathematics to the world in general and to the motions of
the heavens in particular, such that the question of whether Plato would
have discovered Uranus becomes redundant. 64 I merely wish to suggest
that Plato's middle period theories do not necessarily result in the
disparagement of detailed observational work.

76
While Plato was a theoretician rather than a practising scientist, another question here is his attitude to observational studies carried out by others. One approach to the question of whether Aristotle had sufficient empirical support for his astronomical theories is to carefully comb through the De Caelo and other works in search of passages where Aristotle cites empirical data in support of his views. The conclusion of such a search might well be that Aristotle was at least somewhat arbitrary and selective in his use of examples. However, Aristotle was essentially a theoretical astronomer who took over a tradition from Eudoxus and Callippus. In doing so he would have been absorbing the large body of data that provided the basis for these theories, and then improving the fit between theory and data. Indeed, on more than one occasion Aristotle refers to results obtained by many years of observation by Egyptian and Babylonian astronomers.

We might take roughly the same line with Plato, as he too is a theoretician rather than a gatherer of data. As he is perhaps the progenitor of the tradition that Aristotle later takes on board, we cannot deploy quite the same argument in his case.\textsuperscript{65} We need some more direct evidence that he took over a body of data, and this I suggest is provided by the Epinomis and Timaeus. In the Epinomis we are told that

"The first to observe these bodies was a non-Greek. Tradition nurtured those who first took these things to mind, due to the excellence of the summer season which both Egypt and Syria adequately possess, and revealed to their sight, so we say, they always beheld the stars together... These observations have since disseminated everywhere, and have been shown to be true by the test of time." (Epin.987a)

If we are to believe the Epinomis,\textsuperscript{66} it would seem that Plato was well aware of detailed Egyptian astronomical observations, and was fulsome in his praise of their accuracy. It is worth noting that in the Timaeus, while Plato does not refer directly to astronomical records, he praises the Egyptians for having the most ancient and comprehensive records,\textsuperscript{67} and at Laws 967b he is full of praise for those who have accurately studied the heavens. As the Timaeus, Laws and Epinomis are later works than the Republic, Plato's attitude here may represent a change of mind. However, according to my arguments in this chapter it need not; the Republic does not condemn or denigrate observational astronomy, but has a firm view of its position as the necessary starting point for investigation and of the limitations of a purely empirical approach.
At the end of section two of this chapter, I suggested that if we compare the investigation of nature suggested by the line allegory with modern science it would appear that Plato's conception is somewhat broader as modern science, which appears to operate between the borders of L1/L2 and L3/L4. At the lower end of the line this difference does not seem to be critical. In fact, modern science uses the sort of images Plato consigns to L1, making it as broad in this direction as Plato, but does not recognise any significant epistemological difference between L1 and L2. It may indeed use L1 methods in preference to L2 with superior results to more direct observational methods; electron microscopy and radio astronomy seem good examples here.68

What though of the other end of the line and the relation of L4 to modern science? A tough minded instrumentalist might tell us that the job of science is merely to produce mathematically framed theories which account for the evidence; anything else is the task of the metaphysician. If we accept this, then much of L4 is going to be ruled out as unscientific. However, more generous and more realist positions in the philosophy of science bring some aspects of L4 into play. It might be argued that two of the key projects of modern theoretical physics are the unification of quantum mechanics and relativity, and the unification of the electroweak, strong nuclear and gravitational forces. Science on this account has a drive towards theoretical unification. Plato has the grander design of drawing together all areas of human investigation, but the drive toward a unified theoretical structure is plain enough.

According to Republic 517bc, the last thing we encounter on the intellectual journey envisaged by the epistemological allegories is the Form of the Good. It may be that we are to equate this with the [arche anupothetos], the unhypothesised first principle, or perhaps as Fine has argued the Good is 'beyond being' and is to be found in the structure of the world and our knowledge of it.69 Whatever the precise outcome here, one might worry that this is then a fundamentally teleological vision, and that there lies a serious discrepancy with modern science. However, as I shall argue in later chapters, if we take into account some of the assumptions concerning the comprehensibility of the universe and the orientation of enquiry that are made in order to get realist conceptions in modern philosophy of science off the ground, this gap may not be as large as it might appear at first sight. I wish to delay discussion here though for two reasons. Firstly, the account of
investigation given in the Republic is a quite general one or even, given the mainly political and ethical subject matter of the work, slightly skewed toward an ethical conception. It may be that when Plato has the investigation of nature more specifically in mind that he employs a more technical and mathematical conception of the Good. Secondly, it may be the case that Plato's conception of the Good undergoes some change and becomes more mathematical in later works, particularly in the Philebus. These are matters that I shall examine in later chapters, particularly in relation to the Timaeus, the Philebus, and the various reports on Plato's Lecture on the Good.

V

If the arguments of this chapter are correct, we need to reassess the Republic's contribution to the development of scientific methodology in terms of a necessary initial empirical approach followed by a move to the consideration of the relevant intelligibles as part of the same discipline. This gives Plato a potentially much more reasonable methodology for investigation, in terms of observation followed by abstraction and mathématisation, than has been allowed for in much of the literature up to now.

While this may represent progress on his predecessors, we must not get over-enthusiastic, for as Lloyd has argued, it would be wrong to assimilate Plato to Galileo or even Archimedes. Mathématisation for Plato at this stage of his development is primarily a step on the road to the cognition of the Form of the Good, and not to the quantification of the physical world. Further, it would seem that in the Republic at least the physical realm is not amenable to precise mathematical analysis. We might also be critical of the way in which hypotheses are subjects for discussion, not empirical testing, even if they are initially based on observations. Nor ought we to be blind to the (positive and negative) effects of Plato's fundamentally teleological approach, involving the drive towards a unified theoretical structure.

Such then is the position of the Republic. In the following chapters I shall argue that there are important changes to some of these views. In particular I shall argue that TW is dropped, that the heavens become amenable to precise mathematical analysis, that there are changes in Plato's notion of the Good, his notion of [techne] and his view of the irregular behaviour of bodies. Such changes may have significant implications for our assessment of Plato's philosophy of science.
As I hope to have shown in this chapter, it is not the case that Plato advocated the banning of observation from astronomy in the Republic. While there may be things to be said about the precise role and emphasis Plato gives to observation, he did not propose an investigation that was devoid of empirical input. If so, then we must reject some assessments of Plato's astronomy. For instance, Neugebauer comments that

"His advice to astronomers to replace observations by speculation would have destroyed one of the most important contributions of the Greeks to the exact sciences." 75

The line, taken by many commentators, that Plato was a disaster in the development of astronomy and scientific method because he wished to ban observation, must be rejected. We ought also to be suspicious of assessments which attribute an accidental positive contribution to Plato, while remaining generally critical. Two positions here are that Plato's call for hypotheses of uniform circular motion to save the heavenly phenomena positively influenced Eudoxus and following astronomers, or that his emphasis on the role of mathematics was important in the development of science, but that he otherwise held a deplorable methodology which denigrated observation. Such evaluations need to be carefully reconsidered in the light of the arguments offered in this chapter.
NOTES TO CHAPTER THREE


02) At this point in Plato's career I do not believe that spatio/temporal considerations are a characterising issue here (though they are later; see my ch.7 and 8), and I would disagree with Vlastos (1964, 1969a) that Plato's concern is to separate a priori and a posteriori or necessary and contingent; see here Jordan (1984) p12-14, 24-25, 70-72.

03) E.g Mueller (1981) p104, comments that "Plato assumes every science to be the study of some kind of real but non-sensible objects". There is varied opinion on what these objects might be. See Mourelatos (1981a) p63 n.2-10 for some possibilities here.

04) E.g "Science then is only concerned with realities independent of sense-perception; sensation, observation and experiment are entirely excluded from it", Heath, (1913), p135, cf. p139. So too Mittelstrass (1962), p117; cf. Shorey (1935 vol II) p187, n.c, and Lloyd (1968) p78 n.1-9 for further examples of this view.

05) This position might cite Tim.27c-29e in support, e.g Lee (1955) p311, comments concerning line section L2 that "In the Timaeus, Plato includes the natural sciences in this subsection, as they can never reach ultimate truth, being concerned with the changing world".

06) The final phrase here is translated in a manner which is sympathetic to this position; later I discuss whether this is the best rendering. Here one might also emphasise the abstract definition of astronomy given at Rep.528a and 528e, as the study of solids in motion, with its close links to arithmetic, plane geometry and solid geometry in the curriculum for the guardians.

07) Simplicius mentions this challenge twice, at Aristotelis De Caelo Commentaria 2.12, Helberg edition 488.18-488.24 and again at 492.31-493.05 (quoted here), with a slight reformulation of the wording. Simplicius quotes his sources as Eudemus and Sosigenes, though there is some doubt on this matter; see Vlastos (1975b) Appendix L p110.

08) See e.g Burnet (1924) p184/5.

09) These positions on Plato's science are of course not exhaustive of those that have been taken, but they have been influential. Furthermore, the assumptions that they make concerning TW and the demarcation of enquiry for Plato occur implicitly or explicitly in many other views of Plato's science (see e.g Cornford (1937) p29, who argues that there is no 'science of Nature' for Plato as there can be no exact truth in our account of the objects of physics, which for Cornford are those of the lower part of the line).

10) Nor any other position, such as that of Cornford, which relies on restricting scientific enquiry for Plato to one of the two realms. Which position here commentators have adopted has sometimes depended on their view of modern science; see my next section on the sort of historiography which may have led to the genesis of these positions.

11) One link with the Rep. here is [epanabasmois] at Sym.211c3, matching
the allusion of ascent; cf. Rep.511b5-6, where hypotheses are [hoion epibaseis te kai hormas].

12) It is important not to prejudge the 'horizontal/ vertical' debate when translating the names of line sections; e.g. by rendering [episteme], used to refer to the upper parts of the line, as 'science'.

13) When astronomy is discussed later, its methodology is equated with geometry; cf. Rep.511b, 529de.

14) See Vlastos (1980) p11 ff here. Cf. Grg.465c ff and 500e ff where identical distinctions are drawn between [empeiria] and [techne] concerning rhetoric and medicine, and see Grg.465a and 501a on the requirement that to be in possession of a [techne] one must be able to give a rational account. For necessary/insufficient pairs in later works, see e.g. Tim.47a and 91d, Plb.55e and 56a, and Le.719e-720d.

15) See e.g. Rep.523a ff, where some perceptions provoke us to philosophical reasoning; cf. the allegories of line and cave, where the sensible world and our perceptions are the starting point.

16) E.g Rep.510b where the investigation disposes of images.

17) Ep.VII strongly supports this view (though see my earlier comments on authenticity). 342b distinguishes name, account, image, and knowledge, and states that the first three are the necessary means for attaining the fourth; cf. 342d. At 343d we find that we must "Work between all of these four, passing up and down over each". Thus we need to grasp the image (i.e. the physical manifestation, cf. 343a3 ff) in order to access the intelligibles, and as we must pass 'up and down' between all four in investigation, there can be no demarcation at the border of the two worlds.

18) Thus we ought to read 'knowable' as 'opinable and knowable', and 'opinable' as 'only opinable'. So too 'intelligible' and 'perceptible'. This is not to suggest that we can reason about sensibles in the strongest sense, as their deficiencies prevent us having knowledge of them, but surely we can think about them, or bring them before the mind by some other route than perception, perhaps by memory or imagination.


20) Thus we can first opine intelligibles and then know them. Cf. my horizontal/vertical and dynamic/static discussion of the line.

21) Fine (1990) p85 draws this consequence if we attribute her TW view to the Rep.

22) Fine (1990) p86 takes Rep.520c to contradict her construal of TW.

23) See esp. Rep.510ab, where the analogue links the two central sections of the line allegory.

24) See Rep.529d-530b. I discuss these matters in greater detail in ch.6.

25) One might argue that for Plato there are no just acts to be known,
all actions being both just and unjust, so this is the most we can expect from the guardians. See Rep.479a ff, and cf. Fine (1990) p87, who is worried that if the guardians only have opinions of sensibles like everyone else, then they are no more fit to rule.

26) See also Rep.526e, where a division is made in geometry along the intelligible/sensible distinction for the purpose of determining which part will be useful for education, suggesting that there is a sensible part of geometry, however small in relation to other disciplines. In a much later work, Plb.55e ff is clear on this; when we remove the theoretical/mathematical element of any [techne], we are still left with the [empeiria], however small that may be.

27) See Rep.523a ff, esp. 524e, where any contradictory perception will force the mind to consider unity, plurality, individuation and counting.

28) This is possibly implied by the order of the subjects in the curriculum; note the fuss Socrates makes to get this right at Rep.527d.


30) See Vlastos (1981b) p10 ff. Vlastos' position here might be related to his view that the contrast Plato is interested in is a priori/a posteriori or necessary/contingent, a view I reject; see my note 2.

31) One might cite Pdr.268e here.

32) See e.g Cornford (1932), Ryle (1939) p136–141, Runciman (1962) p40–45.


37) There are two ways of interpreting this approach. The stronger view is that this defines what is science in Plato. A weaker view is that this merely defines Plato's attitude to modern science.

38) One could generate many similar examples of Platonic intelligibles which would be investigated by modern physics.

39) Though as I argue later, this is not as clear cut as it first appears.

40) The aim here is to generate the view that for Plato science deals with knowledge, so according to TW it deals exclusively with intelligible objects. One can then attempt to generate anti-empirical methodological consequences.

41) This is especially so if we reckon, with e.g Popper, that scientific knowledge can be distinguished from the certain knowledge of mathematics, and mere opinion, yet is a provisional account susceptible to change.


44) Or how we might train astronomers.

45) This passage affirms that a subject straddles the two worlds, as a contrast is drawn between its more and less advanced sections along this distinction, but both are part of that discipline.

46) Cf. e.g Lee (1955).

47) Both an eminent physicist and a secondary school class 'study' physics, but one researches and the other learns.

48) See Rep.529c7-d5.

49) See Rep.529d7-530b2, and 510b-511c for parallels with the line and the treatment of geometry; see here Mourelatos (1981a) p37 ff.

50) Note that there is no ban on observation here, where investigation is being discussed; we are to use the visible heavens as a model, as in the line allegory.

51) See Rep.531c3 for clarification as to the nature of these problems, where we ascend to consider 'which numbers are concordant, which are not, and in each case why'.

52) It picks up Rep.521c ff which sets the educational purpose of the whole section, as well as 526e and 529a.

53) A point originally made by Dicks (1970), p234 n39; cf. Vlastos (1981b) p3. Some other instances of [chairein ean] as meaning to renounce, are at Prt.348a, Pdo.63e, 101c+d (see Brandwood (1976) for a full list). Even this stronger phrase is not always totally dismissive. Dicks' explanation of this passage is unconvincing. He comments ((1970) p109) "There had been accumulating during the fifth and sixth centuries B.C a mass of crude, but none the less practically useful observational material... What was now needed was for astronomers to sit down and do some hard thinking on about astronomical theory... That is precisely what Plato realised, and this is why he urged the astronomers to concentrate on the mathematical side of their subject... to the extent even of calling a temporary halt to the mere accumulation of more observations". There is no mention by Plato of any (temporary or otherwise) halt to observation. Dicks accidentally provides the best argument against his own position. At Tim.39c, where we are told that "Men have not pondered the periods of the other stars... thus men do not name them nor investigate the mathematical relations between them", he comments ((1970) p130) "Evidently in Greek astronomy as known to Plato very few planetary observations had been made". If so then Plato can hardly have been calling for a temporary halt to observation in the Rep.

54) A further matter of translation here concerns the phrase [ontos astronomias metalambanontes] at 530c1. Shorey (1935) translates "Have a part in the true science of astronomy", and Vlastos (1981b) p3, "By doing real astronomy". The sentence then becomes one about investigating rather than teaching astronomy, so carrying the implication of banning observation from it. The more natural reading though is to take the
adverb [ontos] with the verb [metalambanontes], giving 'really partaking in astronomy', rather than 'partaking in real astronomy'.

55) E.g Heath (1913), p139, "It may be that, when Plato is banning sense-perception from the science of astronomy in this uncompromising manner, he is consciously exaggerating"; cf. Shorey (1935 vol II) p187, Lloyd, (1968) p80/81.

56) Cf. Tim.47a ff on the benefits of eyesight and hearing. One would need to invoke the sort of on/off account of irony that I rejected in ch.1 to deny a role for sense perception here.

57) The same comments about the translation of [manthanein] in this sort of context apply here as at Rep.529c.


61) We also need to invoke the special and general theories of relativity for total accuracy, or even to explain some apparently anomolous phenomena like the advancing perihelion of Mercury.

62) Aristotle's view is that the more matter or motion involved, the less we can expect mathematical precision; see e.g. Metaphysics 995a15 and 1078a14. However, as the heavens were for him composed of aether, they did move in a precise manner. One might argue that Aristotle did not in fact engage in a detailed observational study of matter in motion, but my point is rather that he did engage in such studies in other fields where both matter and motion are involved.

63) There are still some vast discrepancies in some cases though; the most notorious perhaps being the ten-fold difference between the observational and theoretical estimates of the amount of matter in the universe.

64) Perturbations in the orbit of Neptune led astronomers to posit another planet, Uranus. Would Plato have ignored these perturbations as expected real anomalies? In the middle period perhaps, but not in the Tim, I shall argue; cf. Shorey (1935 vol II) p184 n.c, and Adam (1902) on Rep.530b.

65) See here my ch.5 on the relation between Plato and Eudoxus.

66) See my earlier comments on the authenticity of the Epin.

67) See Tim.22dff; as much of the subsequent discourse concerns astronomy, this may be highly significant. This suggestion hopefully illuminates the Tim. passage whether the Epin. is genuine or not.

68) One might also note that modern visible spectrum astronomy makes use of reflecting telescopes, such that we are studying mirror images of the heavens. All this seems slightly unfair on Plato, as in general if we have only the naked eye we are better off with direct rather than indirect observation.

85

70) As opposed to the methodology for the education of the guardians.

71) How much of an advance Plato represents here is partially dependant on the sophistication of the Pythagoreans on this matter, something that I shall investigate in later chapters.


73) One might distinguish between contexts of discovery and justification, accepting that Plato allows some empirical input to the former but not to the latter. This is not entirely clear cut though; one reason for doubting a hypothesis might be its inability to accord with the phenomena without being able to give an account as to why it does not (cf. Rep.602e), and the elenchus does allow the use of concrete examples.

74) See Rep.531d.

The central question for this chapter is how we ought to read Plato's Timaeus. Can we take it that Timaeus acts as Plato's spokesman or mouthpiece, delivering us unmediated Platonic doctrine, or, as I suggested in chapter one, are there some more complex factors relating to Plato's PWP that we ought to take into account? I shall argue for the latter, which I believe opens up some rich interpretational possibilities. We might start from the supposition that Plato wrote works which were intended to be literary and philosophical wholes. That is, they have an overall purpose and coherence, and all the parts of that whole have some function within it. If so then it would seem that some parts of the Timaeus are significantly under-explored. For instance, in Cornford's commentary the first ten pages of text are given two paragraphs of discussion, where later on we can find this ratio reversed. One might introduce another supposition here, that Plato's introductions are vitally important for the overall interpretation of a dialogue. It is not enough, perhaps, to analyse the arguments of the main body of the text, we must also understand their literary and philosophical context within the structure of the whole work, especially as this context may crucially affect these arguments. One task of this chapter then is to attempt to link the introduction with the main part of the Timaeus and to try to show how it contributes to the overall purpose and structure.

I

Let us begin with Timaeus' speech at 27c-29d. This is generally believed to be a statement of Plato's current epistemology which sets up the nature of the main account that Timaeus is about to embark on. However, if this speech is meant to represent Plato's views, it has some very strange features. A discussion of these incongruities will hopefully shed some light on the ten pages that lead up to this passage. Timaeus states that

"In every matter it is of great importance to start at the natural beginning. Thus concerning both the likeness and the paradigm, one must
make the following distinction, that accounts of them will be of the
same family [sungenes] as the things they expound. Therefore accounts
of that which is steadfast, firm, and is clearly apprehended with the
mind are steadfast and unchanging, and so far as it is possible for them
to be irrefutable and undefeatable as befits such accounts, they must
not fall short of this. On the other hand, that which has been copied
from the model, being a likeness, will have accounts that possess
likelihood, standing in an analogous relation to the previous accounts.
Emphatically, whatever is related as becoming is to being, is also
related as opinion is to truth." (Tim.29b)

My first concern here is the distinction drawn between the nature of the
accounts concerning the physical and the intelligible. Why should we
accept that accounts will be [sungenes], 'of the same kind' as what they
explain? 5 The Phaedo would seem to explicitly reject such a principle
of explanation, whether we think of it in terms of entities cited in
explanation or the status of that explanation. At Phaedo at 96 ff, the
intelligible entities are postulated in order that they might be cited in
explanations of physical phenomena. 6 There is a sense here in which
the intelligible must be related to the physical, as the explanans must
fit the explanandum, but the Forms could hardly be thought to be
[sungenes] with what they are supposed to be explaining. 7 This is
especially so if one of the major motivations behind the theory of Forms
is to postulate cognitively stable entities in order to resolve the
compresence of opposites. There is also no suggestion in the Phaedo that
any account of why one thing is larger than another will be only a
'likely account' because it deals with the physical world. The cases of
two men and two horses are treated equally with two numbers, ten and
eight. 8 Timaeus seems here to be making a radical separation of the
intelligible and the sensible and to be denying an explanatory link from
one to the other. 9

It is notable that Timaeus does not really argue for his position
at 27a-29c, but rather states it in a manner that leaves open many
questions. We have the strange and unsupported [sungenes] stricture. We
also have the word play of [eikones] and [eikotas], 'likeness' and
'likely' at 29c2. Why should we accept that an account of a likeness can
itself only be likely? And why should we accept the formula that
follows, that as becoming is related to being so is opinion related to
truth? There are obvious echoes of the Republic here, but no grounds
for being convinced of Timaeus' claims.

88
There are also other passages in the Timaeus which cast doubt on Timaeus' position here. Consider the way in which Timaeus often has trouble sticking to his methodology, and note in particular he tells us that his account of geometrical atomism is [kata ton orthon logon kai kata ton eikota], 'in accordance with the correct account as well as the likely' (Tim.56b). One then wants to know what this correct account is, how Timaeus has access to it and what the implications are for the epistemology which Timaeus espouses at 27c ff.

The likely story also generates an interesting paradox. We are told at Timaeus 37b9, in language which is highly reminiscent of 27a-29c, that the world soul can have opinions and beliefs about the physical which are true and stable. Now that entails two things, that there cannot be anything intractable in the nature of the physical, or in the nature of opinion, that prevents the formation of such opinions. The likely story then is telling us that it is likely that the basis for giving this sort of account - that because of the nature of the physical world as a likeness, it will only admit of a likely story - is incorrect. The analogy between the world soul and human soul that is then developed goes on to suggest that the epistemological difficulties that we face are due to the nature of our minds rather than the nature of the world, and are tractable rather than intractable.

These matters I shall consider in detail in chapters six and seven, but for the moment I just want to indicate how one can cast doubt on the notion that 27a-29c is all the Timaeus has to say on epistemology. What I want to suggest here is a radical departure from the way that this passage has usually been read. Perhaps it no more represents Plato's current epistemology than say the views of Nicias and Laches represent his views on courage or those of Cratylus and Hermogenes represent his views on naming. That Timaeus' view superficially looks like something Plato has advanced in earlier works, and here one thinks of the Republic in particular, does not establish it as Plato's current view. Several of the later dialogues seem to allude to, and then go on to criticise earlier positions. As noted in the first chapter, Plato's strategy is often to present his readers with some extreme views, none of which prove acceptable on further analysis. It is then the job of the reader to steer a course between the various perils to arrive at an adequate theory. One can perhaps discern this strategy with Timaeus' epistemology. The question that is being posed to the reader here might look something like this. If we accept this radical
separation of reason and sensation and their objects, do we have an adequate epistemology and ontology? If we do not, then what is the relationship between these factors? One aspect of this may be a critique of some of Plato's earlier views. Another may be that it is also an attack upon, or perhaps a development of the views of some presocratic philosophers. One might then ask who, prior to Plato, made a radical separation of reason and sense perception and their objects and/or believed that explanans and explananda are [sungenes]. More accurately, we might ask who Plato believed to hold such views. Two prime candidates here are Parmenides and Heraclitus, and there are two ways of setting up the contrast that I suggest is the central epistemological theme of the Timaeus. The first, while admittedly somewhat speculative, is rich in its implications for the interpretation of Plato's later works, and sees Plato as taking up a discussion that (he believes) was started by Parmenides. The second is somewhat more orthodox in contrasting a Parmenidean account of the intelligible with a Heraclitean account of the sensible, though still radical in the sense that it sees Plato as probing and criticising such a position, rather than accepting it.

II

Let us begin by noting certain affinities between Parmenides' poem and Timaeus' speech. Both separate the objects of reason and sensation, reckoning these to be coordinate with what is knowable and what is opinable, and both require explanations to be [sungenes] with what they explain. We might also compare Timaeus' repeated use of [eikos] to describe the status of any account of the physical with Parmenides' similar usage at Fr.8/60. Both Parmenides and Timaeus draw a distinction between the veracity of what they have just said and the nature of the account they are about to give, and both aim to provide the best account of the physical world that it is possible for mortals. If Timaeus 27c-29d alludes to Parmenides' poem, what might Plato's purpose have been? Here I must touch briefly on what may have been Parmenides' intentions. McCabe has argued that the purpose of Parmenides' poem is not so much to argue for a strong monism, but rather to question the relationship between reason and sensation by setting up a radical disjunction of these elements and exploring the difficulties for both alternatives.
It is uncontroversial that Parmenides is unhappy with the way of seeming, with undiscriminating sense perception, but the way of being also seems highly paradoxical. As McCabe has argued, the context of the poem is dialectical, with the conversation between the Goddess and Parmenides couched in the second person. Dialectical also in that the poem seems to argue with us - the use of the second person seems to reach beyond the text and address the readers, and challenges us to sort out the difficulties raised. The context then is a pluralist one, of the two minds assumed for dialectic to occur. Yet the way of being cancels out this context, telling us there is only one thing, and cancels out all of the discriminations used to establish it, for if there is only one homogenous entity then there are no distinctions to be made. Thus the [aletheia] too becomes wildly paradoxical.

The central question of the poem perhaps revolves around the verb [krin ein], to discriminate or judge. The thinkers discriminate between [aletheia] and [doxa], and rejecting the testimony of our senses argue rationally that only the one exists. The [akrita phula] (Fr.6/7), the 'undiscriminating horde', fail to discriminate between being and not-being, and wander [dikranoi], two headed, trusting their perceptions, and convinced that the path is backward turning. The problem posed could be put like this. If we do not discriminate, if we simply put our faith in what sense perception tells us, then we will have a hopelessly contradictory account of the world. If, on the other hand, we indiscriminately discriminate, and ignore the evidence of our senses completely, then we cancel out our own context and our own identity. One of Parmenides' problems, then, is a meta-question, about judging judgements; How many and what sort of discriminations should we make? This is intimately related to a second question; If this radical disjunction of reason and perception leads to unacceptable conclusions, what is their proper relation? This might lead us to another crucial question; How much of sensation can we trust, upon what criteria, and how are we to do this without losing logical coherence?

What I want to suggest here is that if this was the way that Plato viewed Parmenides, then his use of a radical separation of reason and sense perception and their objects at Timaeus 27c ff may not be a statement endorsing a strong TW doctrine but a way of setting up a discussion of the proper relation of these elements. If this is the case, then we should expect other parts of the Timaeus to break out of
the TW epistemology. We might also expect a discussion of the nature of the physical world and its epistemological status, and an account of the nature of our minds and their place in the physical world. So too we might expect some other passages to notionally support 27c-29e, perhaps developing some of the views implicit in that position to broaden the context of the discussion and to sharpen the contrasts that Plato is offering us. This, as I shall argue at length in the following chapters, is indeed what we find. If how to discriminate or judge is a central concern of Parmenides' poem, we may be able to draw another significant parallel with the Timaeus. At the close of Timaeus' introductory speech, he says

"If then, Socrates, on a great many matters concerning the Gods and the generation of the universe we should not be able to give what is due [apodounai] in terms of accounts which are in every way entirely in agreement with themselves and perfectly exact, do not be surprised. But if our rendering is inferior to none in likelihood, this must please, remembering that both I who speak and you the judges [hoi kritai] are human, such that concerning these things we should gladly accept the likely story, as befits this, and not seek any further." (Tim.29c)

The use of [hoi kritai] has perhaps a double resonance with Parmenides' poem. Firstly, [krites] is a cognate of [krinein], and secondly this is addressed in the second person. [hoi kritai] might merely be the others present, Socrates, Hermocrates and Critias, or perhaps the use of the second person may be inviting us, the readers, to actively do some judging ourselves.

Resonances with Plato's earlier works should also make us highly suspicious of whether we ought to attribute the epistemology espoused here to Plato. Should we 'gladly accept a likely account', or would Plato's Socrates of Meno 81d and 86bc castigate this as a 'lazy' approach, likely to stop men searching? Would the Socrates of Gorgias 482b so glibly accept any account that does not agree with itself? Wouldn't the Socrates of Phaedo 90b ff reject Timaeus as an [antilogikos], one who does not put sufficient trust in the power of argument? That Plato uses [apodounai] at Tim.29c8 is perhaps indicative of his attitude here. His usual phrase for 'give an account', from the Meno onwards is [logon didonai]. [apodidomi], however, carries the sense of 'to give what is due'; is Timaeus then failing to give what is due? That depends on what I suggest is the central question that is raised
here, and that we are being invited to ponder; What is due in terms of accounts of the physical?

Plato's reply to Parmenides at Sophist 243 ff is one that deals in metaphysics and semantics. Perhaps the Timaeus complements this by taking the other arm of Parmenides' challenge, and discusses the epistemological questions concerning the relation of reason and sensation, of what is possible in terms of an account of the physical, the cosmological question of what the world is like in relation to that epistemology, and the question of the nature of the mind and where it fits into this scheme.22

Now, one need not be committed to this as an interpretation of the historical Parmenides. All that I require is that this is roughly how Plato sees Parmenides, and this is something I shall argue for in the next section of this chapter.

There is a second way of setting up this antithesis which is less dependent upon giving Plato such a radical view of the nature of Parmenides' poem. A second figure who Plato believes thinks that accounts are [sungenes] with their explananda is Heraclitus. Whether this is an accurate picture of the historical Heraclitus is another matter, but the Theaetetus certainly takes this line about Heraclitean flux, and here we can, if we wish, attribute to Plato the more orthodox view of Parmenides as arguing for a strong monism.24 The contrast of Timaeus' speech at 27c-29e is then between a Parmenidean account of reason and the intelligible and a Heraclitean account of sensation and the physical. This leads us back towards more familiar territory, but I shall still argue that this is not Plato's position and that the later contents of the Timaeus sharply contrast with this scheme.

The consideration of Heraclitean themes at Timaeus 27c ff is entirely consistent with the way that I believe Plato sees Parmenides and with the purpose that I have suggested that Plato has here. One problem that Plato will have is how to account for the fact that the world appears to be in flux. To do this he will have to breach the [sungenes] stricture, or fall foul of the sort of arguments against unstatable flux offered by the Theaetetus. He will have to produce a flux which is describable and manageable, and as I shall argue in chapter seven, this he achieves. Let us first take a step back, though, and see if it is possible to argue that Plato views Parmenides in the manner I have indicated.

93
III

We might begin by comparing Plato's *PWP* with the style that Parmenides employs. One can immediately see certain affinities here. On any account of his purpose in writing, Parmenides makes full use of myth, paradox and aporia. His choice of poetry as a medium allows him certain literary resonances. These though are superficial similarities. The key question is whether Plato believed Parmenides wrote doctrine in flowery language or whether he used these literary devices as a means to challenge his readers. There is one passage from the *Theaetetus* which may be highly indicative of Plato's views in this respect. Socrates says of Parmenides

"He seemed to me to have a depth of mind that was entirely noble. I am afraid that we may not understand his words, and that we may be left even further behind in understanding his thought." (Tht.183e)

This suggests that for Plato the key to understanding Parmenides' thought lies behind the text, not in what is given immediately. As with Plato, what is concealed may be a positive viewpoint or it may be a problem, with a suggested framework for its solution.

We might also consider the characterisation of Parmenides and Zeno in the *Parmenides* and the dramatic frame of that work. There is a certain oddness about what each of the main characters argues for in this dialogue, given the orthodox account of Parmenides as a strong monist, and Zeno as his supporter. Plato does not have Parmenides argue for strong monism, but rather has him insist on consistency and rigour. Zeno states that the purpose of his treatise is to argue against pluralism,

"To show that the hypothesis that many things exist suffers still more ridiculous consequences than the theory that the one exists, if examined in sufficient detail." (Rm.128d)

This though carries the implication that the hypothesis that the one exists also leads to absurd results, yet Parmenides raises no objection here. Socrates also offers a knock down argument against any defence of strong monism by Zeno

So. "Is this the purpose of your arguments, nothing other than to contend against all that is said that what exists is not many? And you take each of your arguments to be a proof of this, such that you believe the number of proofs you give that what exists is not many are as many
as the arguments you have written down? Is that your meaning, or have I not understood you correctly?"
Ze. "But no, you have understood beautifully the whole intent of the treatise." (Rm.127e)
The point that it is rather odd to have two independent arguments that there is only one thing, Yet Zeno concurs with this and Parmenides again does not raise a whisper. Consider also Parmenides' speech at the conclusion of the first section of the Parmenides, where he says that
"Looking at all these difficulties and others like them, if someone will not allow the existence if ideas of things or will not define some one idea in each case, he will have nothing on which he can fix his thought, not allowing that each idea of things is always the same, and in this way he will destroy the power of dialectic." (Rm.135b)
This is hardly the position of a strong monist. However, it is consistent with the position that I argue for. Parmenides as Plato portrays him is deeply concerned with the relationship between the intelligible and the sensible. His dominant purpose is to provide an account of their relationship that is consistent and rigorous while maintaining important features of the perceptible world. Hence his trenchant criticism of all the proposed relationships between particulars and Forms that the youthful Socrates comes up with.

Now consider some of the dramatic elements of the Parmenides, particularly in relation to the Theaetetus. Why, for instance, does Plato have Socrates talk directly to Parmenides, but not to Protagoras in the Theaetetus? I am assuming here that historically there was no meeting between Socrates and Parmenides, and so the Parmenides is not a historical or semi-historical account. What I want to suggest here is that Plato believes Parmenides to have written in accordance with Plato's PWP, such that Parmenides' philosophy remains in a sense alive and something that can be dialectically engaged with. Socrates in the Phaedrus tells us that
"It is for the sake of a pastime that that he will sow seeds and write in the garden of letters, when he writes, this being laid up as a store of reminders, both against the onset of forgetful old age, and as a track for all those who follow him, and he will be pleased to watch the growth of these tender things... but in my opinion, much better is the serious treatment of these matters, that is whenever someone employs the method of dialectic, and taking a suitable soul,
plants and sows words of wisdom, which are able to defend themselves and their planter, and are not barren but are pregnant with seed, whence other truths are brought forth in other minds, rendering these seeds immortal, and making their possessor happy, as far as is possible for humans." (Pdr.276d)

In chapter one I argued that for Plato writing can take on some of the characteristics of oral dialectic and so achieve some of the same goals. A well written work might then achieve some sort of immortality for the thought that lies behind it. Now, if Plato believed that Parmenides did and Protagoras did not write in this manner, then at a literary level, this might be symbolised by the way that Plato has Socrates engage the long dead Parmenides in conversation, but not Protagoras. Plato's characters Parmenides and Protagoras then might be seen as symbols for their respective philosophies. One, observing the importance of dialectic and having been written in accord with Plato's FWP is still alive and can be dialectically engaged with, while the other, failing in these matters, has died with its progenitor.

Let us explore some points of similarity between the Parmenides and the Theaetetus in relation to the Phaedrus. Both have the old engaged in teaching philosophy to the young by means of oral dialectic. Parmenides is 65, while Socrates is 69 or 70. Theaetetus is 16, and if this parallel is strong, the Socrates of the Parmenides may well be 16 too. That would give a dramatic date of 454 for the Parmenides, four years earlier than it is usually taken to be. Theaetetus is praised as a good student and potential philosopher, and Socrates is praised in much the same sort of terms first by Zeno and then Parmenides. It is important that Socrates chooses Theaetetus carefully. He questions Theodorus on who the most promising young men are - Socrates is seeking a suitable soul for his dialectic. So too in the Parmenides. Socrates is an eminently suitable soul, and Parmenides is reluctant to go through the gymnastics he prescribes, only being willing to do so in front of a small and select audience. This is an important contrast with Protagoras, a man who will accept any pupil as long as he can pay. There is also a close parallel between the mental 'gymnastics' Parmenides recommends and the nature of the examination that Socrates gives Theaetetus. Note also the allusion to the Phaedrus in Socrates' closing speech in the Theaetetus.

"So if after this you should attempt to become pregnant with other
thoughts, Theaetetus, if this happens, you will be filled with better thoughts because of our present investigation, while if you remain barren, you will be gentler and less troublesome to be with [heto
barus tois sunousi], prudently not believing yourself to know that which you do not know." (Tht.210b)

Compare Phaedrus 275a, where those who have learnt by reading alone are described as as only appearing to be wise and as [chalepoi suneinai], 'difficult to be with'. Throughout the part of the Theaetetus that deals with Protagoras, there is an emphasis on the destructive consequences that the measure doctrine would have on the process of dialectic. For instance, Socrates says that

"I say nothing of how much ridicule myself and my art of midwifery would deserve, as well as the whole business of dialectic too, I think. To investigate and test in discussion each other's fancies and opinions, when each are correct, would be sheer and utter nonsense, if the Truth of Protagoras is true, and is not uttered playfully [paizousa] from the innermost sanctuary of his book." (Tht.161e)

The final conditional clause here is highly interesting. It would seem to ask: Is there anything more to Protagoras' book than is given on the surface? In distinction to the comment on Parmenides that we looked at earlier, the answer appears to be no. In chapter one I suggested that Plato's writings are a sort of 'serious play', and that [paidia] and its cognates build up certain resonances in Plato's works. Here its use may be highly significant. The question being asked might be phrased: Is the measure doctrine a piece of serious play, from whose paradoxical consequences we are meant to go on to some deeper analysis, or is this all that Protagoras has to say? The implication is clearly the latter, hence the absence of Protagoras from the discussion. We might usefully deal with an objection to my approach to the Timaeus here, too. Surely, someone might say, citing Timaeus 59cd, Plato regards giving accounts of physical phenomena as an amusement, a pleasant diversion. What Plato actually has Timaeus say is that providing accounts of the phenomena will be pleasant, and that anyone doing so

"Will be creating in his life a pastime [paidian] both suitable and prudent."(Tim.59d)

Now that, on my reading of Plato's conception of [paidia], is a very positive thing to say. Just as the 'serious play' of Plato's myths is supposed to lead us to the contemplation of the philosophical issues
involved, so too the attempt to form hypotheses which fully account for
the phenomena may lead us somewhere useful. I shall return to this theme
in later chapters, here I merely want to tie in Plato's use of [paidia]
at a crucial juncture in the Timaeus with its use in other late
dialogues and its theoretical discussion in the Phaedrus.

It is also important that Theaetetus and Theodorus have read,48 or
at least are acquainted with the contents of Protagoras' book,49 as they
too are suitable souls who are not inspired by their contact with
Protagoras to defend his position.50 Note in contrast to this the way in
which Zeno is happy to defend Parmenides. Socrates creates a defence of
Protagoras himself, but he does this in the interests of justice, and
not through any inspiration he has gained by reading Protagoras' work.51
Finally, consider, the strange appearance of Protagoras' head at
Theaetetus 171d. After the self-refutation argument, Socrates says

"If immediately hence he [Protagoras] should emerge as far as his
neck, he would accuse me of much foolishness, and in all likelihood you
too for agreeing, before he would be gone again, sinking down and making
off." (Tht.171d)
The point of this rather odd image is probably about dialectic; that
Protagoras will not stay and argue the matter is symbolic of the
implications that Plato argues his philosophy has for dialectic.52 Even
if we could resurrect Protagoras, his measure doctrine would still
sabotage proper debate, and if the measure is all he has left us, there
can be no dialectic with his philosophical heritage, hence the absence
of Protagoras from the Theaetetus.53 If I am correct here, the contrast
between the treatment of Parmenides and Protagoras is quite striking.54

All this then is to argue that in Plato's view Parmenides was not a
simple purveyor of strong monist doctrine. Rather, according to Plato,
he wrote in a manner analogous to Plato's own FWP, and leads us to
question the relationship between the sensible and the intelligible,
sensation and reason, and our minds and the world. If this is so, then
Timaeus' speech at 27c-29d may be setting up similar questions for the
rest of the Timaeus to investigate and to provoke its readers into
further thought.

IV

We now have a working hypothesis for the questions which are going to
hold the Timaeus together. Let us go to the ten pages which precede
Timaeus' epistemological speech to see if we can give some account of their contents in these terms. The opening lines of the Timaeus are So "One, two, three, but where, dear Timaeus, is the fourth of our guests of yesterday, our hosts of today?" Ti "Some illness has befallen him, Socrates; for he would not willingly be absent from our gathering."
So "Then isn't the part of filling in for the absent one the work of you and your friends?" (Tim. 17a)

If we take the use of the second person here as significant and extra-textual, then this immediately sets up a dialectical context in which it is the reader who must supply the part of the missing fourth man. But what is it that we are to supply? Here the incomplete nature of the synopsis of the Republic given by Socrates may be indicative. We are given a recapitulation of the moral and political theory of the Republic, but significantly not of the epistemology and philosophy of mind of Books V, VI and VII, nor of the cosmology of Book VII. This may then act as a setting of the agenda. We are warned that it is going to be up to us to think about the issues discussed in the Republic which are not mentioned in the synopsis. If we are to carry through this identification of the missing fourth person and the missing part of the synopsis of the Republic, we should also note that the missing man has fallen ill. Might we take this as an indication that Plato believes some of the views expressed in the Republic need revision? It is quite in Plato's style, after all, to anthropomorphise arguments in this manner. I shall try to show in detail in following chapters that the Timaeus does deal with the issues suggested by this agenda and that there are important revisions to the Republic's view of these matters. In outline, firstly I shall argue that there are some important cosmological changes. The cosmos becomes stable, and the motions of the heavenly bodies become perfectly regular. This may be indicative of a deeper metaphysical change concerning the relation of mathematics to the world. I argue that the Timaeus develops a theory of flux which allows the world enough stability to underwrite this view of the heavens. I also argue that the analogy the Timaeus develops between the world soul and human souls produces an epistemology which challenges both the Republic and Timaeus 27c-29e, as well as introducing a new model of mind which accords with this new epistemology. Put together, these points amount to a major revision of the views of the Republic.
After the synopsis of the Republic we come to the myth of Solon. Socrates wishes to hear an account of the state of the Republic in action. At 19b ff Socrates compares his description of the ideal state with a painting depicting animals; in both cases, he says one wants to see the subject in action. This seems to be an allusion to Phaedrus 275d and the discussion of the nature of writing. The function of this, I suggest, is to throw doubt on both myth and writing as vehicles for philosophy.57 We have seen how Plato intends to avoid the problems he perceives with writing; is myth a good vehicle for him? What Plato argues at Timaeus 19b ff is that some sorts of myth are useful but others are not. This is a matter of great importance as the main body of the Timaeus is a written myth.58 The problem here is exacerbated by the fact that at both beginning and end, Solon's myth is described as wholly true.59 What is the nature of the warrant for its truth? Several criteria are suggested during the myth, all of which are external to the reader. They all call upon the reader to accept the myth on someone or something else's authority. That on its own might make us suspicious, knowing Plato's preference for self-reliance. Indeed, all the criteria alluded to here are ones that Plato has given us grounds to be suspicious of in earlier works. At Timaeus 20d, we are asked to accept the myth because Solon is wise and old. Yet surely we have seen enough of the fate of the 'experts' in the early dialogues not to put our trust in the testimony of an eminent man, whatever his credentials.60 At 21d Solon's sources are questioned, and at 23a we find that the source is the ancient writings of the Egyptians. The Phaedrus, however, has warned us not to simply accept the written word, whatever its provenance, and the reference here to Egypt may be a further allusion to the Phaedrus in addition to Timaeus 19b.61 At 26a ff a different tack is taken. Perhaps the story is trustworthy because it is well remembered, or even because it is recollected. However, at 19a Socrates finishes his synopsis of the Republic, on which he should be the expert, having discoursed the previous day. He states that this completes the contents, and asks if Timaeus agrees that this is a complete list of the contents, which he does. As we have seen though, this synopsis is far from complete; memory, then, is not to be trusted. Of recollection, I will say little more here, having treated it at length earlier. There is an allusion to the arguments against recollection in the Phaedrus at Timaeus 26c; recollection is like a
painting in the mind, presumably a painting which in the usual manner can give no account of itself.

The overall effect of Timaeus 19b-27a is then to make us suspicious of all external authorities in judging a myth and to make us rely on our own internal criteria. How then are we to treat written myths if we cannot take on trust what they tell us? Perhaps we should treat them as hypotheses, or as sources of philosophical ideas which we can make judgements and discriminations about before we accept or reject them, rather than sources of philosophical doctrine. Myths are perhaps repositories of raw materials for us to mine and subsequently decide the value of. Naturally, we should extend the lessons of the myth of Solon on how to treat myth to the rest of the account of the Timaeus. Thus we should not take what Timaeus gives us as simply Platonic doctrine, but as a source of provoking ideas to make our own discriminations about. All the more so when Timaeus is described as [onta astronomikotaton hemon], our best astronomer, when we have just been warned not to accept any external authority, whatever its credentials, but to judge for ourselves.

We might also consider the contrast between the myth of Solon and the main account, as well as with the myth of the Critias. The myths of Solon and Critias have in common that they are purely historical and factual and have nothing to provoke philosophical thought. The only discrimination we can make is to judge them true or false, and they may be either for all we can tell. Here one might recall Socrates' comments on the myth of Orethuia and Boreas in the Phaedrus. Socrates is not interested in cashing out the myth that Boreas abducted Orethuia into a question of was she pushed or did she fall, because this will not help him with the Delphic injunction to know himself. Note also that there are no criteria here for judging the matter one way or the other. Nor is Socrates interested in the tales of monsters that are the baggage of this myth. The myth that Timaeus gives us is a different matter though. There are plenty of criteria on which to judge the contents of this myth, and if I was correct earlier about the structure of Timaeus' opening epistemological speech then one of the central problems is how, why, and in what manner we should discriminate. Timaeus' tale also has a great deal to tell anyone about themselves, if it is the case that one of its central themes is the nature and contents of the human mind and their relation to the world. Considering this contrast between the
myth of Atlantis and Timaeus' discourse, we might recall Socrates' words in the Phaedrus

"I investigate myself rather than these things, to see if I am a more complex and fearsome beast than Typhon, or a gentler and more single-minded creature, who has by nature a less puffed up fate appointed by God." (Phdr.230a)

The central mythical account of the Timaeus then is philosophically interesting, in distinction to the myth of Solon and Atlantis, because it gives us something that we can make philosophical discriminations about and will tell us something about the nature of ourselves by discussing the place of the mind in the cosmos. Not only that, but the framework that the myth is set in, and contrasts between the content of the myth and that framework will lead us to question the nature of the judgements that we make about the myth. As with Parmenides' poem, there is another level of analysis at which we must discriminate about the discriminations we employ.

V

In conclusion, then, the Timaeus is not a vehicle of Platonic doctrine but a set of views, some we may ascribe to Plato and some not, that we must judge the philosophical worth of ourselves. Running through the Timaeus there is a contrast of the 27c-29e viewpoint and passages developing and rephrasing it against other suggestions as to how the intelligible and the sensible, reason and perception and our minds and the world relate to each other, and it will be the task of the following chapters to develop and investigate this contrast. This reading of the Timaeus has the advantage of being in line with Plato's PWP, of making some sense of the relation between the introduction and the rest of the work, of giving the whole work some coherence, and of narrowing the gap in style and concerns with other late works. It also opens up several very interesting interpretational possibilities. If the epistemology of 27c-29d is not Plato's current one, what is suggested by the rest of the Timaeus and how do the discussions of flux and the place of the human mind in the universe fit in with this? What are the implications for Plato's philosophy of science? The next chapter will return to astronomy, and will argue that there is a fundamental shift in Plato's attitude to the motions of the heavenly bodies and to the physical world in general between the Republic and the Timaeus.

102
NOTES FOR CHAPTER FOUR

01) See e.g. Dicks (1970) p116 "It seems certain that he was merely a convenient mouthpiece for Plato's own views". Part of my plan here is to narrow the gap between the way we read the Tim. and the other later dialogues; cf. my introduction and Sayre (1983) ix.

02) Cf. My ch.1 and Pdr.264c.

03) See Cornford (1937), and cf. Taylor (1927), who gives 13 pages to Plato's first 10 (Stephanus), and later 17 pages to three lines. As ratios, Cornford devotes 11/350 pages to the first ten Stephanus pages of the Tim. (most of which is the text itself), and Taylor 13/604, as against 10/75 in the Tim.

04) See Pdr.264c on the importance of all the parts of a literary composition fitting together as a coherent whole.

05) [sungenes], 'of the same stock, descent or family' (LSJ).

06) Cf. Pdo.96d and 100e. Men and horses are large because they participate in the large.

07) Some speculation here. One theme in Plato is that the explanans must be both properly related to, and properly distanced from the explanandum, in order to be adequately explanatory. Too close and the explanation tells us too little (cf. the non-identity assumption in the Pm; see my ch.8), too far and the explanation falls flat. Here, the use of [sungenes], 'of the same family', may indicate that the position that Plato is presenting us with here is pulling the explanans too close. Interestingly, we may see the converse, again expressed in terms of family relations, when we are told that the receptacle is apprehended with 'bastard' reasoning. In ch.9 I shall argue that some versions of the receptacle that we are presented with (I believe Plato deliberately gives us several) fail to be properly related to the phenomena that occur in them and so become non-explanatory. In ch.1 I argued that Plato sometimes overdraws positions in order to create some difficulties for the reader, who if they solve the difficulties and move to read the text at a different level of sophistication will come to understand better. So here, I suggest; the question being raised by this process is, What is the proper relation between explanans and explanandum when we are talking of physical phenomena?

08) See Pdo.96d, and the solution at 100e ff. It is sometimes suggested that the myth of the Pdo. is a 'likely story' in the manner of the Tim. However, while Socrates in the Pdo. does not claim certainty for his tale, there is no suggestion that all that can be achieved is a likely story, merely that this is an hypothesis that would take an inordinate amount of time to prove; see Pdo.108d + 114d.

09) Certainly Timaeus effects a radical separation of reason and sense perception and their objects at the beginning of his speech "It is possible, in my opinion, to firstly make the following distinction. What is it that always is and never becomes, and what is it that always becomes and never is? The one is apprehended by the intellect with reasoning, and is always the same, the other in turn comes to be believed by opinion with unle the reason of sensation, always coming to be and
passing away, but never really existing" (Tim.27d); cf. Frede (1988) p40 on this matter. Here [logos] seems ambiguous between reason and account, perhaps deliberately on Plato's part, to make us think of the relation between the two; cf. Cornford (1935) p206 n.1. There are also affinities here with the position argued against by the final argument of the first part of the Pm. (133b-134e). Does the Pm. criticise the Tim. or does the Tim. use this epistemology as a starting point for its discussion? I suggest the latter.

10) When the world soul perceives something physical [doxai kai pisteis gignontai bebaioi kai a lethes], Tim.37b9. Cf. 29b6 and 29c3, which this appears to contradict.

11) See Tim.43a ff, esp. 43e.

12) See e.g Tim.47b ff.

13) For instance, one might consider the way that the Pm. criticises the Forms of the Pdo, (see esp. Pm.129a ff) how the Tht. examines the 'knowledge is true judgement with an account' position of the Meno (Cf. Men.97a ff and Tht.200d ff), and how the Crt. explores naming in relation to Pdo.103e. More provocatively, we might look to the description of the 'Friends of the Forms' at So.248a ff, or the relation between the battle of the Gods and Giants and Socrates' autobiography in the Pdo, as suggested in ch.2. Ch.8 will discuss possible later revisions to the middle period theory of Forms.

14) Cf. esp. Parmenides Fr.1/28 ff and Tim.29b.

15) Parmenides Fr.8/60, "I tell you the entire arrangement as seems likely, so that no opinion of mortal men will ever surpass you".

16) See Parmenides Fr.8/50 and cf. Tim.29c ff.

17) Cf. Fr.8/60 and Tim.29c, and passim comments in the Tim. that this is the most likely account. See also here Sayre (1983) p240 ff on some cosmological affinities between the two works.


19) Cf. Archer-Hind (1888), p8, "Again the Eleatics are bound to deny not merely the plurality of objects, but the plurality of subjects as well. What then are these conscious personalities, which seem so real and so separate, and which yet on Eleatic principles must, so far as their plurality and their separation is concerned, be an idle dream?".


22) A recurring theme in the next few chapters will be that the Tim. and the So. share a division of labour in answering some of the problems raised by the Pm.

23) See Tht. 181d ff.

24) See Aristotle Metaphysics 1078b16 ff on Plato's early Heraclitean influences.


27) Parmenides has just arrived (Pm.127d) before the exchanges between Socrates and Zeno; see Barnes (1982) p235 on this matter.

28) I would argue that Plato's view of Zeno is similar to his view of Parmenides. Rather than being a defender of strong monism, he forces us to consider our position by arguing against all possibilities. That makes him (in Plato's view) a defender of Parmenides' method (though not necessarily of his 'doctrine', if he has any). Thus we can reconcile Zeno's use of reductio arguments for all arms of exhaustive dilemmas with a defence of and association with Parmenides. Cf. Dies (1923), Frankel (1942), Solmsen (1971), Vlastos (1975b).

29) Cf. a similar argument at So.244b ff.

30) It is of course also very strange that Socrates has the middle period theory of Forms at his disposal at such a young age.

31) Cf. So.259e ff.

32) At the time that Plato composed these dialogues all three would have been long dead; Parmenides in the 440's on the usual dating, Protagoras around 420 (see Guthrie vol III, p262), Socrates in 399, while the dialogues would have been composed some time in the early 360's. Plato could have Socrates talk with both, either, or neither; so why this particular combination?

33) The meeting is not attested by any independent ancient source. I would tend to agree with Cornford (1935) p1 "To suppose that anything remotely resembling the conversation in this dialogue could have occurred at that date would make a nonsense of the whole history of philosophy in the fifth and fourth centuries".

34) If the dialogue is fictional, then we cannot attribute motives to historical characters, but must attribute motives to Plato's characters and ultimately to Plato himself; this is a significantly different matter.

35) What is written may be a 'track for others to follow', in the language of the Pdr, but it is possibly not the whole of Plato's thought. The word here translated as track, [ichnos], has important further metaphorical senses of a clue or a trail to follow. LSJ give 'a track, footprint: metaphor. a track, trace, mark, clue'.

36) I take it as uncontroversial that the Tht. and Pm. are meant to be read in fairly close conjunction. See Thesleff (1982) p152 ff, 157 ff and p188 for a discussion and further references on the dates and relative sequence of the Pm. and Tht. Note too that the Pm. and Tht. have similar introductory dramatic frames, and the Tht. is concerned with the death of both Theaetetus (introduction) and Socrates (conclusion).

37) See Pm.127b for Parmenides' age, and Tht.210d for Socrates', where
as he is about to face the charge of Meletus he must be 69 or 70.

38) The relevant information is that Socrates was born in 470, and is described as [sphodra neon] (Pm.127c) and [neos] (Pm.130e1 and 135d), and in references to this dialogue as [panu neos] (Tht.183e8) and [neos on] (So.217c7). We are also told that this is the year of a great Panathenaia (Pm.127b), which were held every four years. The usual argument for 450 is that 20 is about the youngest Socrates could be in order to plausibly have such a conversation with Parmenides. However, if Socrates is 16 this would shift the dramatic date back exactly one olympiad to the great Panathenaia of 454, and gives a better sense to [sphodra neon] and [panu neos], which I think suggest an age somewhat younger than 20. Theaetetus is described as a [meirakion] (Tht.142c, 143e, etc) or as [neos] (Tht.142c, 148c, etc) interchangeably, while at So.237a he is a [pais]. It may also be relevant that at So.237a the E.S says "When we were your age, my boy, the great Parmenides argued this from beginning to end". This may suggest that 16 is the correct age to be subjected to such arguments. The 'we' may refer to other members of the present company, i.e Socrates, carrying the implication that he was the same age as Theaetetus when he met Parmenides. Antiphon also studied the dialogue when he was a [meirakion] (Pm.126c6). While these arguments are hardly decisive, 454 has at least as much in its favour as 450.

39) This suggestion will affect the dates of Parmenides and Zeno, if we are to generate these from this dialogue. It is sometimes argued, e.g KRS (1983) p240 that as Plato gives exact ages and has no reason to do so, that it is likely that his chronology is correct. However, he gives approximate ages, Parmenides being 'about 65' (Pm.127b) and Zeno being 'nearly 40' (Pm.127b), and one reason for giving approximate relative ages independent of correct chronology may be to emphasise a master/pupil relationship between them. Alternatively, there is the dubious testimony of Apollodorus (See Burnet (1892), p169 ff), who gives Parmenides' floruit and Zeno's birth as 504-500, but this seems to be based solely on the notion that Zeno was Parmenides' pupil, who was Xenophanes' pupil, whose floruit is given as 544-540, the foundation of Elea, and that pupils are born in the floruit of the master.

40) Cf. Tht.144 ff and 210c and Pm.128c, 130a, 130e and 135d.

41) See Pm.136e and 137b.

42) Cf. Tht.161de and 179a. A further implication of this may be that while Parmenides and Socrates know who to speak to and who to be silent with, Protagoras does not. Cf. Pdr.276a, where Socrates comments "The word which is written with knowledge on the mind of the learner, is capable of defending itself and knows before whom it is necessary to speak or be silent".

43) Cf. Pm.135d ff and the allusions to gymnastics and wrestling with words and accounts at Tht.162b and 169a, and the setting of the dialogue around a [gymnasion] may be intended to emphasise this. Note also that the E.S refers to the trial undergone by Tht. and about to be undergone by the young Socrates in the So. as 'gymnastics' at Ptl.257c.

44) There is also a strong parallel between the agricultural metaphors of the Pdr. (the gardaetn caring for plants, plants and nurtures it to fruition) and the midwifery imagery of the Tht. Interestingly, when Socrates describes himself as a midwife of ideas, his first illustration is
agricultural (Tht.149de), about soil, seeds and harvesting, perhaps an allusion to Pdr.276b ff, the passage concerning the farmer who knows how and when to sow his seed. Theaetetus is of course also 'pregnant' with 'wind-eggs' which must be properly dealt with. It is Socrates who has previously made Theaetetus pregnant at a distance; see (Tht.148e).


47) Following Burnet's text here.

48) I take it that Tht.144e ff establishes Theodorus as a suitable soul, as he is 'skilled in astronomy, mathematics, music and is widely educated'.

49) It is highly likely that Theaetetus and Theodorus have read Protagoras' book, though the Greek does not make this entirely clear. When Socrates asks if they know of Protagoras' views, [anagignoskein] at 152a can mean either 'to know accurately' or 'to read' (cf. 170a). At the very least Theaetetus and Theodorus are well acquainted with the contents of Protagoras' book.

50) A good example of Theodorus' reluctance is 162a, where he says 'He was my friend, Socrates, as you just said. Therefore I would not favour the refutation of Protagoras through my own admissions, but neither do I wish to oppose you contrary to my own opinion'. Hardly the view of a man inspired by Protagoras' writings ! Cf. Tht.168e, where Socrates says to Theodorus "It is not just I alone who must defend your deceased friend in every possible manner, while you do nothing." Note too that as a friend, he is someone Protagoras would have had oral communication with, and yet is still uninspired by Protagoras' views.

51) Socrates tells us that "This might not be so, my friend, if indeed the father of this tale were still alive, for he would have much to say in its defence. Now we are abusing his orphan. For not even those who Protagoras appointed its guardians, such as Theodorus here, are willing to come to its defence. In the interests of justice, we shall venture to defend it ourselves" (Tht.164e).

52) See here also Burnyeat (1976) p31 ff on some of the implications for identity through time for the Protagorean/ Heraclitean thesis.

53) There may be a further point being pushed here concerning the way that Protagoras' epistemology has been tied to a Heraclitean ontology. For the measure doctrine to be true, the world would have to consist of a series of discrete individual instants, about which each measurer makes a judgement before the world changes again. If there is no temporal continuity, then there is nothing that holds bodies together through time, such that they are only a collection of properties, which could quite possibly come apart at the next instant. The point for the image of Protagoras' head popping out of the ground to utter an objection and then be away again may be that we get only the relevant part of Protagoras for an instant.

107
54) One might compare the treatment of Protarchus and Philebus in the Plb; the aesthete Philebus ('lover boy') makes a contribution only when it pleases him (note his short attention span and Plato's characterisation of pleasure without intelligence) while Protarchus ('for order') conducts the discussion with Socrates.


56) E.g Tht.203de, where an argument takes to its heels and escapes, as Socrates and Theaetetus have not been watching it properly; possibly an allusion to Men.97d ff and the likening of arguments to the statues of Daedalus.


58) Contra Vlastos (1939) p380, who argues that the myth of the Tim. should be treated differently from Plato's other myths, as "The Timaeus uses none of the devices by which all of these disavow the scientific seriousness of major sections of their accounts".

59) Cf. Tim.21d and 26d.

60) We have also seen Socrates upbraid Phaedrus for being interested in the pedigree of a myth rather than its content; see esp. Pdr.275 bc, cf. Vlastos (1939) p380.

61) Cf. Pdr.274a ff.

62) See Pdr.229b ff.

63) Cf. Crm.165 ff on 'know yourself'.

64) See Pdr.229d ff.

65) I believe there to be parallels with the deuteros pious of the Pdo, which also throws us onto our own resources, as discussed in ch.2.

66) Note for instance that Timaeus is disinterested in the genealogy of the Gods at Tim.40e ff.

67) Typho was a monster with one hundred heads, so I translate [haplousteron] as single-minded. [atuphou] at 230a6 is the alpha-privative from [tuphos], vanity, and a pun on a-Typho.

68) This same argument is also, I suggest, what allows Socrates to launch into myth in the middle of the Pdr, despite his earlier rude comments about myth; it is a myth concerning the nature of humans and their relation to the world, and one that we can make some philosophical discriminations about.
CHAPTER FIVE

CELESTIAL MOTION IN THE TIMAEUS

The main aim of this chapter is to argue that in the Timaeus the motion of the heavenly bodies is regular and amenable to precise mathematical description, contrary to Plato's earlier view as expressed in the Republic. This is important both as a matter of Platonic scholarship, where it has been controversial, and as an episode in the history of science. Plato's belief in the regular and circular motion of the heavenly bodies sets the stage for astronomy for the next two millenia, so the development of his views is of some interest. This change in cosmology perhaps also gives us a new criterion for the relative dating of Plato's works. I shall argue that the last expression of the Republic view comes in the Politicus, and that those works that share the Timaeus' view, the Critias, Philebus, Laws and Epinomis might all be dated later. I shall also argue that it is possible to discern a change in Plato's attitude to the inevitability of political, social and moral degeneration, and that this may be linked to the cosmological changes. I argue that my group of later dialogues disown the inevitable degeneration of the earlier works and discuss Owen's arguments concerning cosmology and politics for an early dating of the Timaeus.

I

The key passage in the Republic concerning the regularity of celestial motion is the following. Socrates asks

"Won't the true astronomer be similarly persuaded when he gazes upon the movements of the stars? He will hold that the architect of the heavens and what is in them has constructed these things as beautifully as is possible for such works. But concerning the proportion of night to day, of these to month, of month to year, and of the other stars to these and each other, wouldn't he consider it absurd to expect these things always to behave in the same manner and never to deviate [paralattein] in any way, as they are physical and visible, and absurd too to seek by every means to grasp the truth about them? (Rep.530a)"  

The position of the Republic seems quite clear on whether there is a constant relationship of the periods of the stars to each other, and
hence whether there is regular celestial motion. We cannot expect physical and visible entities always to behave in the same manner and not to deviate.² We can find similar though more general comments in the myth of the Politicus,³ and the Phaedo too appears to adopt substantially the same position. There the myth draws a parallel, which we might term the 'fish's eye' view of the world.⁴ Just as a fish might look up and see the sun and stars through the water, and believe the sea to be the true heaven, only to be disabused if they were to put their heads above water, so we, living in the hollows of the earth live in a murkier world than the true heaven. Exactly what lesson we are to draw about the nature of the heavens and of astronomy is unclear, though it may well be that we see the same sort of blurred and unstable image of the heavens as a fish would see of the world if it were to look up through turbulent waters.

One might also argue that Plato is committed to a degenerating cosmology. The clearest statement of this occurs in the myth of the Politicus at 273b ff, where we are told that the physical world has a tendency to degenerate from its current state to one of total disorder. So too the passage at Republic 529d ff can be read as saying that not only do the planets not follow mathematically precise orbits, but that their orbits are also continually decaying. I have translated [paralattein] at 530b3 as 'to deviate' but it is worth noting its resonances as given by LSJ, 'to change or alter a little, esp. for the worse... to pass aside, turn from the path, to deviate, vary'.⁵ One might see such a degeneration as an expression of the general principle enunciated at Republic 546a that "All things that come to be must also decay", where it is used to underpin a description of inevitable social and political degeneration. One can find similar language of corruption and decay in the myth of the Phaedo, where Socrates tells us that

"This earth and the stones and the whole region have been corrupted and eaten away, as things in the sea are by salt water." (Pdo.110a)

One interpretation of the Timaeus has it in agreement with the Republic on these matters. Burkert comments that in the Republic, Plato "Was still of the opinion that real exactitude was impossible in the physical world, so that the true astronomer should not depend on sense perception but busy himself with purely ideal magnitudes and movements. In the Timaeus, too, Plato speaks without hesitation of the 'wandering' of the planets."⁶
Certainly there are things to be said in favour of this sort of position. The planets are often referred to by the use of [planes], 'a wanderer*, and its cognates. We might wish to equate this usage of [planes] with that at Timaeus 48a9, where we are told of [tes planomenos eidos aitias], the 'wandering cause' which prevents the complete expression of reason in the universe. So while reason might wish the heavenly bodies to move in an orderly manner, the dictates of the compromise with necessity to which all physical entities are subject ensures that they move irregularly. Thus [planes] attributes disorderly motion to the heavens. However, I believe that there are considerable difficulties with this view. Instead I shall argue that celestial motion in the Timaeus is entirely regular, and that the [planes] description is used in two separate ways. In the context of astronomy it merely distinguishes the fixed stars from those bodies which move in complex orbits and so 'wander' across the sky, while in other contexts it carries the attribution of disorderliness.

First consider the use of [planes] in the context of astronomy. At 34a Timaeus tells us that the demiurge gave to the universe "A motion proper to its body, that of the seven motions which is best suited to reason and intelligence. Therefore he made it move in a circle, revolving of itself uniformly and in the same place, and he took from it all trace of the other six motions and kept it free from their wanderings [kai aplanes apeirgaseto ekeinon]." (Tim.34a)

There is then at least one motion which is [aplanes]. Further, at 40b Timaeus distinguishes between 'the stars which do not wander' [hos aplane ton astron] (40b4), and the planets 'which turn and as such wander' [ta de trepomena kai planen toiauten ischonta] (40b6). This is rather awkward for the position I have sketched, according to which there should be no [aplanes] celestial motion. What though of the bodies which do have [planes] motion? Concerning the orbits of the planets, Timaeus tells us that "Men do not name them nor investigate the mathematical relations [summetrountai skopountes arithmois] between them, so that they do not know that the wanderings of these stars constitute time [chronon onta tas touton planas], as they possess immense complexity and form astonishing patterns." (Tim.39c)

Now, if the wanderings of the planets constitute time, and these wanderings are irregular, then time will be irregular. Thus [planes]
cannot attribute irregularity of motion when applied to the heavenly bodies; more likely it merely distinguishes the mobile hands of the celestial clock (the planets) from the static numerals (the fixed stars).11

It is illuminating to compare this passage with Republic 530a. Both talk of how the motions of the heavenly bodies relate to time, but here the emphasis on the deviations of physical bodies and the consequent irregularity of celestial motion has been lost. Instead, it seems that most men, including perhaps the younger Plato, have been led astray by the immense complexity of the heavens and have not properly investigated the mathematical relationships between the stars. Note for instance the difference between the [summetria], 'proportions' at Rep.530a8 which deviate, and the precision of the [summetrousaitai arithmos] 'commensurates in number' that we are to investigate at Tim.39c8.

If Plato did not at any stage countenance an irregular flow of time, then his conception of what constitutes time may also have changed. In order to judge that celestial time is irregular we need some independent access to absolute time. How this is done is left unspecified in the Republic, but it is clear that absolute time there cannot be constituted out of the motions of the planets. It may well be that Plato had not considered these difficulties at the time of writing the Republic and had no clear ideas concerning the nature of absolute time or how we might gain access to it.12

One might try to grasp the nettle here though, and argue that perhaps for Plato, with his view of the imperfection of the physical world, time does not flow in a perfectly regular manner. While there is no explicit statement on this matter,13 there are some points which weigh heavily against such a view. Timaeus tells us that the demiurge

"Intended to create a movable image of eternity, and at the same time as ordering the heavens, he made from the eternity that resides in unity an eternal image moving according to number [kat' arithmoniousin], that which we have called time." (Tim.37d)

Now, although time may be less perfect than that which it is an image of, this does not entail that its flow is irregular.14 The contrast here between stability in unity and motion according to number is sufficient. All that is required is that time flows while eternity stands still,15 and the phrase 'moving according to number' would suggest that time flows in an orderly manner.16

112
The comments of Aristotle, or rather the lack of them, may also be indicative of Plato's thought here. Aristotle begins his discussion of time in the Physics with his usual historical survey and criticism of his predecessors. He states that

"Some have identified time with the revolution of the whole, and others with the sphere itself." (Phys.218b)

Aristotle is thought to be referring to Plato and the Pythagoreans respectively.17 His general criticism is that time, while intimately related to motion should not be identified with motion. He states that

"Time is not motion, but that by which we can quantify motion...
Not only do we measure motion in terms of time, but time in terms of motion too, because they are defined by each other. For time determines the quantity of motion and motion the quantity of time." (Phys.219b ff) Aristotle also gives us what is perhaps the first surviving explicit statement of the uniformity of time

"Time is alike everywhere and in relation to all things. Further, change is always faster or slower, but time is not. For fast and slow are defined in terms of time, fast being more movement in less time, slow being less in more, but time cannot define time, being neither an amount nor a type of it." (Phys.218b)

Now while Aristotle has been more than happy to criticise Plato and his other predecessors in this section of the Physics, there is no criticism of them on this point. Had Plato advocated a non-uniform flow of time in the Timaeus we might well expect to find some criticism of it, either in the Physics, or elsewhere in Aristotle, but we do not.18

One can construct a similar ex silentio argument for the related matter of the regular motion of the heavenly bodies.19 In the De Caelo Aristotle is again critical of Plato and others,20 but states, without any criticism of Plato's views that

"The revolution of the heavens is the measure of all motions, because it alone is continuous, uniform and eternal." (De Caelo.287a)
Other ancient sources are also unanimous in the view that the Timaeus advocates regular celestial motion.21

A further consideration is the stability of the solar system and the nature of the great year. Timaeus tells us

"It is entirely possible to grasp the exact amount of time elapsed at the completion of the perfect year." (Tim.39d)
If there is a specific amount of time between the grand conjunctions,
then celestial motion must be regular, or we are left with the highly improbable alternative that the irregular motions somehow cancel each other out. In that case, the great year would lose its significance as a sign of the rational ordering of the universe. If the great year recurs, and there is no suggestion in the Timaeus that it does not, then celestial motion must be regular and the solar system stable and free from any degeneration.

One might also note, in relation to this passage, the way in which in the Timaeus we can make precise calculations about the visible heavenly bodies in distinction to the position of the Republic 530a ff. The general idea that the visible heavens are amenable to calculation proliferates throughout the Timaeus,\(^{22}\) as does the idea that events occur in the physical world [kat' arithmın], 'according to number'.\(^{23}\)

One must also take into account the fact that Timaeus tells us that the revolutions of the mind of God, the visible manifestations of which are the motions of heavenly bodies, are entirely unwandering [pantos aplaneis] (47c3), while our own mental orbits wander [peplanemenas] (47c3). We can compare this with Timaeus 40b, where [planes] and [aplanes] are used of the planets and the fixed stars respectively. Either Plato has made an oversight, or [planes] is being used in two different senses. Outside of its specific use in astronomy of distinguishing planets from fixed stars, [planes] again takes on its sense of disorderliness, but here we are told that the motions of the heavens are not disorderly.\(^{24}\)

II

One objection to this position might ask how it is that as the physical world is supposed to be an imperfect copy, there can be perfectly regular celestial motion. Firstly, we need to consider the difference for Plato between ideal and uniform motion. If we were to describe the usual Newtonian scenario to Plato, of a body moving in a straight line at a constant velocity unless acted upon by external forces, would he consider such motion to be perfect? The answer to this, I argue, is no. In the Laws the Athenian Stranger asks "What is the nature of rational motion?" (Le.897d), and answers himself, saying

"Rational motion acts in one way, and is uniform, regular, in one place, around the same centre and in relation to the same things, and in accordance with one reason and plan." (Le.898a)

114
This gives us six criteria for rational motion, to which we can add some
more from the hierarchy of motions discussed at Laws 893b ff, such as
the principle that the best sort of motion moves itself and is not moved
by others. It is clear from this that we can remove some of the
qualifications for perfectly rational motion without losing regularity
or uniformity, as they are necessary but not sufficient conditions. Thus
the univocality of 'regular' and 'perfect' can be broken. This appears
to be the course that the Timaeus takes. The motion of the whole
universe is one of uniform rotation entirely free from the other six
motions. Consider how the motion of the fixed stars relates to this.
Timaeus tells us that while they have translational motion due to
obeying the motion of the same

"With regard to the other five motions, they are motionless and
still, in order that each might attain the greatest possible
perfection." (Tim.40a)

One can show the regularity of this translational motion in two ways.
Firstly, it is equated with the motion of the same, and secondly, we
are told that it consists of only one of the six motions to the
exclusion of the other five. Such motion is less perfect than that of
the universe as a whole in the hierarchy of motions, but this is
achieved by complexity rather than irregularity. So too with the
planets. Their motion may be less perfect than that of the fixed stars,
but this is because their paths are more complex, being subject to the
motion of the different as well as that of the same.

The Timaeus does not, unlike the Laws, specifically condemn the
description of the planets as [planeta], because of the ambiguous use of
this term. One point of interest concerning the condemnation in the Laws
is that it reads like a strongly worded clarification of a matter on
which Plato may have felt that he was misunderstood. The Athenian states
categorically that

"The usual opinion concerning the sun, moon, and other planets,
that they at some time wander [planatai], is not the case; precisely the
opposite is true. For each of these bodies always travel on one path,
and not many, although this may not seem so." (Leg.822a)

This passage shows that the Laws too operates with the idea of regular
celestial motion, as is borne out in several places.

So too the Philebus assumes the regularity of celestial motion.
That the universe has a soul, and that the years, seasons and months are
arranged by intelligence are emphasised at Philebus 30a and 30c
respectively. Philebus 30d tells us that a kingly soul is behind this intelligence, and that there are others which carry out similar functions. That is very much in line with the Timaeus position, where the demiurge creates the order of the world, and then has lesser daemons, whose embodiment are the heavenly bodies, mark out time. This is important because we are told that pain and pleasure are to be equated with deterioration and restoration, and, in line with the general tenor of the Laws, that it would be quite unfitting for the Gods to experience pleasure or pain. If so then the heavenly bodies cannot suffer any deterioration and hence, like the Timaeus but unlike the Republic, their motions ought to be entirely regular. One might also compare the general tenor of the remarks at Philebus 28-33 with those of the Laws 967 ff. There is the same emphasis on the order of the heavens and the supposition that the stars have souls, and the same denigration of previous thinkers who thought otherwise.

This change to a more stable cosmology may be indicative of a deeper rethink of some metaphysical issues on Plato's part concerning how mathematics relate to the motions of the heavens. One might suggest here two quite different analogues for this relationship. Firstly, there is the relation between the definition of a geometrical entity and any diagram of it that we might draw. Secondly, there is the relation between a number, and any group of things that has that number. The key difference between these two is that while a geometrical diagram must deviate from the relevant definition, a group has its number precisely.

Now it is fairly clear which of these analogues is in play in the Republic's discussion of astronomy. Firstly, Plato has Socrates tell us that we ought to treat the heavens as if they were a well drawn diagram. We might admire the skill of the craftsman who created such a thing, but just as we wouldn't examine a drawing to 'learn the truth about equal and double' (Rep.529e), so with the heavens. That is a reasonable and uncontentious point. However, that analogue is then applied to the relation between the motions of the heavens and their mathematical descriptions, with the result that the heavenly motions are then imperfect instantiations of some ideal, and so there is no constant relation between the periods of the heavenly bodies. That, to the modern eye at least, is an error. Our thinking is that bodies perfectly express the mathematical laws which govern them. If we look to the line allegory, it may well be that this analogue is used quite generally for the relation of the intelligible to the sensible.
However, as Plato changes his mind on the regularity of celestial motion, it is possible that he also moves to the second analogue for the relation of mathematics to these motions, one that would certainly better underpin such a cosmology. Admittedly direct evidence of such a change of analogue is sparse, but the contrast that the Philebus at least is interested in is between the arithmetic of the philosophers and that of the masses, the former working with pure numbers, the latter 'with two armies and two bulls and two extremely small or extremely large things'. 41 The Philebus also suggests that this analogue is the appropriate one for many other fields of study. 42 If this second analogue is in place for the relation of mathematics to the motions of the heavens in the Timaeus, then that would explain the move to regular motion, and if it is in place quite generally, it would explain the Timaeus' constant insistence that events occur [kat' arithmon].

III

One objection here to the notion that the heavens move in a regular manner in the Timaeus is the problem of the relation of reason and necessity. We are told that

"The generation of this universe was the bringing together of a combination of necessity and intelligence. Intelligence ruled necessity by persuading her to lead the greatest part of the things that were generated towards the best. It was in this way, through necessity submitting to sensible persuasion, that this universe was in the beginning brought together. If this was the manner of its generation, then really speaking one must bring in the way in which the wandering aitia acts." (Tim.48a)

What does Plato mean by necessity though, and how is it that necessity can be 'persuaded' by anything? Plato speaks of necessity accomplishing things of chance and disorder. 44 As reason only scores a partial victory over necessity, there is then some residual chance and disorder. 45 Now it seems strange that necessity should be associated with these things. However, one might take both chance and disorder in two separate senses, depending on what they are contrasted with. An event might be said to occur by chance because there is no causal chain that leads to its occurrence, contrasting chance with causal determinism. However, one might also contrast chance with human design. If we were to blindly throw paint at a canvas, it would be mere chance if anything good were the result, though no causal chain need be broken if such an
Similarly perhaps, if the necessity that Timaeus speaks of produces anything of worth this is chance in the absence of any teleological design rather than in the sense of any breach of causal connections.

We can take the same sort of approach with disorder. The order that it could be contrasted with might be that of physical law, or that of a teleological arrangement of the phenomena. The ordinary emission of light, for instance, might be law-like but disorderly, relative to the stimulated emission of light and its ordering into a laser beam. An ancient analogue here might be the idea that the principles of military strategy apply to all groups of men, but some groups are well ordered while others are disordered rabble. This is important as Plato often uses [taxis] and its cognates, with its connotations of drawing up into a good military order in these contexts. If we then take it that the partial victory of reason over necessity is the partial instantiation of teleology, then there is not a problem with perfectly regular behaviour by physical bodies.

This would rule out the 'homogeny' interpretation, whereby all matter is persuaded to behave in a regular manner 'for the most part'. However, one might cite Timaeus' division of his account into the works of reason and necessity, and separating the celestial and the terrestrial, argue that while some matter behaves in a regular manner not all of it does. The awkward question then is, If the demiurge has the ability to make some matter behave regularly, and wishes for the world to be as good as possible, what is it that prevents him from making all matter behave regularly? It seems to me that there is no satisfactory answer to this question.

It may be that the attempt to completely instantiate the good produces a set of conflicting demands which cannot be jointly met. A good example of this might be the question of the human skull, discussed at Timaeus 75bc. In order for us to have acute perception, the skull ought to be as thin as possible. In order for it to protect our brains and ensure a long life, it should be as thick as possible. Similarly at 75e there must be some flesh around the skull for the purpose of temperature control, but as little as possible so as not to obstruct perception. If we think of necessity in this manner, then reason can only persuade it as far as logical possibility will allow.

Cornford has raised two general objections to the position that I
have been advocating. Firstly, that as necessity is equated with the 'errant cause' it ought not to be equated with regular behaviour.\(^5^0\) However, as I have argued above for 'chance' and 'disorder', behaviour may be errant relative to teleological ordering rather than regular but purposeless behaviour.\(^5^1\) Secondly, Cornford questions how regular behaviour can be persuaded in any manner. The important thing to recognise here is that the demiurge performs a once and for all action when he orders the world from its primordial chaos. There is then no question of a ghostly hand interfering with causal sequences after the initial ordering. The persuasion of necessity lies in this initial ordering. If the demiurge does not bother to order the matter of the universe, then anything good that occurs in the subsequent development of the cosmos will be purely due to chance.\(^5^2\) However, if matter is arranged such that good will result from the law-like development of the initial conditions, necessity is perhaps 'persuaded' by reason to produce something good. If the demiurge not only arranges the positions of the matter in the universe but also determines the shape of the fundamental particles, then further constraints enter the picture. If the shape of these particles must be the most aesthetically pleasing, and the shape of the particles contributes to the properties that they possess, then the demiurge is saddled with some more constraints on what a reasoned arrangement of the particles may be able to achieve.\(^5^3\)

As Cornford points out, it is important that we do not make the demiurge omnipotent.\(^5^4\) On my account, the demiurge is limited by causal necessity, which he can persuade only by altering the initial conditions of the system, and logical possibility which prevents him from instantiating conflicting demands of the good.

One might also object that my line of interpretation attributes too much in the way of regularity and stability to the physical world of the Timaeus, and by allowing reason so much sway, renders too much of the physical world comprehensible. If we can only have a 'likely account' of the physical realm,\(^5^5\) one of the key reasons that this is so may be that matter is incapable of perfectly regular behaviour. This is a point which I readily accept in relation to an orthodox interpretation of the Timaeus' epistemology. However, in the next chapter I shall argue that the Timaeus has rather more to say on epistemology than orthodox accounts allow, and that this accords well with my account of reason and necessity.
IV

A further consequence of the regular behaviour of bodies in the Timaeus is a strengthening of the connections between events. In the Phaedo, Plato has Socrates make some strong claims. For instance, he tells us "What is snow will never, according to what we said before, admit the hot and still be what it was, snow, and also hot, but at the approach of the hot will get out of the way or perish." (Pdo.103d)

So too with the converse, that fire will never admit the cold and still be fire. In order to make himself clearer, Socrates gives a further example, that of three and oddness, which is treated on a par with the snow and cold and fire and heat examples, and the relation here is explicitly spoken of as necessity at Phaedo 104d. There has been some debate as to whether Plato reduces physical to logical necessity at here, though as all agree that the following passage from the Timaeus concerning the nature of fire and its relation to heat deals with physical necessity I shall not pursue that matter. Timaeus says "Let us consider why we say that fire is hot. We may investigate this by noticing the dividing and cutting effect that it has on our bodies. That it has the property of sharpness is something we nearly all perceive. As for the thinness of its sides and the sharpness of its angles and the smallness of its particles and the speed of its motion, by virtue of all of which it is energetic and divisive, always cutting keenly whatever it encounters, these must be accounted for by recalling the origin of its shape, and it is rather this and no other property that divides up our bodies into small pieces and which naturally gives it the quality we call heat and supplies its name." (Tim.61d)

That fire should have the properties attributed to it here is by no means necessary, a point which the Timaeus quite happily admits.

However, Sorabji has argued that if for Plato physical bodies are incapable of perfectly regular behaviour then there can be no question of causal necessities, and in certain works, such as the Republic, it is unquestionable that this is Plato's position. He comments that the content of Republic 530b "Is contrary to the spirit of those who believe that nature obeys exceptionless laws, and who would seek ever to improve mathematical formulae, to approach closer to the laws." Sorabji further argues that Plato distinguished physical from logical
necessity more sharply than a modern philosopher would as he associated necessity with the 'wandering cause' in the Timaeus, and Sorabji associates this wandering with passages from the Republic (530b) and the Politicus (269de) which imply that bodies behave irregularly.\(^3\)

Now, if the arguments of the previous sections have been correct, in that at least for the heavens the Timaeus does not postulate any deviant behaviour, and that necessity and the 'wandering cause' ought not to be associated with such behaviour, then clearly there are some important consequences for Plato's philosophy of science. Firstly, the Timaeus is within Sorabji's spirit of belief in nature obeying exceptionless laws. As suggested earlier, this is almost certainly the way that the astronomical tradition after Plato took the challenge reported by Simplicius to devise a system of regular circular motions to fit the motions of the heavens. Secondly, it would appear that not only is Plato interested in exploring the possibilities of a cosmology which postulates regular behaviour, but he is also concerned with explaining why there should be such behaviour. As Vlastos remarks, the physical philosophers who had preceded Plato had believed that, as Leucippus put it "Nothing happens at random, but everything by reason and necessity."\(^4\) Aristotle also informs us that Democritus argued that natural explanation reduced to "Things always are or happen thus" and felt that "There is no sense in looking for a reason for that which always happens".\(^5\) Now of course there is a modern debate too on whether the regularities of nature ought to be treated simply as de facto uniformities, or explained as the consequence of real dispositional properties.\(^6\) Plato in the Timaeus appears to be getting to grips with the key problems that have to be solved in order to adopt a realist position here. While it is somewhat anachronistic to discuss Plato in terms of laws, one might feel that he obeys the spirit of Van Fraassen's injunction, from the other side of the debate;

"Do not rely on such a conception as Law without inquiring whether there is any that could play the required role."\(^7\)

At Timaeus 61d above and in the Timaeus generally, Plato relies on the attribution of dispositional properties to matter to explain regular behaviour, and more strongly, the necessary connection between events. As with the Phaedo, we need not see this as a reduction of physical to logical necessity.\(^8\) Rather, we might explicate the physical necessity holding between events in terms of the logical necessity holding between

121
the propositions that describe those events, although Plato would not express the matter in those terms.\textsuperscript{69}

Again, one might object that this account allows more comprehensibility to the physical realm than the epistemology of Timaeus 27c-29e would seem to allow. That may well be so, and I shall pursue this matter in following chapters.

V

Let us now consider the consequences of using this change in cosmology as a criterion for the relative dating of Plato's dialogues. The latest work which operates with the old cosmology is arguably the Politicus. This dialogue presents us with a myth where the cosmos is subject to two cycles. Firstly, there is the reign of Cronos where God guides the rotation of the heavens. When at the appointed time he relinquishes his control, the motion of the heavens reverses and the reign of Zeus ensues. It is made clear that we are currently living under the reign of Zeus.\textsuperscript{70} The central passage for my discussion is the following, where the Stranger describes the fate of the world in the reign of Zeus:

"In the beginning it remembered the teaching of its creator and father most accurately, though this eventually dulled. The reason for this was the physical element in its constitution, which had been in it from the earliest stage, and partook of great disorder before the universe came to be in its present ordered condition... When the world nurtures within itself living things under the guidance of the helmsman, it produces little evil and much good. However, when it becomes separated from him, it fares best during the time immediately after the release, but as time proceeds and it grows forgetful, the old condition of disorder gains sway more and more, and towards the conclusion of time little good and much of its opposite flourishes, and there is danger of the destruction of the world and those in it." (Plt.273b)

That this change affects the heavenly bodies is attested at Politicus 269a ff.\textsuperscript{71} We have then a cosmology where the motions of the heavens will become progressively more chaotic. That in general is contrary to the position of the Timaeus, in particular the notion of the 'great year'.\textsuperscript{72} We might also note some specific points of difference in support of this.

The Timaeus is adamant that the cosmos, once created, can function in a stable manner without any attention from its creator and can only be dissolved by an act of his will.\textsuperscript{73} In the Politicus though either
God must perpetually guide the cosmos or it degenerates of its own inherent nature, and is only saved from sinking into 'an endless sea of unlikeness' by the active intervention of God.\textsuperscript{74} While the Politicus tells us that the cosmos is mounted on a pivot, the Timaeus is adamant that it is not.\textsuperscript{75} While in the Timaeus the cosmos is now [ageron kai anosos], 'ageless and unailing', in the Politicus God has to make the world [athanaton kai ageron], 'undying and ageless' in recreating the reign of Cronos after the current cycle.\textsuperscript{76}

A further consideration here is the nature of time. If the Politicus is operating with the conception of time found in the Timaeus then time is going to become increasingly chaotic along with the motions of the planets. As we are living in the degenerating cycle it is more likely that Plato is still operating with the Republic's conception of time, a further point in favour of dating the Politicus before the Timaeus.\textsuperscript{77}

If then we read the Politicus myth as giving us some sort of statement of Plato's current cosmological thinking, it would seem that on this criterion we ought to date the Politicus as pre-Timaeus. The main objection here might be whether we ought to read the myth so literally.\textsuperscript{78} One might argue the main thrust of the tale is political and not cosmological,\textsuperscript{79} and we do not, for instance, take every detail of the geography of the Phaedo myth or the cosmology of the myth of Er entirely seriously or ascribe these views directly to Plato.

Firstly though, my position does not require that we accept all the details of the Politicus myth, merely that we take some of the underlying principles which are used to construct it as being indicative of Plato's current views, as we would do with Plato's other myths.\textsuperscript{80} My argument is that the Politicus shares some assumptions concerning cosmology and time with the Republic and the Phaedo. It is highly significant that when Plato re-uses the myth of Chronos to make some political points (Le.713 ff), it is stripped of its cosmology.\textsuperscript{81} It is also important to note the manner in which the myth is introduced. The Stranger asks young Socrates to "Give your full attention to this story, just as children [paides] do; for you have not entirely outgrown such games [paidias]." (Plt.268e) Now, given what I have argued earlier about the resonances of [paidia] and its cognates in relation to Plato's RWP, we might expect some 'serious play' in the coming tale. We are not meant to take the myth literally, but there are important points to be gleaned from looking at
the structure of what is said. That suits my interpretation perfectly; we can ignore some of the cosmological details, but it is the principles behind the construction of the myth that are important, and these suggest the Politicus is pre-Timeaus. As discussed earlier, the notion of a degenerating cosmology may be a quite general one lying behind Plato's thought up to the Politicus.

Whatever the outcome here, the Phaedo, Republic and Politicus share the position that the motions of the visible heavens will be irregular and will not be amenable to exact mathematical analysis, and that is contrary to the view of the Timaeus, Philebus, Laws and Epinomis.

VI

In addition to these changes concerning cosmology and time, it may also be possible to discern a change in Plato's attitude to the inevitability of political, social and moral (PSM) degeneration. In the myth of the Politicus, the Eleatic Stranger tells us that

"From the one who brought it together, the universe has received only good, but from its previous state it retains in itself and engenders in the living creatures all the harshness and injustice that has its origin in the heavens. When the world nurtures within itself living things under the guidance of the helmsman, it produces little evil and much good. However, when it becomes separated from him, it fares best during the time immediately after the release, but as time proceeds and it grows forgetful, the old condition of disorder gains sway more and more, and towards the conclusion of time little good and much of its opposite flourishes." (Plt.273c)

That seems to be as clear a statement as possible of an inevitable PSM decline. We might compare this with Republic 546a ff where Plato has Socrates describe the inevitable descent from the ideal state through timocracy, oligarchy, and democracy to tyranny. One problem with this description is that it is difficult to judge Plato's attitude here as he deploys the [paidia/ spoude] contrast familiar from our discussion of Plato's FWP. One reading of this piece of 'serious play' might be that we should not take the details of each society and the passage from one to another too literally, but should be concerned with the general character types of each society and the tendency for society to degenerate.

We should perhaps distinguish between a deterministic decline,
where each stage is of necessity worse than the previous, and one where
while there are factors which unchecked will cause a society to decline,
conscious human action may, at least temporarily, counteract them.\textsuperscript{89}
Plato I suggest is committed to the latter,\textsuperscript{90} such that when we look at
other works we will have to look for an absence of corrupting factors
rather than mere evidence that society can make some temporary progress.

Let us now consider the position of the Laws. At 769d ff, the
Stranger tells us that legislation ought to be written down and duly
amended if found wanting in practice, "If the ordering of the polis is
always to improve and to in no way decline" (Le.769d). The implication
here would seem to be that not only can there be progress, but that the
fate of the city lies in its own hands, rather than being subject to any
degenerating forces. One of the key political questions asked by the
Laws is outlined by the Stranger at 676b ff, where he says

"Sometimes larger states have come to be from smaller ones, and
sometimes smaller from larger, and worse states have come to be from
better and better from worse... We must attempt to understand, if it
lies within our power, the reason for such change."
The rest of Laws Book III is then devoted to answering this question.
Various factors are analysed here; at 688c ignorance and vice are
discussed,\textsuperscript{91} at 691a, financial acquisitiveness, at 697c a lack of
communal spirit, at 704d geographical factors.\textsuperscript{92} Yet at no stage in Book
III, or anywhere else in the Laws, is any explanation in terms of an
inevitable degeneration cited or alluded to. Indeed, the point of this
investigation seems to be to argue that all of the causes of political
degeneration are either avoidable or treatable.

After this discussion the Stranger introduces a cyclical theory of
history where after periods of increasing social sophistication mankind
is reduced to a primitive and rural existence by severe flooding. There
is no sense of an inevitable decline here though, or of a decline
alternating with a more positive phase. It is highly significant that in
this context when the myth of Cronos make a reappearance at 713a
ff, it is shorn of any commitment to inevitable degeneration.

In the Laws then, we do not find any inevitable PSM degeneration of
the kind we find in the myth of the Politicus. How much of a change that
is from the Republic depends on how seriously we take the passage at
545d ff. Even if the Republic is not committed to an inevitable decline,
there is an important change of tone in the Laws which cannot be fully
accounted for by reference to the different subject matter.\textsuperscript{93}
As for the Timaeus, all the passages which concern politics are to be found in the opening myth, and as I argued in chapter four, these have various literary and philosophical functions to serve which mean that we should not take them to be indicative of Plato's views. The Timaeus does have some interesting points to make about moral decline, however. Our souls, analogously to the world soul, are made up of two revolutions. Our intellectual welfare is related to how uniformly our intellectual revolutions move, which is dependent on whether we take the trouble to master our incoming perceptions, or are mastered by them. Similarly, the key moral injunction for humans concerns the relation of the emotions and the intellect. Timaeus tells us concerning men and their emotions that "If they have mastery over these, then they will live justly, but if they are mastered by them, unjustly." (Tim.42b).

While humans who do not take the trouble to master what impinges on them may become corrupt, there is no sense of any inevitability here, or of any increasing disorder in the world that leads to the corruption of mortals. In contrast to the Politicus, where the world inevitably becomes a more corrupting place, and where humans can do little about this, the Timaeus appears to provide a level playing field for mortals to determine their own fate. One might usefully compare Timaeus 86d ad fin with the Politicus in the way that it analyses moral degeneration as something that is the sole responsibility of the individual soul, and it is notable that at Timaeus 87b ff that treatable moral shortcomings are related to political and social difficulties.

It is interesting that the Politicus ties together the two concepts of cosmological and PSM stability or degeneration, and that in the later dialogues where we find cosmological stability we find PSM stability too. If the driving force behind such degeneration is cosmological or metaphysical, changes here might explain the move to PSM stability.

VII

In arguing that on certain criteria the Timaeus post-dates the Politicus, I am taking up one side of the old Owen-Cherniss controversy. In this section I propose to to deal only with the evidence related to astronomy and politics. Owen argues that there is no Eudoxan influence in the Timaeus and that this implies an early dating. Firstly, there is the question of the [enantia dunamis], the 'contrary power' at 38d5, introduced to

126
account for the motion of Mercury and Venus relative to the Sun. Whatever its exact nature, it appears to be an ad hoc modification to the system. As Eudoxus' system did not require such an excrescence it is a reasonable assumption that Plato was not conversant with it at the time of writing the Timaeus. However, there has been a tendency towards an all or nothing approach to the influence of Eudoxus, and we need to be somewhat suspicious of this. One possibility is that Eudoxus influenced the composition of the Timaeus before he had developed his full system. Such an influence might range from convincing Plato that it was theoretically possible to account for all the motions of the heavens using uniform circular motion, to the possibility that the Timaeus represents a Eudoxan prototype which was later refined into the theory that we now know via Aristotle.

There is also some doubt as to Eudoxus' dates. Citing Apollodorus, Owen places Eudoxus' death at 356–353, and states that he must have produced his system well before this, as he left Athens for Chnidus some years before his death. The effect of all this is to push back the date of composition of the Timaeus, in Owen's opinion to perhaps before 369 and the composition of the Theaetetus. However, Gisinger places Eudoxus' death in 342, and both de Santillana and Lassere give 337, all rejecting the notoriously unreliable testimony of Apollodorus on which Owen relies. While it may be 'commonly agreed' that Eudoxus came to the Academy in 368, the alternative datings allow for Eudoxus to have formulated his full theory after Plato composed the astronomical passages in the Laws or even after his death in 348.

Concerning the phrase [plethei men amechanoi chromenas, pepoikilenas de thaumastos], 'bewildering as they are in number and of surprisingly intricate pattern', Cornford has argued

"Plato must have been acquainted with the system of Eudoxus... The total of twenty seven spheres would certainly make a pattern which would bewilder a layman." Owen though argues that [plethos amechanon] is far too strong a phrase even for 27 motions, which are in effect only twelve as the motion of some of the spheres are common to several planets. Another possibility here however is that rather than referring to the underlying motions, this phrase may simply refer instead to the apparent motions, which do indeed 'possess immense complexity and form astonishing patterns'. If so, then one cannot draw any conclusions about a Eudoxan influence here.
Owen is inclined to find some Eudoxan influence in a move from irregular to regular celestial motion between the Timaeus and the Laws. However, I have argued at length that this change occurs between the Republic and the Timaeus.

From the evidence that we have, it is not clear whether or how Eudoxus influenced Plato. If his influence is as Owen suggests, then it was certainly pre-Timaeus. Even if he did not influence the composition of the Timaeus, the doubts concerning his dates mean that we cannot draw any firm conclusions about the date of this work.

Let us move on to Owen's arguments concerning 'Second Thoughts on Government.' Owen argues that the Politicus moves on from the political theory of the Republic on several points which are mentioned in the introduction to the Timaeus, and that

"The Timaeus, since it adopts without comment these superseded theories, was written before the Politicus." These points concern the possession of private property, marriage, and whether it is possible to lay down once and for all the best set of laws. In chapter four though I argued that the function of the first part of the Timaeus is to remind us of the Republic and to set an agenda for the revision of parts of it. Thus it is not clear in the recapitulation of the Republic whether the Timaeus advocates these points or merely mentions them to orientate us relative to the Republic.

One can also argue, as Gill has done, that the Atlantis myth contains some thoughts on politics which are cognate with the developments of the Politicus rather than with the Republic. For instance, while the best ruler in the Republic is characterised by his knowledge of the Forms, in the Politicus his knowledge is defined more instrumentally, in terms of whether he makes the city better or worse, and the comparison of statecraft and weaving stresses the ability of the statesman with the materials he has available rather than his relationship to some external model, as in the Republic.

On the subject of the divine shepherds of the Politicus and the Critias, I have little to say that has not already been said by Gill. The divine shepherds have different functions in each myth, completely controlling human affairs in the Politicus but only providing the initial political constitution from which men can deviate if they choose in the Critias. Indeed, it may be that as Gill has argued the Critias myth refers to and corrects the Politicus myth. The
Politicus has the Gods guiding men in an undifferentiated manner, where the Critias draws a distinction between how men force animals to comply and Gods attempt to 'steer' men by reason.\textsuperscript{121}

Owen has also argued that the theory of language of the Critias is one that has been superseded by the Cratylus and thus that the Timaeus pre-dates this work.\textsuperscript{122} However, as Gill has pointed out,\textsuperscript{123} it is not clear whether the Critias at 107b actually advocates a pictorial theory of language or merely employs an analogy between writing and painting, stating that some things are harder to depict than others in both media. If the latter is the case, then the Critias shares some of the concerns of the Politicus, and as Owen concedes, the tendency to compare language with painting continues in other dialogues reckoned to be later than the Cratylus.\textsuperscript{124}

One might also consider whether the Critias presents us with a theory of language or a theory of literature, that is whether the reference to painting here is one that looks to Plato's PWP of the Phaedrus rather than the discussion of naming and language of the Cratylus.\textsuperscript{125} If my argument of chapter four was correct in locating allusions to the PWP at the beginning of the Timaeus and seeing the Critias as related to that, we might expect some further such allusion. Owen's political arguments for an early date for the Timaeus are then not convincing.

VIII

The general conclusion of this chapter is fairly evident. The Timaeus, like the Critias, Philebus, Laws and Epinomis but unlike the Phaedo, Republic and Politicus advocates a stable cosmology and celestial motion which is regular and amenable to exact mathematical analysis. Underpinning this may be a change of view of the relation of mathematics to celestial motion and to the world in general. On this basis we have a new argument for the relative dating of Plato's later dialogues. There is also some evidence that the later dialogues have a different attitude to the inevitability of PSM decay, which may be linked to the shift to a more stable cosmology.

The stability of the heavens in the Timaeus raises some interesting questions. What are the implications of there being exactitude in at least one aspect of the physical world? What is the epistemological status of these stable heavens? It would seem that in the first place
we can know that the heavens are stable and in the second that we are able to make some precise calculations concerning the heavenly bodies. Perhaps, then, the astronomy of the Timaeus shares some of the optimism of the Theaetetus and the Philebus towards knowledge of the sensible. There are two difficulties with this, though, both of which require considerable discussion. The whole account of the world given by Timaeus is presented as a myth or likely story. Is it not then the case that the theory that the heavens move regularly is itself only likely, such that our calculations can only be as likely as that theory? As argued in the previous chapter, whether we should entirely believe what Timaeus tell us at 27a-29d is open to question. One can certainly point to places in other dialogues where the regularity of the heavens is asserted without the 'likely story' qualifier, most notably Laws 822a ff and 966e ff. The epistemology of the Timaeus will be the subject of chapters six and nine.

There is also, though, the question of flux. There might be two problems here. Firstly, one might worry as the Theaetetus does about how things that are in radical flux can be known. Secondly, one might worry how it is that the heavens can have regular motion and be stable if the things that constitute them are in radical flux. In chapter seven I shall argue that the flux of the Timaeus is not nearly so radical as is often supposed.

What I hope to have established in this chapter though is a simple fact about the Timaeus, which is that the motions of the heavenly bodies are regular and stable. Given that piece of information, we can then address some of the many other questions that arise concerning the Timaeus knowing that we must account for this fact.
NOTES TO CHAPTER FIVE

01) Agreeing with Vlastos (1981b) p22 n.17 against Cornford (1941) and Duhem (1906a) that [auton] must mean 'about them' rather than 'in them' which would require the dative [autois], and against Shorey (1935 vol II) p186 n.a that the final clause is not a 'trailing anacoluthon'.


03) See Plt.269de, 273b ff.

04) See Pdo.109c ff.

05) It is notable that while [paralattein] occurs here and in the Plt, it is absent from the Tim, (except at 22d1 in Solon's myth, the status of which we saw in ch.4) and the Cri, Plb, Le. and Epin.


07) E.g, Tim.38c6, 39d1, 40b6, and 43b3. LSJ gives 'a wanderer, roamer, rover'. The cognate verb [planao] has associations of 'to mislead, to lead into error'.

08) The six motions are up, down, left, right, backwards and forwards.

09) For [aplanes] LSJ give 'not-wandering, fixed'.

10) One might try to argue that the crucial difference between the fixed stars and the planets is that the former are living creatures and the latter are not, but Tim.38e makes it clear that the planets live too. The fixed stars of course have physical bodies, 'created for the most part from fire' (Tim.40a3).

11) See also Tim.38c, "From this reasoning and thought by God concerning the generation of time, in order that time should come to be, the sun and the moon and the five other stars, which have the name 'wanderers' [planeta], came into being to determine and guard the numbers of time", and cf. 40b.

12) Cf. the clarity of the Tim. on these points, where at 47a we are told that "Sight of day and night, of months and the cycle of the years has procured for us number and the concept of time".

13) There is one direct comment on the nature of time at Epin.991c; "We must grasp the exactness of time, how precisely it marks all the events throughout the heavens".

14) Cf. My later argument concerning 'perfect' and 'regular'.

15) So there is no theoretical reason why time should be irregular for Plato. On the contrary, as particulars in the Tim. are both in time and in space, and space has no characteristics so that it will not distort what it receives (see Tim.50e ff and my ch.8), if being in time is analogous to being in space, time too should be featureless so that it does not distort what is in it.
16) This is reiterated at Tim.38a9 where we are told that time 'circles around according to number'.

17) Cf. Simplicius' references to Eudemus, Theophrastus and Alexander, at in De Caelo 700.18.

18) Whether Aristotle is quite correct here in saying that Plato identifies time with the motions of the heavens is another matter. I would agree with Cherniss (1944) p418 and n.349, and Vlastos (1964) p409 ff, that the key phrase is that the stars 'mark off and preserve the numbers of time' (Tim.38c6), and so implicitly distinguish clock and time as measure and measured.

19) One must beware of the limits of such ex silentio arguments, but where Aristotle would have known Plato's view, and would have been keen to criticise, they have some validity. Note for instance the proliferation of criticisms of the Tim. in the De Caelo.

20) See e.g De Caelo 280a28 ff.

21) See the evidence collected by Cornford (1937) p89 ff.

22) E.g the uses of 'calculate' at Timaeus 47c2 and 40d1.

23) Cf. Tim.37d, 38a9, 38c, and note the addition of [arithmos] at 39c8 in comparison to Resp.530a8.

24) Cf. other uses of [planes] in the Tim, at 19e4 to describe those who 'wander' from city to city, at 43b4 to similarly describe our mental revolutions, and in some biological contexts describing the random wanderings going on in our bodies, of phlegms at 86e7, of atomic particles at 88e2, and of the womb in women at 91c4.

25) There might be a worry here about reading the views of the Le. back into the Tim, but the Tim. advocates similar, if not quite so well expressed or developed ideas; see e.g Tim.34a, 89a.

26) If the motion of the same is the equivalent of the motion of the universe as a whole, then from Tim.34a that must be a regular motion.

27) Note that the motion of the whole is regular but not perfect, too; it fails to be self-generating. See Tim.34a.

28) While we would regard this as mathematically incorrect, as we would resolve the circular motion of the stars on the same into two normal linear motions, the sense is clear enough; the fixed stars have only the translational motion imparted by the same.

29) The exception here would appear to be Venus and Mercury, as Timaeus tells us at 38d that "The morning star and the star sacred to Hermes he placed in an orbit equal in speed to that of the sun, but possessing a contrary power [enantian dunamin] to it, whence it is that the sun, the star of Hermes and the morning star overtake and are overtaken by each other". There has been a great deal of debate on the exact nature of this 'contrary power' (cf. Proclus In Timaeum 221d ff, Heath (1913) p166 ff, Cornford (1937) 108 ff, Dreyer (1953) p68 ff, Dicks (1970) p123 ff), which would seem to be an attempt to account for the fact that Venus and Mercury are always to be seen in the vicinity of the sun. All I require
is that this 'contrary power' acts in a regular manner.

30) E.g Le.897b ff, or 967a where the A.S tells us that "Even at that time a sense of wonderment emerged concerning the heavenly bodies, and those who studied them accurately suspected what is now indeed believed, that if they were soulless and lacking in intelligence, they would not be amenable to wonderful calculations [logismois] of such accuracy." Cf. my previous notes on calculation and number.

31) One might feel that Plb.30c (and Epin.983c) are deliberately evocative of Rep.530ab.

32) See Tim.40a ff and 40b ff.

33) See e.g Plb.32d.

34) At Plb.31d it is emphasised that pain occurs when the harmony of the living being is disrupted. One might think here of the way in which both the Plb. and the Tim. describe the universe as a living being, and the way that the Tim. takes great care to emphasise the harmony that constitutes its body, esp. at Tim.35a-37d.

35) At Plb.43a ff the idea that nothing is free from the processes of deterioration and restoration is raised in language that is reminiscent of the discussions of Heraclitean flux at Tht.179-183 and Crt.439-440. Socrates deliberately avoids discussion of the truth of this theory by suggesting that there are some changes that are so small that we do not perceive them, and hence we sometimes feel that we are in a state that does not involve deterioration or restoration.

36) There is no question that the Epin. advocates regular celestial motion; see e.g Epin.982b-d, 983c, 987a, 991c.

37) See Rep.529e ff.

38) See Rep.530a ff.

39) Cf. my ch.3.

40) See esp. Rep.510d ff where this analogue is used as the model for the relation between sections L2 and L3 of the line.

41) See Plb.56d ff. That the Plb. is concerned with participation is cogently argued by Sayre (1983) p119 ff.

42) See Plb.57d.

43) [emphronos] can mean sensible both in the sense of alive and in the sense of reasonable or prudent.

44) E.g Tim.46e.

45) See Archer-Hind (1888), Taylor (1928), Cornford (1937) and Morrow (1950) for further discussion here.

46) There are possibly some conservative assumptions concerning art in play here; 'good' in the sense aesthetically pleasing, perhaps.
47) One must be careful of anachronism here, as Plato never expresses his views in terms of laws.

48) See e.g Tim.30a5 et passim.


50) The 'wandering' of the wandering cause in my view merely contrasts its purposeless and undirected action with that of teleological/intentional action.

51) See e.g Tim.42d ff, where the demiurge is said to be blameless for anything that may happen after the initial ordering; cf. Rep.380c ff.

52) I.e as in my example, if we throw a bucket of paint at a canvas.

53) See Tim.61d ff on the shape and properties of fire. I shall discuss the construction of the fundamental particles in ch.7 and ch.9.

54) See Cornford (1937) p165.

55) See e.g Tim.27c-29e.

56) Assuming that regularity is postulated throughout the physical world, not just in the heavens.

57) "So too fire, when approached by the cold will either withdraw or perish. It will never endure receiving the cold and still be what it was, Fire, and also cold." (Pdo.103d).

58) See Pdo.103e-104b.

59) "You know, of course, that whatever the Form of three occupies must of necessity [anankezei] be not only three but also odd" (Pdo.104d).


61) See esp. Tim.54a ff, where Timaeus says that if anyone has a better account, he will not begrudge him the prize.


66) See e.g Van Fraassen (1989) and Maxwell (1993b) respectively. Maxwell (1993b) p90 states that "It is legitimate to to interpret (appropriate) physical theories as attributing necessitating properties to postulated physical entities - properties in virtue of which the entities must, of necessity, obey the laws of the theory".


68) I would argue that the 'bringing on' relation is not one of causation but one of sufficiency, and would agree with Fine (1987) that
the safety of the 'safe answer' consists in providing necessary and sufficient conditions, while the 'clever answer' provides merely sufficient conditions. This sufficiency might be founded on several different relations depending on specific cases, and it is interesting that Plato gives us several different examples here. The presence of three may be sufficient for ('bring on') oddness because it is logically necessary that three is odd. The presence of fever may be sufficient for sickness because fever is a species of the genus sickness (As Sorabji (1980) p206 n.77 points out, this is the way that Aristotle (Top.123b35-36) treats fever and sickness, and Plato appears to treat it similarly at Tim.86a ff). Finally, the presence of fire may be sufficient for heat because the relation between fire and heat is one of causal necessity.

69) See here Maxwell (1968) and (1993b) p91 ff.

70) The E.S comments "You have heard of the life under Chronos, Socrates, but the tale of life under Zeus, that of the current state, you are alive to experience yourself", (Plt.272b). Note the emphatic [ton nun] instead of [ton nun] at 272b2.

71) We might also infer this from Plato's general conviction that the stars have physical bodies and the myth's statement that all physical bodies degenerate.

72) The predictable recurrence of the great year is a sign of the cosmological stability of the Tim. Certainly one cannot, as Adam does (1902 vol II) p297/8, equate the great year of the Tim. with the periods of God's help and God's abstinance. The great year could be achieved in the reign of Chronos, (there is though no mention of the grand conjunction, and it is not the criterion by which that age comes to an end, cf. Plt.269c and 272d), but could only be achieved by chance, if at all, in the reign of Zeus when the planets move increasingly chaotically, and contrary to Tim.39c ff, the time between conjunctions would be unpredictable.

73) See e.g Tim.34a on motion and cf. Plt.269d-270b, and Tim.32c, 38b, and 41a on indissolubility.

74) See Plt.273b ff.

75) Cf. Plt.270a9 and Tim.33d9, a point made by Brumbaugh (1961a) p523, although his concern is with models rather than uniform motion. Tim.34a is a better passage for my purposes. It is perhaps worth noting that prior to the Tim. Plato always has the cosmos supported; a pivot in the Plt, the spindle of necessity in the myth of Er (Rep.616b).

76) Cf. Tim.33a9 and Plt.273e4.

77) See above for arguments that indicate that it is highly unlikely that Plato ever advocated irregular time.

78) One qualm that might be raised here is whether any astronomer could accept the cosmology of the myth. This depends on how much deviation is already supposed to have occurred and how quickly the rot is supposed to set in. Ancient Greek astronomy still had to resolve many anomalies concerning the motions of the heavens, which could be equated with the deterioration that had already occurred. That deterioration might also
be very slow. Here I must disagree with Skemp (1952) p147 on a matter of translation. [pollas periodon muriadas] at Plt.270a8 is surely not his 'thousands of revolutions' but something rather stronger, like 'many ten thousands of revolutions'. If we make the reasonable assumption that one rotation of the universe is one day (that is the likely implication of Plt.269a coupled with 269bc ff; cf. Tim.39c), then one thousand revolutions will be approximately three years, and ten thousand approximately thirty (or around 'one generation of men'). Plt.269b, 272de, and 274de each make it clear that we are dealing with a time scale that encompasses many generations.

79) The myth is introduced to illustrate a point in the hunt for the definition of the statesman, see Plt.268de.

80) See e.g Pdo.109a ff, where the 'fishes eye view' is indeed indicative of Plato's current epistemology.

81) This return is also important in ruling out entirely allegorical interpretations of it in the Plt. The Le. draws the sort of political morals one might expect from the myth, which are in line with the E.S's comments at Plt.275b.

82) We should be approaching the main body of the text in the same way, although perhaps not to the same extent. I take the point of the E.S's comments to be Plato's way of saying be even more careful than you usual when you read this myth.

83) One might make the case that the Plt. is transitional, rather than the last use of the old cosmology. Perhaps the two cycles of the myth reflect Plato's first dissatisfaction with degeneration, and at Plt.284a ff there is the concern with mensuration that we find in both Tim. and Plb, and some of the Pythagorean ontological themes which with Sayre I shall argue in later chapters are typical of the Tim. and Plb. are to be found in the Plt. too.

84) See Rep.529d, 530ab, 546a ff, Pdo.110a.

85) There is also a possible argument here concerning the authenticity/dating of the Ep.VII. At 343c ff the author of that work makes the familiar contrast between the definition of a circle with any representation of it. He goes on to state that such an analogue applies quite generally. That is the position of the pre-Tim. works, so either the Ep.VII pre-dates the Tim. or is in whole or part a forgery.

86) It may not be an accident that Plato mentions Hesiods theory of metals at Rep.546e ff when discussing his own theory of decay; cf. Popper (1945 vol.1) p219 n.5.

87) Plato has Socrates say "Shall we, like Homer, pray to the Muses to tell us how a faction first began the trouble, and believe that in their tragic style they speak as if in earnest [hos de spoude] employing high flown language, though they tease and play with us as if we were children [hos pros paidas hemas paizousin] ?" (Rep.545d).

88) So Taylor, (1939) p25 ff. The passage is open to several interpretations, though note that the standard middle period view that "All things that come to be must also decay [genomenoi panti phthora estin]" (Rep.546a) is being pushed here and would be a suitable driving
force for political and social corruption; cf. Adam (1902 vol II) p202, who asks "What was the originating cause of degeneration? Plato finds the cause, not in anything peculiar to the Ideal city, but in a law which prevails through the whole of Nature - the law that everything created is doomed to decay".

89) Those factors, as in the Plt. may become stronger with time. Taylor (1939) has quite reasonably likened this passage to a medical text book description of a terminal illness; it describes the typical stages an unchecked ailment will progress through, while in an actual case there may be many complicating factors. Here conscious action by a doctor may slow the decline, temporarily check it or even temporarily improve the patients condition, without removing the underlying cause of their ultimate decline and demise.

90) Popper though would disagree; he comments that "Plato summed up his social experience, exactly as his historicist predecessor had done, by proffering a law of historical development. According to this law... all social change is corruption or decay or degeneration", (1945 vol I) p19, cf. p37. This seems far too strong though; both Plato's writing (e.g Rep.473b, 502b ff, Le.676b ff, 769d7/8) and his practice, if we are to believe the Ep.VII (and it may be he case that only the digression is a forgery), show considerable optimism that actual societies can (at least temporarily) be improved rather than merely stopped from decaying.

91) As Plato once more invokes the [spoude/ paidia] contrast at Le.688bc, we must beware of his 'serious play' as with Rep.545d ff.

92) The A.S hopes to root out ignorance and vices by an adequate education system (See books I, II + VII), and their are various strictures aimed against financial acquisitiveness. No citizen may possess gold or silver (Le.741e ff), one family may possess only one land holding, which is non-transferable (741b ff), and there are strict limits on personal wealth.

93) It is perhaps worth noting that in the Rep. the decline begins with incorrect breeding (Rep.546a ff); the Le. too discusses this (Le.775c ff) but does not connect poor breeding with any inevitable decline.

94) See Tim.41d ff. These matters will be discussed in more detail in the next chapter.

95) The language of mastery/ being mastered here is precisely that of the discussion of the relation of intellect, the revolutions and perception. Cf. Tim.44a where we find a similar use of [kratein], 'to rule, master, hold sway over' (LSJ).

96) Especially important here is Tim.90d ff, where we are told that the goal in life is to rectify the disordered revolutions in our heads, because by doing so we will attain the best sort of life. I can find no indication that the Plb. entertains the idea of any PSM degeneration.

97) See Owen (1953) and Cherniss (1957a).

98) I deal here with the part of Owen's paper subtitled 'Eudoxus' and subsequently with 'Second Thoughts on Government'.

99) See Owen (1953) p325.
100) Plato may even be giving us a simplified sketch of the full Eudoxan theory, especially if his main interest is elsewhere, in the comparison between the world soul and the human mind.

101) Owen (1953), p325.

102) Gisinger (1921) p5/6.


105) Apollodorus' practice of equating the high point of someone's achievement with the age of forty is of course highly dubious - here he may have associated Eudoxus' acme with his temporary presidency of the academy in 367/6; see Skemp (1967) p142/3. There is also the problem of accommodating the evidence of Pliny (Natural History XXX, 3), who talks of Eudoxus dating Zoroaster as living 6,000 years before the death of Plato, implying that Eudoxus outlived him.

106) Owen (1953) p325.


108) Cornford's translation (1937) p116. [amechanos] could not be Archer-Hinds 'incalculable', given the emphasis in the Tim. on the heavens being amenable to calculation, but as Shorey (1927) p175 points out more 'incredible' or 'wonderful'.


110) Owen (1965) p326. See Aristotle Metaphysics 1073b ff for an account of Eudoxus' system. Owen is correct to point out that if we are only considering the 'wandering' stars, Cornford is wrong to suppose that Eudoxus required 27 motions. Contra Owen, though, it is not clear that Tim.39c refers only to the five planets rather than the seven unfixed stars (i.e planets + sun and moon); in fact Tim.38c seems to imply the latter. He is right to suppose that Eudoxus requires 20 motions for these five, but if we include sun and moon then 26 are required. Similarly, there are 12 and 14 motions respectively if we consider only independent motions, as some are shared. One could also add that there must be doubts as to whether the Tim. was written with the layman in mind, so Cornford's argument for Eudoxan influence here is unconvincing.

111) See Owen (1953) p326.

112) Between the Plt. and the Tim. to be precise.

113) Owen (1953) p332.

114) See Gill (1979) p152 ff.

115) Cf. Rep.484c ff, 500b ff, 520c, and 540a ff.

116) See Plt.293a ff.

117) See Plt.309a ff.


120) Compare the way that the Athenians maintain the constitution laid down for them and do not alter their environment (Tim. 24c, Cri. 109c, 110e ff) with the way that the people of Atlantis alter theirs (Cri. 113c, 115c, 118c) and how the war is blamed on their failure to maintain their constitution (Cri. 119c ff).

121) See Gill (1979) esp. p157. Plato's use of the metaphor of steering in both myths ties them together tightly. I agree with Gill that the Cri. can be read as correcting the Plt.

122) See Owen (1973) and Crt. 422a ff, esp. 424-425.

123) See Gill (1979) p151.

124) See Owen (1973) p147, and cf. So. 234 ff, Plb. 39 ff and Le. 769 ff.

125) See Pdr. 273c ff, but esp. 275d ff.

126) See e.g Tim. 40c, 47c2 on calculation and astronomy.

127) So too one may find much of the Tim.' astronomy without the 'likely story' qualifiers in the Epin.
In the previous chapter, I suggested that the reformed cosmology might lead us to believe that the Timaeus shares some of the optimism towards knowledge of perceptible entities that is shown in the Theaetetetus and the Philebus. One problem with this though is the epistemological pessimism of Timaeus 27c-29d. The aim of this chapter is to investigate whether this is all that the Timaeus has to say on this matter.

Earlier, I called into question whether we should blithely accept views of Timaeus 27c-29d as Plato's own. Here I shall argue that the analogy developed between the world soul and human souls provides an alternative and more optimistic epistemology, one that in places directly contradicts that of 27c-29e. In line with my arguments of chapter four, it is one that re-thinks the relation of reason and sensation, and one which will tell us much about the kind of creatures we are and what our place in the universe is.

In the process of developing this analogy, the Timaeus gives us a model of the mind and of false judgement. So far, I have argued that on cosmological grounds we might date the Timaeus after the Politicus, and so after the Theaetetus and Sophist. The Theaetetus, however, has much to say about the nature of the human mind, the possibility of 'common notions', the nature and possibility of false judgement, and offers us the wax tablet and aviary models. The Sophist too gives us much of interest concerning negation and the nature of false judgement. A further question that this chapter will address is whether the models of mind and false judgement put forward in the Timaeus are primitive or sophisticated relative to the Theaetetus and the Sophist.

I

Let us begin with the question of what the world soul can know and what it can form opinions about, and how it acquires these states. Having described the construction of the world soul, Timaeus goes on to say

"Therefore, as soul was blended out of its three constituent parts, sameness, difference and [ousias]... whenever she has contact with something that has either dispersed or undivided [ousian], she is set in
motion throughout the whole of herself and states what this thing is the same as and what it is different from, and what precise relation of location, manner and time. existing thing bears to each thing that becomes or is always the same. This account is true of being and becoming, and in relation to both the same and the different, is carried within the self moved without speech or sound. Whenever this occurs concerning the sensible the circle of the different announces this to the whole of the soul and opinions and beliefs which are secure and true occur [doxai kai pisteis gignontai bebaioi kai aletheis]. On the other hand, where the rational is concerned and the smoothly running circle of the same declares this, intelligence and knowledge of necessity result." (Tim.37a)

The full epistemological implications of this passage have been considerably underestimated in the literature on the Timaeus. If the world soul can have opinions concerning the physical which are both secure and true, then there cannot be anything intractable in the nature of the physical, or the nature of opinion, which prevents the formation of such opinions. There may be difficulties for us mere mortals, but that is a different matter, and one that locates the problems with us rather than with the physical world or with opinion itself. Timaeus goes on to give us an account of the formation of the human soul and its capacities, and gives us an analysis of how it is that human beings are able to form false judgements.

Having created a race of demigods to be the souls of the heavenly bodies, the demiurge then gave them the job of helping in the creation of mortals. The demiurge once more blends together sameness, difference and [ousia], though this time not as uniformly as before, and divides the resulting mixture into the appropriate number of souls. Though not explicitly stated, it would seem that he also performs the same acts of dividing into strips and binding into circles that he does with the world soul, such that our souls consist of the two revolutions. He then turns these over to the demigods, who proceed to fashion a body for each. Having been implanted in physical bodies subject to influx and efflux, mortal souls are then subject to sensations, to desire mingled with pleasure and pain, to fear, anger and other emotions. As we saw in chapter five, the fundamental moral injunction is then to master rather than be mastered by our emotions. The crucial difference between our souls and that of the world soul can be put like this. The revolutions of the same and the
different that make up the world soul are regular, stable and
imperturbable. This makes the world soul perfectly rational, and all
of its judgements of sameness and difference are correct. However, when
our souls are bound into our bodies, the revolutions are disrupted, they
partake in all six motions, and the influx of sensations further
disorders their motions, such that initially the two revolutions barely
hold together. It is because of the imperfection of our mental orbits
that when they encounter some external entity

"They label it the same as or different from something contrary to
the truth, falsehoods and stupidity occur..." (Tim.43e).

What is remarkable about this model of mind and false judgement is how
optimistic Timaeus is about the possibility of human beings bettering
themselves. At 44a ff Timaeus tells us that at first we are hardly judge
anything correctly, though with time and effort as the orbits settle

"They announce both the same and the different correctly, so
rendering their possessor intelligent. If he now takes part in some
correct nurture of education, he becomes perfect and entirely sound in
mind, having escaped the greatest of maladies." (Tim.44a ff)

This all looks very promising. If we can train ourselves properly, then
it would seem that we too can have some opinions concerning the physical
world which are both secure and true. Astronomy, according to Timaeus is
going to have a large part to play in this, for he tells us that

"God devised and gave us vision in order that we might observe the
rational revolutions of the heavens and use them against the revolutions
of thought that are in us, which are like them, though those are clear
and ours confused, and by learning thoroughly and partaking in
calculations correct according to nature, by imitation of the entirely
unwandering revolutions of God we might stabilise the wandering
revolutions in ourselves." (Tim.47b)

This passage has considerable significance in indicating one of the
chief ways in which we may improve the stability of the revolutions
which constitute our minds. Note also that the process of looking at
the heavens will lead to the stabilisation of all of our revolutions,
which might suggest that the true and stable opinions that we are able
to form concerning the sensible world may be converted into knowledge,
if observation is going to eventually lead to the stabilisation of our
rational orbit as well. Why astronomy has a special status for Plato
is a question that I shall attempt to answer in chapters seven and nine.
Let us now compare Timaeus 37a ff with 29b ff. At 29b6 ff the implication was of a [sungenes] matching of secure [bebaios] accounts with secure entities, and of 'likely' accounts with likenesses. At 37a ff though, there exist [doxai kai pisteis] which are both [bebaios kai alethes] in direct contradiction of both the letter and spirit of 27c-29d. Further, given the analogy developed between the world soul and human souls it is possible for us, if we train ourselves properly and have mastery over our perceptions, to have this sort of opinion. That too is contrary to the spirit of the closing part of Timaeus' opening speech which tells us that we who are human in nature should be ready to accept a likely account and seek no further.24

The likely account has now generated a very interesting paradox. The likely story is telling us that it is likely that the basis for giving this sort of account - that because of the nature of the physical world as a likeness, it will only admit of a likely story - is wrong. It is likely that the likely story refutes itself. This ought to give us considerable misgivings about whether we can treat the views expressed by Timaeus at 27c-29e as Plato's own, for the passage at Timaeus 37a ff is not an isolated example which we can explain away as a slip by the author. The human psychology developed in analogy with the world soul is carefully worked out and is one of the central themes of the Timaeus.

All this, I suggest, is entirely concordant with the account of the structure of the Timaeus that I argued for in chapter four. There I suggested that both the dramatic context and the contents of Timaeus' epistemological foreward should lead us to be cautious about attributing its views to Plato. Here we find two of its most dubious aspects, the [sungenes] stricture for explanation and the pessimistic attitude to enquiry, under attack.25 What is more this is being done in the context of a myth which will tell us much about ourselves and our relation to the world, and which takes up the agenda set in the introduction.

II

One might gather from the account of the construction of the world soul, in the way that the demiurge mixes together portions of sameness, difference and [ousia] that each of these are being treated as complete predicates. That is, it would appear that it is legitimate to say of something that 'it is same' perhaps in virtue of the sameness it posses rather than saying 'it is the same as x'. However, other passages seem to treat sameness and difference as incomplete
predicates. Why should there be this apparent disparity? It might be that Plato has not yet properly distinguished properties and relations, and only apparently treats sameness and difference as relations.

Another suggestion is this. As all of the complete uses are in the passages concerning the construction of the world soul and human souls, perhaps this is a metaphorical means of attributing something to those souls. As Timaeus goes on to tell us that whenever they encounter anything, both the world soul and humans make judgements of what that thing is the same as and what it is different from, perhaps what is being attributed is an innate ability to make judgements of sameness and difference. What though of the use of [einai] here? If its treatment is similar to that of sameness and difference, then perhaps Plato reduces what he considers to be a two-place operator (the 'is' of identity and predication) to a one-place operator (which then looks like but is not the 'is' of existence) in order to attribute another innate ability, perhaps that of forming statements of identity and predication. This is even more fundamental, for in order to be able to form judgements of relations of sameness and difference we require the ability to form such propositions. If this is so, it would explain why, though souls are constituted from sameness difference and [ousia], Timaeus only speaks of making judgements of sameness and difference, as in doing so we are also employing the ability attributed by [einai].

Plato may have had several reasons for introducing such innate abilities. If, by this time, he has rejected anamnesis with its recollected knowledge, he may feel the need to postulate some fundamental innate abilities in order to be able to explain learning ab initio. The Timaeus model avoids some of the notorious difficulties concerning what the new born child can know or perceive according to the account of recollection at Phaedo 73-75. According to the Timaeus, we are able to make judgements about our sense perceptions straight away, although these will be rather poor due to the confused initial state of our mental revolutions. One advantage of the Timaeus account is that it allows for intellectual development, in the sense of an increase in our cognitive powers associated with the steadying of our mental revolutions as well as the mere gain of knowledge allowed by recollection.

It is also worth noting in relation to the argument that I offered in chapter three concerning acquaintance with the Forms, that Plato's
first concern in developing this model of mind is with propositional thought. He does not provide an innate ability for acquaintance, or the re-call of any pre-carnate knowledge. With anything we encounter, we are able to form propositions relating to sameness and difference. Plato is perhaps not giving us an exhaustive account of functioning of the mind, especially as in later works he allows that we may think pictorially.\textsuperscript{33} Rather, he is allowing us to think propositionally about anything that is brought before the mind.\textsuperscript{34} One might also note in relation to my arguments in chapter two that Plato develops a very active and independent account of the mind.\textsuperscript{35} As we have seen, the two key injunctions in the Timaeus are that our minds should have mastery over our perceptions so that we can become wise, and over our emotions so that we can become good.

We might also consider this theory of innate abilities in relation to the 'common ideas' of the Theaetetus. Socrates and Theaetetus have the following interchange

So "Through what does the ability function which reveals to you what is common [koinon] to all things, that which you name is or is not, and others which we were asking about just now? What organs will you assign for all of these, through what does the perceptive part of us perceive each of these?"

Th "You mean being and not being, likeness and unlikeness, sameness and difference, and one and the others numbers as applied to them... I don't know what to say, Socrates, except that it seems that there isn't a special organ for these as there is for others, but the soul is its own instrument examining what is common in all things." (Th.185c)\textsuperscript{36} The theory of recollection would undoubtedly have a tale to tell here about the acquisition of these common ideas.\textsuperscript{37} One of the interesting aspects of the Timaeus is that Plato presents us with a highly parsimonious theory of the innate abilities of the mind. The Theaetetus mentions several common ideas, such as unity and plurality,\textsuperscript{38} likeness and unlikeness,\textsuperscript{39} beautiful and ugly, good and bad,\textsuperscript{40} as well as sameness and difference. Now, a more generous innatist might make the ability to apply all of these innate capabilities. The Timaeus though grants only the last two, which in conjunction with the ability to think propositionally, might be thought to be foundational. The Timaeus suggests that we form some of our abilities to make judgements from abstraction from what is given in perceptual experience. For instance, we are told that
"Sight of day and night, of months and the cycle of the years has procured for us number and the concept of time, and has also led us to seek the nature of the universe. From these we have derived philosophy, the greatest gift of the Gods to mortals." (Tim.47a)

It is presumably by applying our judgements of sameness and difference to our observations of the heavens that we acquire the concepts of number and time that we can subsequently apply to other perceptions. Similarly perhaps with our knowledge of sameness and difference. It is presumably by applying our innate abilities to form judgements of sameness and difference that we come to some conscious knowledge of sameness and difference.

There is also an important point here to be made about the relation of perception and opinion in the Timaeus. It has been argued that the Theaetetus quite rightly distinguishes between perception, opinion and knowledge. The Timaeus, so the argument runs, wrongly contrasts knowledge with either opinion or perception in a way that suggests that it is making the same contrast in each case, as does the Republic. Thus the Theaetetus must postdate the Timaeus. The position of the Theaetetus, I take it, is that first we have perceptions, we then apply our judgements, and finally we arrive at an opinion concerning them. Consider, though, the way in which the world soul functions, and by implication human souls too. Timaeus 37a ff makes it clear that the world soul first encounters an object, it then determines all its relations of sameness and difference and only then arrives at an opinion. The Timaeus not only follows the Theaetetus on this matter, but the discussion might be thought to develop some of the themes there.

A further important feature of the account of mind in the Timaeus is the way that the structure and abilities of the mind relate to the structure of the world. The world is made up of things that are the same as and different from other things. The world of the Timaeus is also structured in time and space, and is organised by the demiurge [kat' arithmon]. Our minds have a fallible ability to judge sameness and difference, and are able to acquire the concepts of time, space and number. The implications of this for whether we can have knowledge concerning the physical world I shall postpone until we have discussed the flux of the sensible world, and I merely note here that there is an interesting concordance between the structure of the world and the nature of our judgements about it.
III

Let us now consider what the Timaeus has to say on mind and false judgement in relation to the Theaetetus and Sophist. The discussion of the problem of false judgement in the Theaetetus begins from the assumption that there are only two cognitive states, of knowledge and ignorance, with other alternatives left on one side for the moment. Assuming this exhaustive disjunction, Socrates then presents and rejects four possibilities for false judgement. These are that

1) You cannot falsely judge that something you know is something else you know.

2) You cannot falsely judge that something you do not know is something else you do not know.

3) You cannot falsely judge that something you know is something you do not know.

4) You cannot falsely judge that something you do not know is something you know.

I shall refer to these as type 1 - 4 misidentifications. One might well agree with Socrates here, given the bifurcation between absolute knowledge and ignorance, and the assumption J1, that

J1. If something is to be the object of a judgement, it must be known.

It is hard to see how we could make any judgement at all about things we are entirely ignorant of, with types 2, 3 and 4, while with type 1 if we know something absolutely it is hard to see how we err. The necessary condition for making a false judgement, that we know both parties, appears to also be a sufficient condition that we do not mistake one for the other. Socrates claims at Theaetetus 188c that these are all the forms that false judgement can take, and so given the know/ not know bifurcation, false judgement is impossible. Now, we might agree that these are all the forms that false judgements of identity could take, but disagree that this exhausts all possible judgements. In particular, we might be interested in statements of predication as well as those of identity, in misdescriptions as well as misidentifications. There is a
question as to whether Plato at the time of writing the Theaetetus had yet made the distinction between identity and predication. If he had, then perhaps there is a division of labour between the Theaetetus and the Sophist, the former dealing with misidentification and the latter with misdescription.50

One way to try to break the impasse here is to take a semantic approach. While we might agree that we cannot judge that which we are entirely ignorant of, it might be argued that the necessary condition for a mistake, that we know something, is not a sufficient condition for us getting all our judgements about that thing correct.51 Instead of simply knowing the object of our judgement, we might differentiate our knowledge into different things we know about this object. We may then know enough to bring it before the mind without the total knowledge needed to exclude error in judgement of all its aspects. With identity statements in mind, we might also want to invoke Frege's distinction between sense and reference as a basis for distinguishing what we think of from what we think of it as, allowing identity statements to be both true and informative, and not simply trivially or analytically true or false; compare 'the morning star is the morning star' with the 'morning star is the evening star'.

This is not the route that the Theaetetus takes, however. Rather, it treats this as an epistemological problem and suggests other means for the mind to grasp something besides knowledge and ignorance. Instead of distinguishing different senses of propositions with the same reference, different semantic routes from words to things, the Theaetetus proposes different epistemetic routes by which something may be brought before the mind.

Socrates introduces the wax block model of the mind at Theaetetus 191c ff, along with two assumptions, that we cannot fail to know something we do in fact know and that learning, coming to know, is possible. We come to know when a perception is imprinted onto our wax block, and our knowledge lasts as long as that imprint lasts. The attack will focus on type 3 misidentifications, allowing that we may falsely judge that something we know is something we do not know if the unknown element is brought before the mind by perception rather than by the memory/knowledge of the imprint on the wax block. Thus the wax block model proposes two epistemetic routes, perception and memory/knowledge. This means replacing principle J1 with the more generous one J2,
J2. If something is to be an object of a judgement, it must be either known or perceived.

Now we can mistake the man we do not know but perceive for someone we do indeed know, breaking the prohibition on type 3 misidentifications. Other types of misidentification are still ruled out, however. The wax block model is rejected though, because it cannot account for misidentifications where both the terms are imperceptible items, such as numbers. We also need then the distinction between concrete and abstract identifications, where the former deal with perceptible entities and the latter with intelligible entities.

One might also note some further difficulties with the wax block model. Firstly, by what mechanism is it that we acquire our memory/knowledge, the imprints on our wax block in the first place? How, within that, do we initially pick out part of our perceptual field, such as a man, and treat it as a subject of knowledge? By what faculty of the mind do we compare our memories with our current perceptions? Some advantages of the Timaeus account of the mind here is that it tells us how learning and judgement occur ab initio, how we can discriminate within our perceptual field and how we can make comparative judgements. Secondly, one might worry whether talk of matching psychological entities such as the imprints on the wax block with perceptions really gives us an answer to the problem of misidentification. One may feel that it substitutes the relation of matching, which holds between imprints and perceptions for that of identity which holds between things in the world, or terms in a proposition. The Timaeus model treats thought much more propositionally, and so avoids this worry.

The aviary model is introduced with a distinction between having and possessing. A man with an aviary might possess the birds that are inside it, but only be said to have a bird when he has it in his hand. So too with knowledge; if we can possess some knowledge without actively making use of it, so that we can be said to possess but not have it, then our minds may be like aviaries. When we are young, Socrates goes on, the aviary is empty, and learning is the process of acquiring birds and shutting them up in the aviary. Bird hunting (learning) then has two aspects. Firstly, we might seek to acquire a bird for the sake of possession, the initial act of learning. Secondly we might seek for the sake of having, grasping a bird already in the
aviary, hoping to activate the knowledge that we passively possess. True judgement occurs when we grasp the correct bird, false judgement when we pull out the wrong one.

The aviary then attempts to break the impasse on false judgement by allowing us to possess knowledge that we do not actively use all the time, such that we can think of some abstract entities without being said to know them. This gives us the more generous principle, J3, that

J3. If something is to be the object of a judgement, it must either be perceived, be actively thought of using one's knowledge (had), or thought about unknowingly (possessed).

With this we can perhaps break the prohibition on type 3 abstract misidentifications. We can now have both terms of an identity statement before the mind, but can be thinking of at least one of them unknowingly.

However, this proposed solution very quickly runs into trouble. False judgements, the aviary tells us, occur when when we have knowledge of one of the terms of an identity statement but only possess knowledge of the other. Thus abstract entities can be brought before the mind without being actively known. Error occurs because in our attempt to have knowledge of the second term, we seize the wrong bird, and so error concerns solely that which is not actively known. But error in identity statements is infectious; if we falsely judge a to be b we also falsely judge b to be a. That means that we also make an error about the first term, and that is something which we actively know, that we have knowledge of. This objection might also be thought to bite on the wax block model, where we compare the memory that we do know with the perception that we do not.

Considering it to be impossible that we err about something we know, Theaeteus suggests that there may be pieces of ignorance as well as pieces of knowledge flying around inside the aviary. The person who pulls out a piece of ignorance will believe it to be a piece of knowledge instead. How though do we explain this further false judgement which is required to explain the first one? Either we face the four possibilities for false judgement without the distinction between possessing and having knowledge, in which case the aviary is superfluous, or we use it again to create a further aviary, when the
same arguments will apply and an infinite regress will be generated. Thus both the wax block and the aviary models are abandoned.

IV

Our question now is whether the Timaeus' model of mind and false judgement avoids the pitfalls of the Theaetetus. Firstly, let us take stock of our resources. Certainly, we are well provided for in terms of epistemic routes. An important point here is that just as the Theaetetus splits apart perception, judgement and belief the Timaeus seems to go a step further in pulling apart the intellectual analogue of perception, which I shall call apprehension, and knowledge. As we have seen, just as the world soul must apply judgements concerning sameness and difference to the physical entities that it encounters before it attains true beliefs, so it must apply these to what it intellectually apprehends before it attains knowledge. That seems to imply four epistemic routes, namely perception, true opinion, intellectual apprehension and knowledge.

Also at our disposal are some fallible innate abilities which at Timaeus 44a are linked to the occurrence of error and falsehoods. We might usefully compare this passage with the Sophist, in particular where the Eleatic Stranger says

"When statements about you state as different what is the same and what is not as what is, it is very likely that the occurrence of such a combination of verbs and nouns really and truly constitutes false statement." (So.263d)

Timaeus says that if the revolutions that constitute our minds are disturbed, then

"Whenever they encounter some external object, whether it be of the class of the same or the different, then they label it the same as or different from something contrary to the truth, falsehoods and stupidity occur (Tim.43e)

The Timaeus then seems to be in rough agreement with the Sophist on what constitutes false statement and judgement.

Our first question relative to the Theaetetus is whether the Timaeus can give us an analysis of concrete misdescription. On the basis of Timaeus 43e, if we assert that something is the same as something when it is different, or vice versa, we have a misdescription. Given that we can misdescribe concrete entities in this way, then the
possibility of concrete misidentification follows. The Timaeus, I suggest, provides two routes here.

Firstly, even if our innate abilities for judgement are functioning correctly, if we misperceive something we are going to end up misdescribing it. For instance, two objects may appear equal in size when they differ, or vice-versa, due to some trick of perspective. Because of the resulting misperception we may then misdescribe these objects, even though we describe our perceptions of them correctly, and as a result misidentify them. In the Republic Plato has Socrates say

"The same magnitude through our eyes does not appear to be equal close up and far away... the same things appear bent and straight when placed in and out of water, or the concave appears convex due to the errors of our eyes concerning shading, and there are clearly all sorts of confusions like this in our souls." (Rep.602d)

One can formulate an example as follows. Take a stick bent at an angle equal to the refractive index of water. Then imagine two presentations with the stick and observer so arranged that in the first the stick in water appears to be straight, and in the second appears to be bent to twice the angle of refractive index. Then present the observer with three sticks, a straight one, the original one and one bent at twice the angle of the original and ask them to identify which of these three sticks was present in which presentation. Because they misperceive the sticks they will misdescribe them in the first two presentations, and so they will misidentify the sticks in the third.

The Timaeus wants to say something more than this, however, and the manner in which it does so may help to demonstrate the intimate connections between the discussion of the Theaetetus and the proposed model of mind in the Timaeus. Just before our passage at 43e, Timaeus tells us of the disruptions suffered by our mental revolutions, and says that the effect of these disruptions

"Is like when someone sets themselves upside down, with their head against the ground, holding their feet aloft by pushing them against something. In this case right and left both of the sufferer and of any onlookers will appear to be reversed to the other party." (Tim.43e)

On this basis, we make some incorrect attributions of sameness and difference. At Timaeus 46a ff, we are told that mirrors can also make left appear right and vice versa. The essential point here is that in addition and analogously to tricks of perspective and reversal which may mislead us, because the revolutions in us are imperfect our
judgements of sameness and difference are fallible. That allows us to form incorrect judgements concerning things that are not perceptually deceptive. This generates a second source of misdescriptions which greatly extends the number of possible scenarios where they may occur, allowing each of our perceptions to be misdescribed.

It is interesting that the Theaetetus alludes to the same sort of example as the Timaeus in its discussion of false judgement, though without drawing the same conclusion. In the discussion of the wax block in the Theaetetus, Socrates tells us that

"The possibility of false judgement remains in the following manner... it may be that I am in error suffering as sight is affected by a mirror, left changing into right. In such a case other judging and false judging happen." (Tht.193c)

One point on which the Timaeus might be thought to advance beyond the Theaetetus and the Sophist is in providing a model of the mind which is consonant with the epistemological and semantic insights of the Theaetetus and Sophist and allows plausible false judgements and statements to occur.

How might this deal with the standard example from the Theaetetus, that of mistaking a person in the distance, who is in fact say Theodorus, for Theaetetus? The Timaeus account would suggest that either we misperceive the person in the distance, or that we misjudge our perception of them, in either case making an error in our attributions of sameness and difference. On the basis of this misdescription we misidentify the person in the distance as Theaetetus instead of Theodorus.

Thus we have two sources of error that will lead us to plausible misidentifications. Now if we describe correctly an object that we misperceive, there is of course a sense in which we do not misdescribe it, though as the description will not be accurate it must be a misdescription. Similarly with misdescriptions and misidentifications; we correctly identify our misdescription with something, though not the object we are describing. Thus our errors of misidentification are plausible and not crass. We may thereby have identity statements which are false, but are not manifestly false, and carry some genuine information. They are of the form $a = b$ (the man in the distance is Socrates), and are plausible because our error of misdescription, caused by misperception or misjudgement of perception, occurs before we come to
consider such a statement. In line with what Socrates has to say at Theaetetus 190b ff though, judgements like 'the odd is even' or 'a horse is a cow' are still implausible, the sort of thing that 'no-one in their right mind or out of it' would judge to be so. It may of course be the case that we can deliberately misidentify in this way, or perhaps deliberately misdescribe. However, I take it that Plato's main concern is to explain how convincing cases of misdescription arise where we believe ourselves to have acted to the best of our ability but have in fact been (correctly) describing a misperception, incorrectly judging a perception, and then (correctly) identifying a misdescription.

V

The wax block model of the Theaetetus was rejected because although it might deal with cases of misidentification where perception is involved, it could not deal with the misidentification of imperceptible abstract entities. Our next task then is to see what the Timaeus model may have to say on this matter. The Timaeus as we have seen espouses a different and perhaps still more generous approach to judgements, and gives us J4:4. If something is to be the object of a judgement, it must either be perceived, opined, intellectually apprehended or known.

The question is how much difference does this principle make in a treatment of abstract misidentification? One thing here seems clear, which is that intellectual apprehension is meant to be in some ways an analogue of physical perception. This suggests that we should approach the problem of abstract misidentification along similar lines to the solution of concrete misidentification. Firstly, then, is abstract misdescription possible and if so how is it possible?

The analysis of misdescription in the Sophist and the Timaeus is indifferent to whether its objects are abstract or concrete. A misdescription along these lines would be the incorrect attribution of sameness and difference to an abstract entity.

So how do abstract misdescriptions come about? Again, we might split this into external and internal factors. We might misapprehend because we hear an illusory but convincing argument, that is there is something deceptive about what we encounter. One might think here of the comment that Socrates makes about Zeno in the Phaedrus
"Don't we know that the Eleatic Palamedes has an art of speaking such that things appear to be like and unlike, one and many, still and yet moving?" (Pdr.261d)

That, I suggest, is an intellectual analogue of a misperception. Another important passage in this context is Sophist 234b ff. Here an analogy is drawn between a deceptive drawing, which may appear at a distance to be what it represents, and the sort of arguments put forward by the Sophists, which may deceive those who are still young and are 'standing at a distance from the truth of the matter'. As with the correct description of misperceptions, we might then correctly describe a misapprehension and arrive at an abstract misdescription. The second route here is an analogue of the incorrect description of the things that we correctly perceive. One important factor of the Timaeus' model of mind is that we apply our capacities for judgement to that which we intellectually apprehend, and because the capacities are fallible we may make errors in attributing sameness and difference to the ideas that we are trying to grasp. There are several English phrases which seem particularly apposite to the sort of sensible analogues that Plato uses for intellectual apprehension. When we come across an idea but get it wrong, thinking in relation to the example of Timaeus 43e, we might say that we got the idea 'upside down' or 'the wrong way round', or perhaps thinking in relation to Republic 602d ff that we got the 'wrong end of the stick'.

The example of abstract error given in the Theaetetus that this model of mind and false judgement has to deal with is $7 + 5 = 11$. I would suggest that there is one way a great deal of similarity in the way that the Theaetetus treats concrete and abstract misidentifications. With concrete misidentifications, perception is treated fairly transparently; what we perceive goes straight into the terms of the identity statement, with little discussion of the process. Now the equation $7 + 5 = 11$ can be thought of in two ways, as

1) $7 + 5 (=12) = 11$
2) $7 + 5 (=11) = 11$.

The first presentation treats the left hand side of the equation as transparent and concentrates on how we might ever think that $12 = 11$. This is the way that the Theaetetus discusses the problem, and is in
some ways analogous to its treatment of concrete misidentification.\(^79\) (2) on the other hand suggests that we ought to concentrate on the left hand side of the equation and consider ways in which we might come to believe that 7 plus 5 equals 11. Now while the Timaeus does not go through this or any similar problem, the discussion of the soul is very suggestive of ways in which we might go about solving problems here. In line with his PWP, Plato is perhaps suggesting frameworks for the solution of problems which we the readers must employ ourselves in order to fully understand both the framework, the problem and the solution.

If we are to follow through the analogue with how concrete misidentifications were dealt with, then either we misapprehend or misdescribe our apprehension of the elements of the left hand side of the equation. There would seem to be little that is intrinsically deceptive about 7 and 5 that might provide an analogue of misperception, though as Theaetetus points out this example is meant to apply to all numbers,\(^80\) and we might well be able to think of some more complex numbers which do have deceptive properties.\(^81\) More likely the error is ours, such that when we come to think of 7, 5 or 7 + 5 we muddle our attributions of sameness and difference and end up with the answer that 7 + 5 = 11, without the thought that 12 = 11 entering our heads. Here we do not explain one misjudgement by another, as with Theaetetus' pieces of ignorance, but give a mechanism by which the intitial mistake is made. This explanation is then invulnerable to the regress argument that finally wrecks the aviary model.

The model of mind advanced in the Timaeus seems to be sophisticated relative to the arguments of the Theaetetus and the Sophist. Here may lie some further arguments for a late dating of the Timaeus. That the Timaeus often gives us the right resources in the right context without any argument or discussion might well be taken to imply that the Timaeus was composed at a later date. If the Theaetetus follows the Timaeus, it seems very odd that it avoids a discussion of false judgement in terms of sameness and difference and that it entirely ignores the model of the mind advanced in the Timaeus. As I have suggested, one of the most intriguing aspects of the Timaeus is that in its attribution of innate abilities to judge sameness and difference it may develop the discussion of common natures at Theaetetus 184-186.

VI

The main aim of this chapter has been to develop the epistemology
implicit in the analogy between the world soul and the human soul. This 
epistemology contradicts that of Timaeus 27c-29e on the points that in 
chapter four I argued we should be most suspicious of, the [sungenes] 
structure for explanation and the pessimistic view of investigation. 
What is more, the suggestion that both the world soul and, given proper 
nurture, ourselves can have stable and true opinions of physical matters 
undercuts the very basis for telling a likely story, that one can only 
expect a likely account of a likeness. Either we accept that the Timaeus 
is hopelessly confused, or, as I suggested in chapter four we treat it 
as challenging us with new hypotheses which it is up to us to judge the 
worth of. Certainly we cannot simply dismiss this alternative 
epistemology as it is so intimately bound up with the Timaeus' account 
of the mind. That account, I have argued, is one that is sophisticated 
relative to the Sophist and Theaetetus.

This alternative epistemology is closely linked to the new ideas on 
the regularity of celestial motion. One important aspect of this is 
that one cannot argue against my attempts to show that the world of the 
Timaeus is a considerably more regular and comprehensible place than the 
worlds postulated in earlier Plato that this new comprehensibility 
outstrips the somewhat pessimistic epistemology of that work. On the 
contrary, the new epistemological suggestions seem entirely consonant 
with such a world. How much more optimistic this alternative 
epistemology is is a question I shall return to in chapter nine, as 
there are other important matters to be investigated before any proper 
conclusions can be drawn here.

Firstly, we need to know more about the nature of flux in the 
Timaeus. Orthodox accounts here might be thought both to support the 
orthodox epistemology and provide problems for the idea that the heavens 
moves in a regular and stable manner. In the next chapter I shall argue 
that the flux postulated by the more sophisticated hypotheses in the 
Timaeus is not as radical as is sometimes thought. The next chapter 
shares a division of labour with its successor to some extent. In it I 
argue that against the earlier TW view, Plato allows some stability and 
being to particulars. In the following chapter on developments in the 
theory of Forms, I argue that later works complement this by allowing 
for certain sorts of changes to the Forms, again breaching the 
strictures of TW.
NOTES TO CHAPTER SIX

01) See my next section on the translation of [ousia] here.

02) Cf. Thet.189e ff, So.263e ff and Plb.37 ff on the relation of judging as silent statement and statement as spoken judgement.

03) See my discussion of [logos] in the Tim. in ch.4.

03) There is a question here as to whether this 'pair' refers to intelligence and knowledge or to (opinions and beliefs) and (intelligence and knowledge); see Cornford (1937) p96 n.1.

04) None of the major commentaries accord this passage any special significance, although it would seem to make a very important statement about the nature of the world soul and by implication about the nature of the physical world. It is interesting to note relative to the Thet. (esp. 201c ad fin) that even if the world soul can determine all the relevant relations of sameness and difference correctly, it still does not have knowledge but only a true and stable opinion.

05) As described by Timaeus at 37d-40d, where he concludes "Therefore let this be sufficient for us, and let our account of the nature of the visible and generated gods come to an end" (Tim.40d).

06) See Tim.41c ff.

07) See Tim.41d ff, and for the previous mixing of the world soul 35a ff. This non-uniform mixing might be used to account for innate differences in intelligence, though note in what follows that everyone has an equal chance to better themselves and to be good, such that the demiurge is blameless for any of the woes that subsequently befall mankind; cf. Tim.42d. One might also compare this with Thet.194a ff, the description of how variations in the composition of our wax blocks may account for variation in learning and retention abilities and in the ability to form true and false opinions. Plato clearly wants a model of mind that will allow explanations of personal intellectual differences.

08) See Tim.41e ff. The appropriate number of souls is one per star.

09) As it is not mentioned who performs this process, I think we have to assume it is done by the demiurge.

10) See Tim.42e ff, a passage that I shall examine in detail in the next chapter as it is rich in implications for the nature of flux in the Tim.

11) Our sensations are due to motions in our bodies which are set up by its contact with fire, earth, water and air impinging on the soul; see Tim.43c ff.

12) See Tim.42a ff. As well as desire, fear and anger, mortals are subject to "All such emotions as follow with them, and all that are of a contrary nature."

13) See Tim.42b.

14) Cf. Tim.34a, 47c, 90cd. Cf. my arguments in ch.5; the motions of the
heavenly bodies constitute the world soul, which is perfectly rational and imperturbable, the motions of the heavens are perfectly regular.

15) See Tim.43b.

16) See e.g. Tim.43d. Note the world soul immediately begins intelligent life, Tim.36e, as its revolutions are initially perfect unlike those of newly born humans.

17) The Tim. suggests both that there is a natural tendency for the orbits to settle down (Tim.44b) and that it is our job to help them do so as far as is possible (Tim.44c), by mastering rather than being mastered by our perceptions. Note how this relates to the moral injunction of Tim.42b; if we can master our emotions we can become just, if we can master our perceptions, we can become rational.

18) This translation of [holokleros hugies te pantelos] as 'perfect and entirely sound in mind' is justified by comparison with the state of the negligent who have to return to Hades (see following note), who are left [ateles kai anoetes], 'unperfected and lacking in intelligence'.

19) But woe betide the indolent; Timaeus continues "Should he be neglectful, he lives a lame existence, he returns to Hades unperfected and lacking in intelligence" (Tim.44d).

20) The importance laid on astronomy here as the subject which will bring our minds closer to the ideal of the world soul may go a long way to explaining the central and otherwise somewhat disproportionate role that astronomy is given in education in the Epin; but cf. Tim.90cd for comments similar to those found in the Epin, and Le.966e ff.

21) Cf. Tim.90cd where a similar theme is expressed. There is of course an important parallel and contrast here with Rep. VII; in both Plato first treats eyesight and then moves to draw conclusions about hearing. In the Tim. he continues "Again, the same account applies to both sound and hearing, as they were given by the gods with the same intent and purpose" (Tim.47c). Cf. esp. Rep.530d, "As our eyes are framed for astronomy, so are our ears for harmony, and these two are in some way kindred disciplines".

22) Note the plural [tas en hemin peplanememas]. This might refer to the seven orbits of the different, but the general sense of the passage would seem to point to it referring to both the same and the different.

23) The theme of [bebaiotes], 'fixity' or 'security' plays an important part in later Plato; cf. Plb.11e, 14c, 15b and 62b, So.250c, the discussion of the Crt. concerning the fixity of names (and the digression of Ep.VII), and MacKenzie (1986a) p141/2. I shall discuss this in more depth in ch.7 when we come to examine the nature of flux and what sort of names should be applied to the things that are in flux.

24) Though not contrary to the spirit of the Grg, Men, and Pdo concerning investigation in general; see my ch.4.

25) So too the 'as being is to becoming so truth is to opinion' stricture comes under attack; my ch.9 will discuss this more fully.
26) When the world soul interacts with anything, it announces internally 'what it is the same as and different from, in what respect' (Tim.37a9); cf. Tim.44a2 where human souls judge things wrongly to be [tauton toi kai thateron tou], 'the same as and different from'.

27) It might be argued that So.255c ff explicitly distinguishes between one and two place predicates, although I tend to the view that the distinction there is between the 'is' of identity and the 'is' of predication; cf. Owen (1971) and Reeve (1985) p54/5, Cornford (1935) p282-5, Malcolm (1967) p143 n.24. Cf. Bostock (1986) p49-51 and 181-3 on properties and relations in the Pdo.

28) For complete uses, see Tim.35a and passim, for incomplete see Tim.37a and 44a.

29) See Tim.37a ff, 44a ff.

30) At Tim.35a, I suggest [einai] is being used existentially, the point being to mark off soul as something that is neither physical nor indivisible nor incapable of real change as the Forms are (see ch.8 on real vs 'Cambridge' change in Plato). Its use at 35b however may be of the 'condensed two-place' type so attributing an innate ability to the world soul. A less speculative, but less intriguing view is that we are attributed an ability to judge existence.

31) Plato treats thought and judgement as if they have the logical characteristics of speech and assertion; cf. Tht.189a ff, So.263e ff, Burnyeat (1991) p84/5.

32) On this account Plato recognises the relational nature of sameness and difference and their incomplete use is a metaphorical way of attributing to us an ability to make judgements of them.

33) See e.g Plb.38c5 ff and the discussion of what we can see at a distance; note though that Plato's concern there is to develop accounts of what we can visualise.

34) See my ch.1 on the drawbacks of pictures as discussed in the Pdr.

35) Perhaps the clearest statement of this is at Tim.77bc, where we find that the third kind of soul seated in the midriff, in distinction to the revolutions in our heads, "Inasmuch as it continues to be entirely passive, and does not revolve of itself or repel external motion it has no capacity for reasoning about its own experiences."

36) I side with Cooper (1970) p123 ff against Cornford (1935) p102-109 that the main contrast at Tht.184-186 is between perception and judgement rather than objects of opinion (sensibles) and objects of knowledge (Forms).

37) While recollection may tell us how we acquire knowledge of sameness and difference, it is notable that it has little to say about the application of these to our perceptions; possibly because recollection is rejected before Plato comes to a distinction between perception and opinion and the requirement that we apply common ideas to perception before we can have belief.

38) See Tht.185a, 185c.
39) See Tht.185b, 185c.

40) See Tht.186a.

41) Cf. Epin.978b ff, which if anything is even clearer and more forthright on this matter.

42) I do not want to suggest that Timaeus is giving us an exhaustive account of the mind here, merely one of its rational functioning.

43) See Bostock (1988) p147 ff, esp. p149. Bostock connects the optimism of the Tht. with a change of attitude to being, becoming and flux. The Tht. according to Bostock attacks the flux of the Tim. and allows being to impermanent objects, thus allowing knowledge of them. In ch.7 and 9 I shall argue that the flux of the Tim. is not as radical as is often supposed, and allows being to physical entities.

44) See my ch.5 on this matter.

45) See my ch.7. In ch.9 I also discuss the relation of the receptacle to the sort of thinking that the world soul does.

46) It would seem that Aristotle took the main thrust of Plato's account of the soul to be along these lines too. In his critique of Plato's view of the soul in the de Anima, he states that "In the same manner Plato in the Tim. constructs the soul out of the elements [ek ton stochlein]. For he believes that like is known by like, and that things are formed from these elements [ek ton archon]" (De Anima.404b16, cf. 406b25 ff). Cf. So.254a ff.

47) See Tht.188a ff. Theaetetus believes there to be no third alternative anyway, possibly because he has already identified knowledge and true judgement.

48) See Tht.188b ff.

49) See Burnyeat (1991) p75 here on the relation between this principle and one maintained by Russell.

50) See Burnyeat (1991) p72/3, (cf p 79/80), and cf. Williams (1972), Fine (1979b), and Owen (1971). If Plato has not made this distinction, then perhaps it is the work of the So. to sort this matter out. I shall argue that the model of mind and false judgement advanced by the Tim. caters for both misidentifications and misdescriptions.

51) The attack thus focuses on principle J1, and on to what extent we must know something before it can be an object of our judgement.

52) See Socrates' long speech at Tht.192a ff.

53) See Tht.195e ff.


55) See Tht.209b ff on discrimination. If I am correct that recollection is rejected, it is no surprise that the model of mind in the Tim. pays great attention to learning ab initio and to providing a model of intellectual growth.

57) Cf. Tim.37b, Tht.189e ff, So.263e ff and Plb.37 ff, on a statement being a spoken judgement and a judgement a silent statement to oneself.

58) See Tht.197b.

59) See Tht.197c ff.

60) See Tht.197e ff.

61) See Tht.198cd.

62) See Tht.199b.

63) It is worth noting that this attempted solution is still very far from the modern approach which might analyse our knowledge of something into different aspects and distinguish between what we know and what we know it as. The position is still that if we actively know both terms of an identity statement, then it is not possible for us to make an error. Type 1 misidentifications, where we might falsely judge that something we know is something else we know are still ruled out.

64) See Tht.199cd.

65) See Tht.200b ff.

66) The Tim. as we have seen takes the common later period line that a statement is a spoken judgement and a judgement a silent statement made to oneself.

67) There is of course a debate here between Cornford (1935, 1937), Owen (1953) and Cherniss (1957a + b) on the order of the So. and Tim. Owen's central point (1953 p328/9) is that it can be proved the analysis of negation of the So. had not been worked out by the time that the Tim. was composed, as the tenet on which the So.'s account of negation is based is "Contradicted unreservedly by Timaeus' assertion that it is illegitimate to say [to me on esti me on]" (Tim.38b2-3). According to Owen, the So. argues that 'in the only sense which can be consistently allowed to [me on]' this is a wholly correct thing to say. However, Timaeus does not say that such a use is illegitimate, but rather that it is inaccurate [akribes] (38b3), and that it is not fitting at the moment to enquire closely [diakribologeisthai] (38b5) into these matters. It is also not clear that Plato's reference here is to the precise use of these words, as in the So. I agree with Cornford (1937) p98 n.3 that [ta tolade] at Tim.38a9 is remotely governed by [legomen] at 37e5, such that all the following 'inaccurate' phrases may be those of 'we say' common usage, rather than the So.'s philosophical precision, which it may not fitting to pursue at the moment. The Tim.'s attitude to negation is not clear from this passage or any other. Perhaps though one might argue along the following lines. The So.'s analysis of negation is undertaken specifically in order to be able to specify the nature of false statement (see So.240a ff), such that this presupposes the analysis of negation in terms of difference. The Tim, being primarily concerned with the nature of mind rather than of negation, picks up the So.'s analysis of false statements, and by implication the analysis of negation that it presupposes. That is hardly clinching, but there is little evidence
either way to decide the Tim.'s attitude to negation relative to the So.

68) Cf. Plb.42a, where different distance is said to affect the judgement of size leading to false judgements, Plb.38c where we may mistake a carving for a shepherd, and So.234b ff on drawings seen at a distance that may deceive. A point I shall return to is that these are tractable difficulties; as the Rep. goes on to point out, we have measuring, numbering and weighing to obviate these difficulties; cf. my ch.5 on the differences between the Rep. and the later dialogues on the application of number to the world.

69) One might note that the same confusions caused by mirrors (reversed, Tim.43 and 46a, or upside down, Tim.46b) have their analogues in the disruptions of the motions of the same and different, which are "At one time reversed, at another sideways, and at times upside down" (Tim.43d).

70) Cf. So.266c ff, where the mirror image example occurs again, this time in the discussion of images that follows the solution to the problem of false statement and judgement.

71) Cf. Plb.38c.

72) One might compare here the sources of error in the Tim. with Tht.194c ff which discusses the way in which the quality of the wax may lead to error. The Tht. does not discuss deceptive perceptions, however, and the interesting thing about the Tim. is that the sources of error by misperception and misdescription due to the imperfection of our mental revolutions is applied to the abstract as well as the concrete.

73) A key point of this analysis is that we are not required to make an abstract misidentification in order to make a misdescription. That is, we do not mistake straight for bent and substitute one for the other in our thought; the sources of error are lower down the cognitive ladder. Thus error in these plausible identity statements is not infectious, because in a sense there is no error here. Nor is the Tim. model prone to one of the objections against the wax block model, that of substituting the matching of psychological entities, perceptions and imprints, for the relation of identity.

74) On the Tim. model, a deliberate misdescription would have to occur after our initial perception and judgement.

75) In line with his FWP, Plato is more suggestive than explicit here. What follows is an attempt to investigate the implications of treating intellectual apprehension analogously to perception in relation to error. Plato provides the tools, and sometimes it is up to us to do the spadework.

76) Cf. So.253d ff; the job of dialectic is to discern which Forms intermingle and which do not. One also thinks of Simmias and Cebes at Pdo.85e ff, both of whom are merrily engaged in misdescribing an abstract entity, namely the soul.

77) Cf. e.g Le.663b.

78) This may be why the suggestion of Tht.193c relating to mirrors, etc, in relation to error does not get us far in the Tht.
79) See e.g. Th.196a ff

80) See Th.196b.

81) Larger positive integers allow more room for mistakes, according to Theaetetus (Th.196b). In addition, one might think of some more complex mathematical entities which might well be thought to have some deceptive properties; square roots (especially irrational ones), negative numbers, complex numbers, let alone such oddities as e and pi.

82) Perhaps inextricably linked as the entirely rational thoughts of the world soul are the celestial motions.
CHAPTER SEVEN

CHAPTER SEVEN

FLUX AND LANGUAGE IN THE TIMAEUS

As indicated earlier, one serious objection to the theory that the Timaeus advocates regular and stable celestial motion is the question of flux. Put bluntly, how can the heavens be stable when everything physical is subject to an apparently radical flux? Here I shall argue that the flux of the Timaeus is not so radical as is sometimes supposed, and allows for the temporary, and in the case of the heavens, the permanent stability of physical entities. In line with my view of Plato's PWP, I argue that the Timaeus delineates several possibilities and provides us with some criteria for candidates to fill, leaving us to do some of the work ourselves rather than giving an outright statement of cosmology.¹ My account of flux will link up with my account of the Timaeus' alternative epistemology via the questions of language and explanation. This is a process that Plato seems to be provoking; the theme that brings these elements together is the relation of stable accounts to stable language to stable entities. I also deal with some further matters relating to the relative dating of the later works.

I

Let us begin with a distinction which the Theaetetus makes between two sorts of change. Socrates says that

"What I want to enquire is this; do they say that there is only one kind of change,² or, as it seems to me, that there are two?.. Do you call it change when something exchanges one place for another, or spins around in the same place?... Let this then be one form of change. But when something remains in the same place, but grows old,³ or becomes black instead of white or hard instead of soft, or undergoes any other sort of qualitative change [alloiosis], isn't it right to say that this is another form of change?.. There are then two forms of change, change of quality [alloiosis] and change of position [phoran]⁴."

(Tht.181c)

Given this distinction, we might also distinguish between two quite different theories of how things change. I shall term these theories of fundamental flux and of fundamental stability. The issue which divides the two is whether the most basic elements out of which the world is constituted are subject to qualitative change or not.
A theory of fundamental stability postulates some basic entities which do not undergo any qualitative change, and locates all qualitative change with complexes of these basic entities. Take a possible 'O' level physics view of the world. According to this there are three types of elementary particles, electrons, protons and neutrons, which are the exhaustive physical constituents of more complex entities such as atoms and molecules. These elementary particles change velocity and position, and enter into bonding relations with each other, but do not undergo any qualitative change themselves. Complex entities which are ensembles of these basic particles on the other hand, such as atoms or molecules or clouds on a windy day may indeed be said to be in qualitative flux.

A theory of fundamental flux denies that there are any basic entities which are not subject to qualitative change. The position ascribed to Heraclitus in the Theaetetus is clearly one of fundamental flux. Socrates poses a hypothetical question for the Heracliteans

So "Do you hold that everything changes in both ways, changing both in place and in quality [pheromenon te kai alloioumenon], or that some things partake of both, and some only one of the two ?..

Th "By Zeus, I don't know what to say; I suppose they would say both."
So "If they did not, my friend, then it would seem that things are both in motion and standing still, and it would be no more correct to say that all things move than all things stand still... then since it is necessary for them to change, and since it is not possible for something not to change in every way, all things are always suffering all kinds of change." (Tht.181d)

So too, one might argue, the flux described in the Cratylus is a fundamental one. I have no disagreement with this, but I shall argue that the flux described in the Timaeus is one of fundamental stability. A second way of setting up the contrast here would be to employ a distinction that the Sophist uses between change relative to itself and change relative to other things. This would bring us close to Irwin's distinction between aspect (a-) change and self (s-) change. The following arguments are intended to establish that in the Timaeus there are some entities which undergo no change of quality, no change in relation to themselves and no s-change as defined by Irwin.

The first task is to locate the basic entities. Timaeus says concerning earth, air, fire and water that

"No-one has as yet revealed their generation, but we speak as if we
know what fire and each of them are, postulating them as the basic principles [archas] of the physical universe, although it is not fitting for them to be in any likelihood compared to syllables, even by a man of little insight." (Tim. 48b)

This might be read as a rejection of the letters and syllables analogy which commonly occurs in later Plato. However, if the two most basic types of triangle that Timaeus postulates are taken as the letters, and the atomic faces they go to make up are the syllables, then the atoms will indeed not be syllables, although the letters and syllables analogy may still apply. This view is supported by Timaeus 54d6, 55a8, 55b4, 57c9 and 61a7, where the two most basic types of triangle are referred to by the substantive [stoicheion]. This is important as [stoicheion] carries the general sense of 'the simplest component part' (LSJ), and a more specific sense in Plato of letter as opposed to [syllobe], 'syllable'. I shall refer to these two basic types of triangles as the 'stoicheic triangles', and the compound triangles that are atomic faces as 'complex triangles'.

One might object that although Timaeus talks of the stoicheic triangles as the [archai] of the more complex triangles, he also goes on to talk of higher [archai]. At 48c3 he speaks of "the [arche] or [archai] of everything", and later, referring to the theory of stoicheic triangles he says that

"These we hypothesise [hupotithemeta] as the principle [archen] of fire and of the other bodies... but the principles [archas] of these which are higher [anothen] are known only to God and whoever is friendly to him." (Tim. 53d)

These higher principles need not refer to some more basic physical entities, however. It is notable that Timaeus refers here to higher [archai], principles or starting points, rather than to further [stoicheia]. At the termination of explanation in terms of analysis by decomposition into physical elements, one option for Plato is to switch to a teleological analysis. These higher [archai] then may be teleological explanations of why the stoicheic triangles are as they are. One interesting aspect of the passage at Timaeus 53d is that the use of [hupotithemi] and [anothen] is highly reminiscent of Phaedo 101d, the line allegory of the Republic, and the defence of hypotheses by higher hypotheses. One need hardly stress that the Phaedo and the Republic are not looking for further physical hypotheses at this point.
The final clause concerning the man friendly to God might also suggest some intention to invoke explanations in terms of the Good. When we look at the sort of arguments that Timaeus uses to justify his choice of stoicheic triangles this is born out. At Timaeus 54a ff, we are told that while the isosceles triangle has but one form, the scalene has many and we must postulate the fairest, and teleological language permeates this entire section. It is likely then that the stoicheic triangles are the most elementary constituents of the physical world of the Timaeus, without being the ultimate explanatory [archai].

Are the stoicheics subject to any qualitative change? For the theory of change of Timaeus 53c ff to work, no change in the stoicheic triangles is required and none is mentioned. Qualitative physical change is analysed solely in terms of the composition of stoicheic into complex triangles and these into atoms, and the converse decomposition.\(^{17}\)

Timaeus 54c ff is important in this context. We are told that while air, fire and water may transmute into each other, they may not transmute into earth, and vice versa, as the first three are constructed from scalene triangles while earth is made from the isosceles. Now if there were some further constituents that the stoicheic triangles could be broken down into, then one could decompose, e.g., fire into complex triangles into stoicheic scalenes into constituents, and recompose into stoicheic isosceles', the square complexes of these, and then earth, and vice versa.\(^{18}\) Now there are other types of qualitative change apart from decomposition, but there is no evidence in the Timaeus to suggest that the stoicheic triangles are subject to any sort of qualitative change.

II

If it is the case that the stoicheic triangles of the Timaeus are qualitatively stable, then there are some interesting consequences. The theory of human ageing tells us that the bonds which hold the constituents of our bodies together have the power to last only for a certain time, and that as these begin to fail, so we slip into decrepitude.\(^{19}\) The sort of flux to which the atoms and complex triangles are subject is not then the radical flux which would have them possessing a quality at time \(t\) and not possessing it at \(t + 1\), but a rather gentler variant. This is important because it allows the physical world a large measure of stability, how much depending on how strong the 'power to last' is. In relation to this, if we examine what the Timaeus
has to say on how human beings and the heavens are produced, we find something very interesting indeed. Timaeus 42d ff tells us that the task appointed to the demigods is to fashion the bodies of human beings. We are then informed that

"Taking the immortal element of mortal creatures, imitating their own fashioner, and borrowing from the cosmos portions of fire, earth, water and air on the condition that this loan should be repaid, they cemented together what they had taken, though not with the indissoluble bonds [altois desmois] with which they themselves were held together, but with well constructed bonds invisible because of their smallness, they fused them into one mass, creating out of all these one body for each, thus clothing the revolutions of the immortal soul in bodies subject to egress and ingress."20 (Tim.42e)

So while the constituents of our bodies are put together with dissoluble bonds, those of the demigods have indissoluble bonds. Our bodies will be subject to a gentle flux, while those of the demigods will be entirely exempt from flux in terms of qualitative change. The embodiment of these demigods though is in the heavenly bodies. Earlier in his discourse, Timaeus told us of the generation of the planets, and stated that

"When each of the bodies required to help in the production of time had been brought into its proper motion, as generated living creatures having their bodies bound with living bonds and having learnt their duties, they moved according to the motion of the different." (Tim.38e)

Now one might attempt to draw a distinction here between the planets as living creatures and the fixed stars as demigods, but in fact the two terms are used interchangeably of each. Timaeus 40b talks of the fixed stars as living creatures while 40cd talks of the planets as demigods. The stability of the heavens is guaranteed by the qualitative stability of the stoicheic triangles allied with the 'indissoluble bonds' with which they are bound together. Through the mechanism of the variable durability of the bonds between the stoicheic triangles and between more complex entities,21 the Timaeus' theory can then account for any degree of qualitative flux at the perceptual level, up to and including the total stability of the heavens.

III

One objection to the idea that the stoicheic triangles undergo [phora] but not [alloiosis] might be based on the theory of ageing of Timæus 81

169
According to this, ageing and natural death are to be explained by the gradual deterioration and consequent loss of function of the particles which constitute the body. One interpretation is that it is the qualitative change of the stoichecic triangles that is at the root of this sort of deterioration. I shall argue that there is an alternative (and better) interpretation here, whereby at most it is the bonds between stoichecic triangles which deteriorate. Timaeus begins his discussion of ageing by saying that

"When the organisation [sustasis] of the whole animal is new, the triangles [trigona] which constitute the atoms being 'fresh off the stocks' [ek druochon], they have strong joins between one another [pros allela]." (Tim.81b)

It is important that the bonds that Timaeus is describing here are [pros allela]. These must be bonds which bind either stoichecic or complex triangles to each other, rather than any bonds internal to the stoichecic triangles. That the stoichecic triangles undergo change in their bonding relations does not entail that they undergo any change of quality.22 We are subsequently told that

"When the bonds of the triangles loosen due to having contested many battles in a great amount of time... finally the bonds fitting the triangles of the marrow together no longer hold out against toil, but separate." (Tim.81c)

At this point death occurs. If these bonds are [pros allela],23 then the ageing process can take place without any qualitative change of the stoichecic triangles.

Returning to 81b, one might take the view that as the triangles are 'fresh off the stocks'24 they have been newly created. However, if we build a wooden boat the wood does not undergo any change qua wood; it is merely reorganised from loose timber to a boat.25 The wood may then be 'fresh off the stocks' without having undergone any qualitative change in itself, and so too perhaps with animals and stoichecic triangles. The verb that Plato uses in this context may support this approach. This is [sunistemi],26 which has more of a sense of ordering that which is already existent than of creation de novo. It is notable that this verb is used in the earlier discussion of atomism for the formation of atoms and complex triangles out of complex and stoichecic triangles respectively,27 where no change in the stoichecic triangles is required or mentioned.

170
Even if we were to take [ek druochon] as signifying some qualitative change, it is not clear that it is stoicheic triangles that do the changing. If the referent of [trigona] at 81b6 is complex triangles, these can pass into and out of existence without prejudice to the stability of the stoicheics. The correct referent of [trigona] is a problem which runs through the entire discussion of ageing. Certainly there are some uses here that can only be references to complex triangles, e.g. Timaeus talks of "The purest type of triangles, smoothest and oiliest" (Tim.82d). As there are only two types of stoicheics, and they could not be described as smoother or oilier than one another, this must be a reference to complex triangles. So too at 81d, where we are told that the process of nutrition involves the triangles of the body cutting and assimilating incoming triangles. That is fine if the reference is to complex triangles, but cutting up stoicheics, as argued in the previous section, is likely to lead to a breach of the rule that earth cannot transmute to air, fire or water and vice versa.

Now it may be that the reference of [trigona] slips between stoicheic and complex triangles. However, in the earlier discussion of how the complex triangles are formed from the stoicheics at Timaeus 53c ff, Plato always has Timaeus carefully mark the distinction between the two, opening each discussion of the stoicheics with an explicit reference to their nature. As some of the references of [trigona] in the discussion of ageing are clearly to complex triangles, and there is at no point any distinction drawn between these references and any other, one might conclude that all the references of [trigona] in the discussion of ageing are to complex triangles.

We now have two tools which work in harmony for analysing statements such as

"For plainly in the beginning the triangles [trigona] of each animal are organised [sunistatai] with the power to last only up to a certain time." (Tim.89c)
In all likelihood [sunistemi] refers to the organisation of existent particles, and [trigona] to complex triangles. So it is complexes of stoicheics which undergo qualitative change, which is consonant with the idea that it is the [pros allela] bonds that are subject to temporal limitations.

On this interpretation, the 'biochemical' processes of ageing and nutrition are merely specialised cases of the more general 'chemistry'
that is discussed at Timaeus 53c ff. They require no more than the division and reconstitution of atoms and complex triangles. In this respect one might note the similarity of the battling imagery between Timaeus 53c ff and 81b ff, as well as the similar uses of [sunistemi].

If the theories of ageing and nutrition require something beyond the general theory of chemistry, one would expect this to be marked and discussed. There is no mention of change in the stoicheic triangles and good reason in the ban on the transmutation of the scalene and isocoeles triangles to believe that no such change occurs.

IV

A different objection might base itself on the 'gold example' of Timaeus 50b ff. Timaeus tells us that

"If someone were to mould all the shapes out of gold and without stopping remodel each of these into the rest, then if he should point one of them out and ask what it is, by far the safest answer in truth would be that it is gold, but as for the triangle and the other figures that occur, it would be wrong to describe them as having being, as they change even as we state them, and we should rest content if they willingly receive the description of the suchlike with some safety. The same account applies concerning the nature of that which receives all bodies. It must always be called the same; for it has no ability whatsoever to depart from its own character, since it receives all things and in no way whatsoever takes a shape like to any of the things that enter into it. In nature it is laid down as a matrix for everything, changed and patterned by the things that enter it, and on account of these appears to be different at different times." (Tim.50b)

If we read this such that the stoicheic triangles are on a par with the things moulded out of gold, then there are obvious difficulties for a theory which states that they are qualitatively stable. However, it is not necessary to read the gold example in this manner, and it is important to note that the ideas of atomic sub-structure and stoicheic triangles have yet to be introduced. Perhaps, in line with what I have argued about Plato's PWP, we might take the gold example as a framework for analysis rather than as a direct statement of cosmology.

Firstly let us place the gold example in its context. Timaeus introduces the problem of the relation of language to things that are in flux, initially taken to be earth, air fire and water by saying that

172
"Speaking of each of these, to say which ought really to be termed water rather than fire, and which by any name rather than each and all, so as to employ language which is sound and secure, is hard [pisto kai bebaio chresasthai logos, chalepon]." (Tim.49b)

The problem we face in attempting to construct a secure logos is that the elements that we refer to are always changing into one another. Along with others, I take this to be a problem concerning identifying references. If we identify some stuff as water, and it changes into air, should we now identify the same stuff as air? If we do, what happens to any distinction between the elements - what name, 'rather than one and all' ought to be applied to each? So instead of calling something [touto], 'this', we should call it [to toquton], 'suchlike', and the gold example is supposed to explicate this conclusion. At this point there seems to be a general agreement on Plato's intentions. Zeyl comments that

"All commentators agree that Plato intends to show (a) that the constituents of the physical world ("phenomena") are caught up in constant change (as is forcefully argued in the case of the 'elements' at 49b7-c7) and (b) that this fact necessitates a reform in the use of certain locutions as referring expressions." One might get the impression from Zeyl's remarks that for Plato the phenomena are all that is in the physical world, and that the elements of 49b ff are the basic constituents of the phenomena. This may be so for the four element theory of 49b ff, but is not the case for 53c ff where the elements are decomposed to stoicheic triangles, which are far below our perceptual thresholds, such that there is more to the physical world than the phenomena.

It is important here to note the differences between the theories presented at Timaeus 49b-50c and 53c ff. Indeed, one might argue that they are two separate theories. In the theory of 49b-50c, there is no mention of any atomic sub-structure, and when describing the transmutation of the elements, Timaeus says that

"We see, so we suppose, water congealing and becoming stones and earth... and thus, it appears, they pass into each other in a cycle of birth." (Tim.49c)

In the later theory, what we suppose we see here is contradicted by the ban on the transmutation of earth and the other elements. These differences may have a bearing on Plato's intentions here. He may well
wish to show that the phenomena are in some type of flux, requiring a reform of our references to them, without being committed to a theory of fundamental flux. The point being driven at by the first theory may then be a conditional one; if we equate changing phenomena, such as the four elements, with the ultimate constitutents of the world, then we will be unable to make any identifying references. This may be a criticism of current four element theories, and may be pushing a theoretical point about fundamental flux. If so, then the later introduction of atomic sub-structure may be an attempt to rectify these difficulties by postulating stability at a lower level, one well below the threshold of human perception. This point is made sharper by the comment at Timaeus 48b that no-one ought to take such things as fire as the ultimate constituents. Here Timaeus 49e7 ff is of great importance too, as it tells us that only that which the four elements are created from or are dissolved into may be referred to as [touto]. If the stoicheic triangles are the ultimate constituents, and are qualitatively stable, then like the gold they may be referred to as [touto]. If so, then we may be able to re-read the gold example with the stoicheic triangles as the gold and atomic faces and atoms as the shapes modelled out of them.

There is a further term to this equation though, as originally the gold was an analogue for the receptacle, such that the gold = referent of [touto] = the receptacle = stoicheic triangles. I would suggest that Plato offers us two visions of the receptacle, firstly as an amorphous substrate, and secondly as the space within which physical phenomena occur. This is something I shall discuss in more detail in chapter nine. Plato, I suggest, uses the receptacle in different ways for the two versions of atomism (four elements vs stoicheic triangles) that he presents us with. If we take up the latter hypothesis, then it may be that the receptacle contains a plenum of stoicheic triangles out of which all physical entities are constructed. The act of ordering that the demiurge performs is then to create well formed complex triangles and atoms from the chaotic motions of the stoicheic triangles. If then we do not treat the gold example as a direct cosmological statement, we find that the Timaeus supplies us with a very interesting alternative account of the structure of the physical world, one where the ultimate constituents are qualitatively stable and may be referred to as [touto]. In the next section I shall attempt to link this alternative account to Timaeus' second epistemological hypothesis and to
examine some further aspects which might motivate us to read the gold example in the manner that I have suggested.

V

One might be concerned that the existence of entities which are both physical and qualitatively stable breaches the exhaustive disjunction that Timaeus makes at 27c-29e between that which is incorporeal, intelligible, and unchanging, of which we may have a stable account, and the likenesses of the intelligible, which are physical, sensible and forever changing, of which we may only have a 'likely' account. However, we have seen that the Timaeus has a second epistemological hypothesis, based on the analogy of the world soul and the human soul. As in the Theaetetus, Plato is perhaps concerned with the question of what the world must be like in order for our account of epistemology to be true.

In the previous chapter we saw that the world soul consists of the revolutions of the same and the different, which move entirely regularly. This renders the world soul entirely rational, and when it makes judgements of sameness and difference these are always correct. At 37a ff we are told that when the world soul encounters anything physical, 'opinions and beliefs that are both true and stable occur'. There cannot then be anything intractable in the nature of the physical that prevents the formation of such opinions. We humans may have difficulties here, but that locates the problem with us rather than with the world, something I investigated in the previous chapter.

Now, if these stable and true opinions are expressed propositionally, there must also be some relation between language and the physical that permits such opinions. In chapter three I argued that Plato's account of the ascent of the philosopher in the line allegory is one that deals exclusively with propositional thinking. It would seem highly likely that the world soul thinks propositionally too, but here are two arguments to support this conjecture. Firstly, the world soul makes judgements of sameness and difference concerning everything that it encounters. The standard position in later Plato is that statement is spoken judgement and that judgement is silent statement, and we have no reason to doubt that this applies here. That gives (judgemental) thought the same propositional nature as statement. Secondly, in the previous chapter I argued that Plato wishes to
attribute some innate abilities to us via the notion that the world soul is constructed from portions of sameness, difference and [ousia]. I suggested that this might attribute an innate ability to form statements of predication and identity about anything that is encountered. If so, then the world soul's thought, and our own too, is fundamentally propositionally structured.

If this is the case, and if we can have [alethes kai bebaios] opinions concerning the physical, then there must be something physical that has sufficient stability that it can properly be called [tuto] rather than [toiauto]. Note that a discussion of what is [bebaios] links both the epistemologies, the passage on reference to physical entities at 49bff, the discussion of the receptacle and the gold example. In the previous section I argued that it is possible to re-read the gold example equating the stoicheic triangles with the gold. Here we find a reason why we should attempt to do this; if the epistemology relating to the account of the world soul is correct then there must be some stable physical referents. Further, if all of the world soul's physical judgements are correct, then this stability must exist at a quite fundamental level. There is more to be said on the relationship of the type of thinking that the world soul does in relation to the structure of the world, particularly in relation to the receptacle, and the sort of role that it might play in predication and explanation. Before we can discuss this fully though, I have much to say about the nature of the receptacle, its relation to the phenomena that occur in it, and the further analysis of the stoicheic triangles. Chapter nine will take up this discussion after we have seen the role that the receptacle may play in the creation of the stoicheic triangles.

VI

It has been argued that the Theaetetus postdates and corrects the Timaeus' view on the relation of flux and language. It is surely true, the argument goes, that if everything is in radical flux, then we cannot successfully refer to anything at all, and this is a better position than the 'lame plea' of Timaeus 49d ff that we can refer to the four elements as 'the suchlike'. However, as we have seen the Timaeus has a further account of the relation between the ultimate physical constituents, flux and language. This does not seem to be vulnerable to the criticisms of the type of flux ascribed to Heraclitus.
in the Theaetetus and the Cratylus. In the Theaetetus, Socrates and Theodorus have the following exchange concerning the Heraclitean position and its relation to language.

So "Let us ask them, are all things changing and in flux?.. Have they both kinds of change that we distinguished, of place and of quality?"

Tho "Of course; they must if they are to be completely in change."

So "If they only underwent change of place, and not of quality, then we would be able to say what the flowing things that change position are. Could we speak in this manner?"

Tho "We could."

So "But since not even this stays still, what flows flowing white, but changing, so that there is a flux of this very thing also, the whiteness, and a change of colour, lest it be convicted of staying still, is it possible to name a colour with the result that it is correctly named?"

Tho "But how could one contrive that, Socrates? Or indeed for anything else of this sort, if it always slips out from under us as we speak, being in flux?" (Tht.182c)

The flux described in this passage is a very radical one indeed. Not only are there no physical entities which are free from qualitative change, but everything changes in every respect at every successive instant, 'lest it be convicted of standing still'. The passage that is supposed to create problems for a late dating of the Timaeus is the following one.

So "If everything is changing, every answer to any question is equally correct, both to say 'thus' and 'not thus', or if you wish, 'becomes', if we are not to employ any expression that will bring them to a standstill."

Tho "You speak truly."

So "Except this, Theodorus, I said 'thus' and 'not thus'. It is necessary, though, not even to say 'thus'. For 'thus' would no longer be changing, and nor would 'not thus'. Indeed, there is no motion in 'this', either. Those who hold this theory must establish some other phrase with which to express it, as by their own hypothesis they now have no words, unless 'nohow' is allowed. That might be the most fitting expression for them, as it is indefinite." (Tht.183a)

At Timaeus 49b-50c the four elements are in flux, and there is the worry about naming the elements which are perpetually changing into one
another. Even here though there may be significant differences from the Theaetetus. While the elements are in flux this may not necessarily be the 'change in all respects at all times' position of the Theaetetus but the gentler alternative of 'in some respect at all times'. There is also the receptacle which is free from qualitative change and may be called [touto]. These differences may account for the different attitudes taken by the Timaeus and the Theaetetus as to whether things in flux can be successfully referred to at all.

The theory of 53c ff is a quite different matter though. Here we have qualitatively stable stoicheic triangles, ensembles of which may have temporary or permanent stability. Clearly the gentle flux which affects most perceptible entities here is a far cry from the radical one of the Theaetetus, and the Theaetetus' comments on how we can refer to items in flux can hardly be applied directly here.

If we are to take it that both the position of the Theaetetus and Cratylus and that of the Timaeus are Plato's own current views, then it is clear, I think, which is the superior, and if we follow the argument through, the chronologically later position. However, I have been counselling all along that we should take great care before ascribing any position advocated by Plato's characters to Plato, and in this case I think it is fairly clear that the description of flux in the Theaetetus and Cratylus is Plato's perception of and perhaps extension of Heraclitus' position. The second theory of the Timaeus from 53c ff, on the other hand, may give us something close to Plato's thinking. It is still presented somewhat elliptically, and there is work for the readers to do themselves, but that, perhaps, is what we ought to have come to expect by now. Plato presents us with a framework in the flux of the Timaeus, a way of analysing the physical world that retains both phenomenal flux and some fundamental stability that allows language some grip on the world.

VII

There has of course been some considerable debate concerning the gold example and the question of the Timaeus' attitude to how we should refer to physical phenomena. The key passage in the Timaeus is the following, which has been the subject of much debate concerning both its translation and interpretation. Timaeus tells us that

"Whatever we perceive as always changing into something else, like
fire, in each case we should not call fire 'this' but 'suchlike' [me touto alla to toiouton ekastote prosageurein pur]." (Tim.50d)

The central debate concerns the phrase [me touto alla to toiouton ekastote prosageurein pur]. The traditional reading is that [touto] 'this' and [toiouton] 'the suchlike' are competing predicates for the subject [pur], fire. The phrase then concerns ways in which to specify a transient phenomenon like fire, one appropriate and one inappropriate. The alternative reading takes [touto] and [toiouton] to be competing subjects for the predicate [pur], the sense now being that words such as fire which we now apply to transient phenomena are better applied to more stable entities.

There were two major concerns over the old reading. Firstly, there was the apparent discord between the Timaeus and the Theaetetus on this matter, the former saying that we can use 'suchlike' for things in flux, the latter denying this. As we have seen though, this is illusory; the Timaeus and the Theaetetus are concerned with different types of flux, and it is only on the assumption that they are not that the discord arises. Secondly, there was the worry that we could only refer to things in the physical world as the suchlike. On my interpretation though, as the stoicheic triangles do not undergo any qualitative changes, they can be referred to as 'this' with respect to their qualities, as can any ensemble of the stoicheic triangles which does not undergo any qualitative change. The Theaetetus is in agreement with the Timaeus on this point as we have seen.\(^ {63}\)

The alternative interpretation, taking [touto] and [toiouto] as competing subjects for the predicate fire has generated difficulties in itself.\(^ {64}\) This view was pioneered by Cherniss,\(^ {65}\) possibly with the aim of defusing the argument concerning flux for dating the Timaeus before the Theaetetus. Cherniss' position though generates objections internal to the Timaeus. At 48e ff a threefold distinction is made between Forms, a second class and the receptacle. Cherniss requires that the second class be one of his 'self-identical characteristics' rather than of the phenomena. Yet immediately prior to and following this division, Plato talks of fire and things like fire, requiring us to suppose that he suddenly and with no indication or warning shifts to talking about some quite different entities. Cherniss has also been criticised for introducing a fourth set of entities in addition to Forms, phenomena and receptacle, where Plato has Timaeus insist on only three.\(^ {66}\)
Lee accepted the general form of Cherniss' translation but differed on the fourth category, postulating spatially localizable particulars instead. This avoided some of the undesirable shifts in meaning, but still left four categories of entities instead of three. Both Lee and Cherniss attempt to resolve the supposed conflict between the Timaeus and the Theaetetus, but in doing so subject the Timaeus to some tortuous interpretation. As argued above, the key to resolving the difficulty here lies in recognising that while the Theaetetus talks of a radical Heraclitean flux, the Timaeus does not. Given that we can resolve the difficulty in this way, much of the impetus behind the Cherniss position is lost, and there is little to recommend it otherwise.

VIII

If the arguments of this chapter have been correct, then the Timaeus' most interesting hypothesis concerning the ultimate constituents of the physical world clearly breaches the strictures of TW, whether we take this to be the strong or weak interpretation of the views of the Republic, or the view that Timaeus sets out at 27c-29e. As with the alternative account of epistemology, the contrast between different parts of the Timaeus is quite striking. For instance we are told that

"It is possible, in my opinion, firstly to make the following distinction. What is it that always is and never becomes, and what is it that always becomes and never is? The one is apprehended by the intellect with reasoning, and is always the same, the other in turn comes to be believed by opinion with unreasoning sensation, always coming to be and passing away, but never really existing." (Tim.27d) Timaeus 28bc goes on to emphasise that all things that have body are perceptible. However, the stoicheic triangles are physical entities which are qualitatively stable, which can reliably be called [toto], and form more complex entities, which depending on the nature of the bonding between these triangles, may be temporarily or permanently stable. It is also interesting to note that the stoicheic triangles are accessible to reason alone. As even the atoms are below our perceptual thresholds, and can only be sensed as agglomerations, so a fortiori are the complex and stoicheic triangles. The later atomistic hypothesis of the Timaeus appears as much at odds with the TW nature of Timaeus' speech at 27c-29d as is the alternative epistemological hypothesis. The final question concerning TW is whether the Timaeus's alternative accounts storm its
final bastion, the question of whether we can have knowledge of at least some physical entities. This question goes somewhat beyond the remit of this chapter, and as it is perhaps better discussed in conjunction with the Philebus, I shall postpone treatment to chapter nine. We can do one piece of important groundwork for that discussion here though, especially as it shows a further breach of TW in the Timaeus.

In section four of this chapter I argued that the thrust of Plato's arguments at 49a-53c, and the gold example in particular, draw us to the equation that the gold = referent of [touto] = the receptacle = stoicheic triangles on the question of what can be referred to as [touto]. One can also use this equation to probe the question of being and becoming, especially as the gold example tells us that the shapes that are moulded in the gold must not be ascribed being, as they 'change even as we mention them'.71 The criterion for being here, as at 27d, appears to be 'always being the same'. The stoicheic triangles, being qualitatively stable, would seem to qualify for this epithet. The Timaeus then gives us grounds for believing that some physical entitles might be said to be, rather than exist in a perpetual state of becoming, contrary to Timaeus 27d ff. One further implication of 27d ff is that things either perpetually change or they are perpetually stable; nothing comes to be stable. This statement has been used to generate a dating argument, as it would appear that the Theaetetus, Sophist, Philebus and Laws all abandon this principle and allow some sort of being to things that come to be, and so it has been argued that the Timaeus must pre-date all of these works.72 In the Sophist's battle of the Gods and Giants, we find that both [to on] and [to pan] must consist both of rest and change.73 The Theaetetus shares the usual late Plato premiss that there can only be knowledge of what is, and from its routine examples of what we may know, we can infer that the things of this world have some sort of being.74 In the Philebus, things come into being via the imposition of determinacy on the indeterminate,75 a typical example being a quantification of temperature on a qualitative scale of hotter and colder.76

We ought here to distinguish between two types of coming into being. The strong view is that something comes into a stable state, and remains permanently in that state. On the other hand, something may come into a temporarily stable state, and subsequently undergo some further change.77 The sort of coming into being envisaged by the key passages
in the Philebus and Laws would appear to be of the latter kind. In the Philebus, it should be clear that what comes into being, effectively a temperature, is unlikely to exist for all time without change, although it may be temporarily stable. So too with the Laws. At 894a we are told that

"By means of this change and alteration everything comes into being. While it remains unchanged, it really exists, but when it changes to another state it is completely corrupted."

I would agree with Bostock here when he comments that

"If we ask what ground the Theaetetus has for its more liberal attitude to being, the answer must presumably lie in its rejection of the Heraclitean theory of flux."

The Timaeus also has a cogent alternative to fundamental flux, and this sort of coming into being is easily achieved by the Timaeus' theory of stoicheic triangles. Consider the theory of ageing, for instance. There we are told that the complex triangles which constitute our bodies are brought together as assemblages of stoicheics with the power to last for a certain amount of time. Thus these triangles are temporarily stable and come into being in the sense specified by the Philebus and Laws. Indeed, the passage in the Laws which follows a discussion of change by collision, may well have been written with the (sub-) atomic theory of the Timaeus in mind. Even if we want entities which are permanently stable coming into being, the Timaeus is not found wanting. The heavenly bodies are permanently stable, and are ultimately stoicheic triangles tied together with indissoluble bonds. Yet as the heavenly bodies are brought together so that time may come into existence, they must have come to be.

An even stronger parallel with the Philebus may be the question of the initial ordering of the universe carried out by the demiurge. At Timaeus 53b we are told that at one stage the universe was devoid of reason or measure, and that the four elements, although possessing some traces of their current natures where 'in such a state as one would expect in the absence of God' (53b3). The demiurge then began by marking out the elements 'by means of Forms and numbers' (53b4). Clearly the elements come into some sort of determined stability, and hence some sort of being. We should treat this passage with some caution as it is the last gasp of the four element theory, the theory of stoicheic triangles and atomic sub-structure being introduced directly after this.
The general idea is fairly clear however, and if we treat this as a framework for analysis rather than a literal piece of cosmology then we can apply its principles to the stoicheic triangles. The work of the demiurge on the latter theory may be the marking out 'by Forms and numbers' of the stoicheic triangles which then being qualitatively stable come into some sort of being. A further significant parallel with the Philebus here is that of the role of the cosmic intelligence or demiurge which in both works is responsible for bringing precisely quantified entities into existence.\(^{81}\)

Turnbull has argued that Plato postulates two worlds of becoming in the Timaeus,\(^{82}\) one being the perceptible and deceptive macro-world, the other the imperceptible, non-deceptive (according to Turnbull) micro world of the sub-atomic structure. While I have some sympathy with Turnbull's discussion of how sub-atomic structure might help with some of the problems of the phenomenal world, I believe he is mistaken on two matters. Firstly, he suggests that Plato postulated the non-perceptible world in order to avoid problems with perceptual deception. However, perceptual deceptiveness, while it does exercise Plato, is never a serious or intractable problem for him; at Republic 602 ff, measuring and weighing will dispose of the problems here, and as I argued in chapter six, the alternative epistemology of the Timaeus does not envisage any great difficulty with this matter. Rather, as Fine has argued in reply to Turnbull,\(^{83}\) Plato's problem is with the compresence of opposites, and it is not clear how imperceptible sub-atomic structure avoids this difficulty; e.g one complex triangle may be bigger than another, yet smaller than a third. If my arguments in this chapter so far have been correct, then the problems that sub-atomic structure is designed to solve are more to do with flux. Plato is concerned to explain how it is that some things in the phenomenal world change, while others appear to be temporarily stable, and others even permanently stable. So too he is concerned with how we can refer to entities which are undergoing change. In order to do this, he allows some measure of being to physical entities and so breaks with TW. It is here that I most radically disagree with Turnbull, and believe him to be pushing in the wrong direction; for he postulates two worlds of becoming, neither of which he attributes any measure of being to, and so reckons on three worlds altogether. On his account Plato breeds more worlds to solve his problems, while on mine by allowing some being to physical entities, and
as I shall argue in the next chapter, some change for intelligibles, Plato is moving in the other direction

IX

The main aim of this chapter has been to argue that even given the Timaeus' account of flux, the heavens are entirely stable and are amenable to precise mathematical description. The Timaeus again appears to be providing more than one hypothesis. On the more sophisticated of these, there are two types of triangles which are the ultimate constituents of the physical world, which while they undergo locomotion do not undergo any qualitative change. According to the strength of the bonding between the stoicheic triangles, composite entities may temporarily or permanently stable. Thus the flux of the Timaeus is by no means as radical as is sometimes supposed, and there may be stability and regularity in the heavens. The Timaeus' alternative account of flux can be linked to the alternative account of epistemology by the common thread of the discussion of entities, names and explanations that are [bebaios]. The existence of qualitatively stable physical entities also clearly breaches the TW strictures of Timaeus' introductory speech. So too they affect two arguments concerning relative dating. Firstly, the Timaeus, like the Theaetetus would seem to reject a radical, Heraclitean flux. If so, then there is no need to date the Timaeus before the Theaetetus. Secondly, the Timaeus does not adhere to the exhaustive bifurcation of [genesis] and [ousia] as is sometimes argued. That impermanent bodies may be organised into temporarily or permanently stable ones accords with the [genesis eis ousia] view of other late dialogues such as the Sophist, Philebus and Laws. The final question for these developments in Plato's views is whether there can be knowledge of at least some aspects of the physical world about us, which will be one of the main subjects of chapter nine. Firstly, however, having argued that Plato introduces greater stability in his theory of physical entities and so breaches TW strictures, I shall argue that Plato introduces some types of change into his theory of Forms, assaulting TW from a different direction.
01) Cf. my ch.4 on the nature and structure of the Tim.

02) [kinesis] is often rendered as 'motion', but I prefer change as [kinesis] is quite general, covering change in nature as well as change of position.

03) I take 'grows old' here to entail some sort of change and decay rather than mere temporal existence.


05) Let us for simplicity here except the account which describes the flux from change in itself, to avoid the problems that Plato ascribes to Heraclitus, and restrict our flux to the physical world. One can allow change into the account in a limited way, as long as it is ordered change, as then one can take as many derivatives with respect to time as are required to produce a temporally invariant description. The higher order account is then free from change as long as one is not bound by an 'everything, whatever it is, is in flux' clause.

06) Cf. Tht.182c ff

07) Cf. Crt.439b ff. See my section VI below.

08) Change in the Sophist will be discussed in the next chapter.

09) See Irwin (1977). On p4 he gives the following definition of a- and s-change "x s-changes iff at time t1 x is F and at time t2 x is not F, and x is not in the same condition at t2 as it was at t1... x a-changes iff x is F in one aspect, not F in another, and x is in the same condition when it is F and when it is not F."

10) Cf. e.g Tht.202e ff, Plt.277e ff, Plb.18b ff.

11) Timaeus introduces the distinction between atoms, atomic planes and the two basic types of triangles at 53d ff, and we are told that 'All triangles have their origin in two triangles'.

12) [stoicheion] also carries a sense of 'a first beginning, first principle or element' (LSJ) which may be important here. It is interesting to note other resonances of [sullaeb]; LSJ gives 'That which is held together, esp. several letters forming one sound'.

13) See Tim.54d ff on how stoicheics form complex triangles.

14) 'Everything' here is [tou pantos], Plato's usual phrase for the physical universe.

15) It may be that Plato is trying to provoke his readers into considering the consequences of equating ultimate physical elements with explanatory first principles; cf. perhaps Socrates' dream in the Tht. In ch.9 I shall discuss the mathematical and ontological [archai] of the stoicheic triangles.

16) Cf. the use of [anothen] (see Pdo.101d7, Rep.514b2 + 518b4) and
[hupotithemi] (see Pdo. 101d ff, Rep. 510b ff), and the Rep. on line and
cave, esp. 511a5 where the soul must [ton hupotheseon anotero ekbainen].

17) At 59c, Timaeus is quite confident that all phenomena can be fully
explained in this manner. It is perhaps important that while we are
given an account of the relative abilities of the atoms to cut up what
they encounter (cf. Tim. 56b, 56d), we are not given such an account of
the stoicheic triangles.

18) If the stoicheic triangles came apart 'at the joints', we might get
one equilateral plus some leftovers out of two isoceles. We might have
six sides from two broken isoceles which might reform to give us one
equilateral plus some leftovers which might form a different size of
equilateral. If the stoicheics come apart in some other way, then
further transmutation may be possible. While the Tim. specifies how
atoms and complex triangles decompose, it does not do so for the
stoicheic triangles; we might take that as an indication that they are
not supposed to decompose into further physical elements.

19) See Tim. 81b ff, and esp. 89bc.

20) There have been some very strange translations of this passage,
especially the phrase [alla dia smikroteta ooratois puknois gomphois
suntekontes]. There is no need to take [gomphos] literally as a bolt or
rivet used to hold together a ship, as it can mean any sort of bond in
general. Other passages which talk of such bonding would indicate that
Plato considers these bonds to be immaterial, so I think it is best to
give him some metaphorical leeway here. Otherwise, one ends up with the
absurdity of welding with rivets or bolts; Cornford (1937) p148 gives
'welding them with a multitude of rivets'; cf. Archer-Hind (1888) p147;
one no more welds with rivets or bolts than one would conjugate a noun
or decline a verb. Archer-Hind (1888) p147 n.15 is right to point out the
contrast between [desmos] and [gomphos], the former having greater
durability. [puknoi] I have taken in its sense of 'well put together,
well made, compact, fast strong'; hence well-concerted, well guarded'
(L&J). If these bonds are immaterial, then this gives a better sense than 'many'.

21) There is a second variable here in that bonds of the same durability
may last different amounts of time depending on how much wear and tear
they are subject to.

22) In the 'O' level physics view, the fact that electrons, protons and
neutrons enter into temporary bonding relations to constitute atoms does
not affect their qualitative stability.

23) Without the [pros allela] clue at Tim. 81b it might be thought that
these two references are to some sort of internal bond, especially as
[hriza] is a rather curious usage. Contrary to this however, it would
seem highly likely, as Cornford and Taylor have pointed out, that [he
hriza ton triganon chala] of 81c8 is intended to pick up and contrast the
[ischuran men ten sunkleisin auton pros allela xesketai] of 81b9.

24) [ek druochon] was a nautical metaphor for something newly made, like
a ship 'fresh off the stocks'.

25) If someone asks what the timber and then the subsequent boat are,
the safest answer I can give is wood; cf. the gold example, etc.
26) LSJ give 'to place or set together, to combine, to organise, pass. to stand together'.

27) Cf. Tim.56e, 81b and 89c.

28) Archer-Hind (1888) notes to p304-306 simply substitutes 'particles' for [trigona].

29) This directly relates to Tim.81d; both passages discuss the marrow.

30) Conversely, when we age and the bonds between our triangles become weak, the incoming triangles cut up our own. The verb here is [temnein].

31) There is one difficulty with the interpretation that [trigona] at Tim.81b refers exclusively to the complex triangles which constitute atoms, which is that not all atoms are constituted out of complex triangles. This is the case for air, fire and water of course, but for the smallest 'isotope' of earth, the atomic faces are squares made of four stoicheic triangles. My interpretation requires that this is a slight oversight on Plato's part.

32) See for instance Tim.53d [duoin archetai trigonoin], 54a [duoin trigonoin], 55b and 57c [ton stoicheon], 55e [ton kat' archas trigonon hupothenton].

33) That the triangles can 'last up to a certain time' (Tim.89d) might be a temporal limitation, or more likely in view of Tim.81b ff, a 'wear and tear' limitation. If we take the reference to be to complex triangles, neither require change in the stoicheic triangles.

34) Cf. Tim.81c ff and 56e where we are told that "Whenever a small amount of fire is enclosed in a large amount of air, water or earth, moving within their movements, battling and breaking up upon being defeated, two units of fire are assembled to make one form of air". If we take the two images of battling to refer to the same sort of process, then it is the atoms being broken into their faces that constitutes old age, rather than any deterioration in the stoicheic triangles.

35) See e.g Zeyl (1975) p127 ff.

36) See Tim.49d and 50a.

37) Zeyl (1975) p125.

38) See Tim.56bc.

39) See Tim.54c ff. Note the guarded and observational language here; 'We see [horomen], so we suppose'.

40) Empedocles may be a significant target here. Note that Plato sometimes uses the Empedoclean (see e.g Fr.6/1) [hriza] (e.g Tim.81c6, 84b1, 90a8) instead of [stoichea].

41) Even the atoms are below perceptual threshold; see 56bc. As Zeyl (1975) p127 points out, Plato may well be attacking the role of the 'elements' (earth, air, fire, water) as privileged basic substrata, as on his view they may transmute into each other. This does not mean, as Zeyl seems to take it, that Plato abandons the idea of basic substrata
which do not transmute; as I argue, he reinstates just such 'elements',
in the form of the two stoicheic triangles, but at a lower level.

42) One might also note relative to Pdo.105b that Plato essays a 'safe'
answer here (even 'safest' [asphalestaton] Tim.50b1), and so we might
expect a clever answer to be lurking somewhere.

43) Cf. Tim.50a, 50b.

44) Cf. Tim.51a ff, 52b ff, and Aristotle De Generatione et Corruptione
329a13 ff. See too Sorabji (1988) p32-36. Note that at Tim.52d the
receptacle moves; thus there can be no objection to the stoicheic
triangles being the referants of [tou to] expressions on the grounds that
they suffer locomotion.

45) We shall see some more uses that the receptacle is put to in ch.9

46) See Tim.53a ff.

distinctions here.

48) Cf. the Tht. on the combined Theaetetus/ Protagoras/ Heraclitus
position.

49) See Tim.35a ff.

50) See Tim.37a-37c. Our souls similarly have two orbits (Tim.42b), but
these move irregularly (Tim.42c cf. 47bc for the contrast between the
world soul and our own), hence we are only partly rational, and we fall
into error when we make misjudgements concerning sameness and difference
(See Tim.43e-44a).

51) The greek here is [doxai kai pisteis gignontai bebaioi kai alethes].

52) This contradicts Tim.27c-29e both in letter and spirit; 29b6 talks
of [bebaios] accounts and entities, and 29c3 tells us [ho ti per pros
genesis osia, touto pros pistin aletheia], 'as being is related to
becoming so is opinion to truth'. Note also that the account of atomism
at 53c ff is described as "In accord with the correct account as well as
the likely" (Tim.56b).

53) Contrary to the earlier epistemology, Timaeus is highly optimistic
that these are soluble problems. See Tim.43a ff, esp. 43e. Cf. Tim.29d,
where we must accept the likely account and search no further, and
Tim.44a-c, 47bc.

54) Cf. Tim.37b, Tht.189e ff, So.263e ff and Plb.37a ff on judgement as
p142 comments that "The Cratylus brings into question the fixity of
names; the fixity of things; and the security of the correspondendence
between the two. The theme of [bebaites] therefore marks the puzzles of
the Phaedrus and Cratylus off from the dogmatism of the Timaeus". I
disagree; these matters are raised and are a central puzzle for the Tim;
the Tim. however presents us with some alternatives concerning flux to
juggle with.

55) See Tim.29b6, 37b8, 49b5, 49d7, 51d7, 91e1, and cf. Crt.386a4,
386.e1, 437a8.
56) See e.g Owen (1953) p322 ff, Bostock (1988) p147 ff.


58) Cf. my earlier discussion of flux.

59) Or perhaps even 'in some respect at some time'.

60) The Tim. differs from the former, as we have seen, and there is no indication at all that language is included in the flux of the Tim, which seems to be exclusively located in the flux of the four elements and their atomic faces.


63) See e.g Tht.182c "If they only underwent change of place, and not of quality, then we would be able to say what the flowing things that change position are."

64) There are two points concerning the text and its translation that marginally favour the alternative interpretation. Firstly, the old interpretation requires the deletion of [pur] at Tim.49d6. Secondly, the use of [to toion], using the article, tells against (though does not rule out) its predicative use; cf. Cherniss (1954) p116.


66) Cf. Gulley (1960) p63/4, Mills (1968) p154, Zeyl (1975) p134, Mohr (1978b) p249. One might also note that the world soul encounters are things with their substance either dispersed or undivided (see Tim.37a ff) such that what it perceives is bodies rather than qualities.


68) Further considerations relating to Plato's reasons for postulating the receptacle may also weigh against the Cherniss view; this is discussed in ch.9

69) Cf. my ch.3.


71) See Tim.50b.


73) See So.249cd.

74) In the Tht. typically a person may be known or perceived (194b), and knowing a person counts as a case of knowledge (201c, 209a).

75) See Plb.26d ff, and cf.27b and perhaps 54a-d as further examples of [genesis eis ousia]. This is only a preliminary sketch of how limit and unlimited relate in the Plb; ch.9 will discuss these matters more fully.

76) See Plb.24a ff. See my ch.5 for the Plb.'s non-committal comments on
Heraclitean flux and the possibility of something being neither in a process of generation or destruction.

77) Rist (1960) p209 suggests that if Plato holds that change is discontinuous and happens 'in an instant', then things may have a form of impermanent being. This, while it might make being and becoming in a sense compatible, does not explain how there can be change (to whatever degree) from becoming into being, which is clearly envisaged in the Le. and Plb. Further, it is likely that later Plato (see here my ch.8 + 9) treats time as a continuum rather than as a succession of discrete instances.

78) One might feel that there is some contradiction between the examples of [genesis eis ousia] and the disjunction made at Plb.59a ff between [ta onta aei] and [ta gignomena kai genesomena kai gegononta]. I agree with Rist (1970 p208) here that it is important that Plato writes [ta onta aei], that which always exists, implying Forms or whatever the Philebus has in mind instead. Other things may come into being but as such are time bound in a way that Forms are not; cf. Plb.61de.

79) Bostock (1988) p147. While agreeing that the Tht. rejects Heraclitean flux, I disagree with Bostock as to whether Plato ever held such a theory (and he certainly didn't in the Tim. !).

80) See Tim.81b ff, and esp.89c.

81) This will be explored in more detail in ch.9.


CHAPTER EIGHT

METAPHYSICAL DEVELOPMENTS IN THE SOPHIST AND TIMAEUS

In the previous three chapters I have investigated the cosmological and epistemological changes that can be found between the Republic and the Timaeus. The main aim of this chapter will be to examine what alterations to the middle period theory of Forms Plato might have made or suggested. Here I shall argue that he undertakes a two-pronged programme of revision. In the Timaeus, he is primarily concerned with the status of particulars and with their relationship with the Forms. In the Sophist on the other hand he is interested in how Forms relate to each other, and with the nature of the Forms themselves. A perennial problem with the relative dating of the Timaeus is its relation to the arguments offered in the Parmenides. The position I shall argue for is that Plato makes changes to his conception of both particulars and Forms such that he is able to circumvent the objections of the Parmenides. In section one I shall argue that the analysis of the relation of Forms and particulars to space and time in the Timaeus provides some of the groundwork here. In the following sections I argue that the Sophist's discussion of the interrelation of Forms also makes advances on the middle period. Finally, I briefly consider the stylometric evidence for the relative dating of the later dialogues.

I

Let us begin with the first third man argument (TMA) of the Parmenides, or largeness regress, which runs as follows¹

Rm "I believe the nature of your grounds for believing each idea to be one is this; whenever there seem to you to be many large things, viewing them all, there appears to be some same one idea equally shared, from whence you are led to the conclusion that the large is one."

So "You speak truly", he said.

Rm "But the large itself and the other larges, if you view them all in the same manner with your mind, won't some further single large appear, by which these many larges appear large?

So "That is likely."

Rm "Then another idea of largeness will appear, beyond the large
itself which has already occurred and the things that partake of it; and in addition to every one of these a further different one, by reason of which all these will be large; and each of your ideas will most certainly not be one, but unlimited in number."
This argument might be reckoned to require three extra premisses in order to arrive validly at its conclusion.2

1. One-over-many (OOM). If any set of things share a given character, then there exists a unique Form corresponding to that character; and each of these things has that character by participating in that Form.

2. Self-predication (SP). The Form corresponding to a given character itself has that character.

3. Non-identity. (NI). If anything has a given character by participating in a Form, it is not identical with that Form.

Granted these three premisses, a regress ensues.3 One point that we might start a discussion from is that for a theory of Forms to function it would appear to be unacceptable for SP to occur either in all cases or in no cases.4 Accepting universal SP would lead to absurdity even without the largeness regress. In that case there could only be Forms relating to the characteristics that Forms are supposed to have, otherwise by universal SP some Forms would have non-Formal characteristics.5

However, Forms must have some characteristics, and if they are to be said to have these by virtue of some relation to Forms, there will be at least some Forms where SP will have to be faced.6 There are of course various strategies for disarming sentences which appear to be instances of SP, Vlastos' distinction between 'ordinary' and 'pauline' predication perhaps being the most famous.7 What none of these strategies will do, however, is tell us which are the real and which the apparent cases of SP, and so where and why to apply these distinctions.

What Plato requires then is some criterion which will distinguish acceptable and unacceptable cases of SP.8 The task of the Timaeus, I shall suggest, is to banish some of the unwanted cases. The central question here is perhaps to be able to specify precisely what sort of entities are involved. This will affect one of the key conditionals of the largeness regress, whether concerning the large itself and the many larges, we should 'view them all in the same manner with our minds'.9
In the preceding chapters I have argued that the position that Timaeus outlines at 27c-29e is undercut by alternative accounts of epistemology and flux, the objective being to provoke the readers to make some judgements for themselves. Here I shall suggest that a similar phenomenon occurs with the Timaeus' metaphysics.

Firstly, I want to propose an alternative view of the way that the Timaeus is structured, though one that is compatible with the standard approach. The orthodox view, as is perhaps signposted by Timaeus at Timaeus 48a is that Timaeus 30-48 discusses the works of reason and 48 ff discusses the works of necessity. However, as we saw in chapter five, the discussion of astronomy from 30-48 is inextricably bound up with a discussion of time. From 48a onwards we are introduced to the receptacle and to the geometrical atomism, and we have a discussion of physical entities in space. These two parts of the Timaeus might then be alternatively characterised as discussions of the nature of particulars in time, and in space. What is common to these two discussions is their emphasis on the homogeneity of time and space. Both time and celestial motion proceed in a perfectly regular manner, and the receptacle/ space is entirely characterless so that it does not distort what occurs in it.

In chapter five I suggested that the change to the more stable and regular cosmology of the Timaeus might be accompanied by a change in the analogue for the relation between mathematics and the motion of the heavens, from a geometrical definition/ representation or model/ copy analogue to one of number/ things that have number. Here we can perhaps see some of the metaphysical apparatus being put in place to support the second analogue being applied more generally. In order for particulars to participate in Forms by way of the second analogue, they need to be instantiated in homogenous, characterless space and time so that they are not distorted.

What the Timaeus then emphasises in distinction to previous dialogues is that participants in Forms are in space and time and as such are spatio/ temporal entities, while Forms exist outside of space and time and so cannot be attributed spatio/ temporal properties. An important consequence of this is that Forms can no longer be generally treated as paradigms. The Form of anything specifically spatio/ temporal cannot be perfectly what its participants are deficiently as it is not the sort of entity that can take on spatio/ temporal predicates.
Like the alternative epistemology, this line of thought clashes with Timaeus' speech at 27c-29e and other related passages, which are clearly still committed to a model/copy relation and to paradigmatism. This difference in analogue may underpin differences in epistemological optimism. If we only have a deficient copy to work with, and we have to obey the [sungenes] stricture for explanation, and there is substantial flux in the world, we might never have more than a likely account. However, with the second analogue we have a world where things occur [kat' arithmon], where we have a fundamental stability underlying a manageable flux, and where epistemological problems are tractable and are located in the nature of our minds rather than the nature of the world.

One might compare the spatio/temporal characterisation of entities in the Timaeus with some of the contrasts that we have been previously offered by Plato, especially those which I suggested characterise the TW interpretation, i.e intelligible/sensible, knowable/opinable, stable/changing, incorporeal/physical. None of these on their own will give us good criteria for deciding which Forms self-predicate and which do not. That Forms are intelligible does not stop them having physical characteristics; the Form of small might be physical, but so small as to be imperceptible. That Forms are knowable or stable does not prevent the Form of large from being large. That the Form of change is incorporeal gives no grounds for ruling out that it is itself subject to change. Importantly, none of these pairs pick out Forms and spatio/temporal entities as they are presented in the Timaeus. In what follows 2 is contentious, and although we have seen some of the evidence this assertion will not be fully discussed until the next chapter.

1) The intelligible/sensible distinction fails as the Timaeus postulates some spatio/temporal entities which are not sensible. We can only perceive agglomerations of atoms, as atoms themselves, the complex and stoicheic triangles are all below human perceptual thresholds.

2) The knowable/opinable distinction will fail as the Timaeus will suggest that at least some aspects of spatio/temporal entities are knowable.

3) The stable/changing distinction will fail because the Timaeus postulates some spatio/temporal entities, the stoicheic triangles, which are qualitatively stable.
4) The incorporeal/ physical distinction is perhaps closest to characterising Forms and particulars in terms of their spatio/ temporal natures, but is less precise and does not bring out the temporal contrast.

Given the Timaeus' analysis, what are the implications for SP? No Form of anything specifically spatio/ temporal can self-predicate because Forms are non-spatio/ temporal entities. Thus the Form of 'spatially large' cannot self-predicate because it is not itself a spatial entity. To return to the largeness regress of the Parmenides, we now have very good reasons for not 'viewing the various larges and the large itself in the same way' with our minds. This deals with a large number of predications, and it is notable that in the Timaeus and the dialogues that follow it, there is no longer any suggestion, as there was in the Phaedo for instance, that Forms can take on any spatio/ temporal characteristics.  

We might also consider some other aspects of the Parmenides in order to support the idea that Plato did not think the objections he raises there are fatal to the theory of Forms. To begin with, there is the behaviour of Parmenides and Socrates. At the close of the first section, Parmenides does not conclude that the theory of Forms has been refuted, but that a man of great ability might be able to circumvent the difficulties raised, and that if we do not allow the existence of Forms the power of dialectic will be destroyed.

We can relate this to two other important aspects of the Parmenides. Firstly, while Socrates sometimes gives confident replies to Parmenides' questions, at other times he is tentative, answering [isos], 'perhaps', [eoiken], 'so it seems' or [phainetai houto ge] 'so it would appear'. Parmenides, when asked how to go about resolving the difficulties that have occurred, recommends some intellectual gymnastics

"You need to do something more than this, to investigate not only the consequences of a hypothesis being true, but also of it being false, if you wish to become better trained." (Rm.135e)

The 'you' here may be the extra-textual second person that invites the reader to do some of the work that I discussed in chapters one and four. It is in line with my conception of Plato's PWP for the Parmenides to set problems for the readers to solve and to propose a framework for
their solution. The sensible place to start this process of negating hypotheses would be at the weakest points of the argument; perhaps those where Socrates is most doubtful and has given a tentative reply. What is interesting about the combination of these two points is that Socrates' tentative answers are often in reply to Parmenides' dubious use of spatio/temporal metaphors. A good example of this is the dispute over the metaphors of day and sail at 131a ff. If participation is to be in wholes and not in parts, says Parmenides, and the whole idea is in each of its participants, then that idea will become separate from itself. Socrates attempts to answer by advancing a temporal analogy, that a Form might be like a day, "One and the same in many places at the same time, and yet not separate from itself" (Pm.131b). Parmenides though substitutes a spatial analogy for this temporal one, equating Socrates' move with placing a sail over many people at once, and this elicits a tentative reply from Socrates.

We might also review a crucial point in the largeness regress here. At 132a, Parmenides invites us to view the large itself and the particular largenesses in the same manner, when a regress will ensue. 'Large' though cannot be univocally predicated of Forms and particulars if Forms are aspatial entities. We might speak of a 'large' idea, but this takes up no more space than a small idea. Socrates' reply at this point is a tentative [eiken], 'so it seems'. The use of 'large' as an example in this argument is then perhaps not accidental, but is meant to emphasise one of the differences between Forms and particulars, namely their spatial and temporal natures. It is precisely these points which the Timaeus takes up and makes clear. In the next section we shall see how the Sophist too picks up various points in the Parmenides and pursues some alternatives.

The position of the Timaeus then is that Forms are aspatial, atemporal entities and as such cannot take on spatial or temporal predicates. This cannot be the whole story concerning SP however, as the Forms themselves have some characteristics, and there will be some characteristics of Forms (e.g existence, sameness, difference, change and rest) which bridge the spatio/temporal distinction. It is to this problem and to the Sophist that I now turn.

II

We are left with some Forms which apparently will still self-predicate. One line of approach here might be to tie particulars intrinsically into
space and time. Thus the properly formed question might be, Does the Form of 'exists in space and time' itself exist in space and time? To which the answer is clearly no. This is not an alternative that Plato pursues, however. He continues to treat existence quite generally, as he does change. This may be because of a problem that remains, which is how we are to explain the properties of Forms. The Sophist raises the question of how the Forms relate to each other, and it is suggested that for dialectic to be possible some Forms must be predicated of others. However, is the means of participation which forms the basis for this predication the same as the one that pertains between Forms and particulars? If the answer to that is no, then this new relation may have some different properties with respect to the premisses required for the TMs to function.

One line of thought here is that perhaps predications between Forms ought to be based on some more egalitarian relation (F-F participation) than the rather hierarchical one that relates particulars to Forms (p-F participation), for here we are talking of a meeting of equals. More technically, one would expect such a relation to be at least non-symmetrical. This must be so, as some pairs of Forms will be predicated of each other; sameness will be different from difference, and difference the same as itself, for example. The relation of p-F participation on the other hand is clearly asymmetrical. Plato's language in the Sophist seems to indicate that he is aware of this point. While he is quite happy to use the phraseology of participation when talking of F-F participation, he quite rightly eschews the metaphors he uses for p-F participation which imply asymmetricality. Instead he tends to use metaphors such as 'communion' or 'blending', which would seem to indicate that he has at least a non-symmetrical relation in mind. Thus Plato avoids the problem, particularly acute when a pair of Forms predicate of each other, of an asymmetrical relationship between them that places them on different ontological levels.

Another difference between blending and ordinary p-F participation is that while the latter is clearly irreflexive, the former may be at least non-reflexive. If we take the p-F relation to be copying, for example, nothing can be a copy of itself. This failure of self-participation will rule out any SP based upon it. However, it may be that the F-F relation allows self-participation and so SP in at least some cases; while blending may not be an entirely appropriate metaphor
here (communion may be more helpful), it avoids the disasters of basing SP on an asymmetrical p-F relation. If SP is then possible, what now becomes important in relation to the arguments of the Parmenides is the question of NI.\textsuperscript{40}

Initially, we had the statement concerning NI that for particulars participating in Forms, which Vlastos has termed "'full-strength' non-identity".\textsuperscript{41}

(NI\textsubscript{g}) If anything has a given character by participating in a Form, it is not identical with that Form.

While this is adequate to make the first TMA work, it is not clear that Plato is committed to anything quite so strong. Rather, he might reject this and instead accept

(NI\textsubscript{w}) If any particular has a given character by participating in a Form, it is not identical with that Form.

Why might Plato be committed to NI\textsubscript{g} ? Owen has argued that Plato is committed to NI, and states that

"The point is this. Plato... thinks (a) that what is predicated, in this case man (not the expression but what it stands for), is always something different from the subjects of which it is predicated; for if it were identical with its subjects these would become identical with each other. Plato is a man, Socrates is a man: if these statements have the form $a = c$, $b = c$, $a$ will be $b$ and Plato will be Socrates."\textsuperscript{42}

However, as Fine has argued,\textsuperscript{43} Plato does not need to accept full strength NI to avoid this absurdity. It is sufficient to say that what is predicated of particulars is not identical to those particulars, and it is not necessary to argue that nothing may be what it is in virtue of itself. So Owen's argument does not require that Plato be committed to NI\textsubscript{g}.

One might also probe the relationship between explanation and NI here. If Forms are supposed to be explanatory entities, then in order to provide good explanations, they had better not be identical with what they purport to explain.\textsuperscript{44} This does not commit Plato to full-strength NI though - if anything quite the contrary. The participation of particulars in Forms is supposed to explain something about particulars,
not about Forms. To explain the properties of Forms we might expect a different level of analysis, perhaps involving some new relationships. That, I suggest, points to a crucial difference between NI\textsubscript{G} and NI\textsubscript{W}. The former attempts to explain a property of Forms using the same explanation used to explain the properties of particulars, while the latter quite properly says nothing about the nature of Forms, only about the relation of Forms and particulars. That is a good reason why Plato should be committed to NI\textsubscript{W} and should reject NI\textsubscript{G}. What of NI and the F-F relation though? We might reformulate the full-strength NI assumption for blending like this

\begin{enumerate}
\item [(NI\textsubscript{bG})] If any Form has a given character by blending with a Form, it is not identical with that Form.
\end{enumerate}

Now while that will not get the actual first TMA to work, as that is specifically about the participation of particulars in Forms, one could reformulate it to assault the relationships between Forms. However, one can also reformulate a weaker NI assumption, as before

\begin{enumerate}
\item [(NI\textsubscript{bw})] If any Form other than that of the character in question has a character by blending with a Form, it is not identical with that Form.
\end{enumerate}

This would save the theory from any reformulation of the TMA. Now it may be that SP is to be explained by the same relation, that of communion, as are inter-Form predications. If so, we might amend NI\textsubscript{bw} to say that if something communes with itself it is identical with itself. Alternatively, we might leave NI\textsubscript{bw} open in the same way as we left NI\textsubscript{W}, and then postulate some further relation on which to base SP.

If asked for some criterion by which we can distinguish which Forms self-predicate and which do not, the reply might simply be the definition of a greatest kind, that it can be predicated of all other Forms.\textsuperscript{45} That is, any Form that can be predicated of all other Forms can also be predicated of itself.\textsuperscript{46} Whether that divides Forms into the same two groups as the spatio/temporal distinction depends on whether there are still Forms of say many, or three, which are non-spatio/temporally specific and cannot be predicated of all other Forms.\textsuperscript{47}

The Timaeus and the Sophist then, with their analysis of the spatio/temporal natures of Forms and particulars in conjunction with
the analysis of inter-Form participation and predication, provide the tools for the creation of the following exhaustive disjunction.

There are those Forms which have specifically spatio/temporal participants which do not self-predicate. It would also seem that Plato is not committed to anything more than a weak NI assumption in relation to the participation of particulars in Forms.

There are those Forms which do not have specifically spatio/temporal participants which do self-predicate, if they can be predicated of all other Forms, and perhaps some others that cannot be predicated of all other Forms and do not self-predicate. Again though, Plato need not be committed to the analogous 'full-strength' NI for the blending relation which acts as the basis for predications among Forms. That renders the theory of Forms invulnerable to the TMA.

The Timaeus then can be dated later than the Parmenides. The question of whether Plato is ever committed to or later rejects SP, is not really the appropriate one. More important is whether Plato can develop some criteria to separate acceptable and unacceptable cases of SP while keeping the coherence of the theory. That, as I have suggested, is a task that the Sophist and Timaeus take up.

III

The notion that certain Forms are allowed to self-predicate in the Sophist raises some interesting problems. In Chapter seven I argued that in the Timaeus Plato arrives at a new theory of particulars whereby certain of them may have stable natures while changing their spatial positions, and I expanded on that view in section one of this chapter. Here I shall argue that Plato in the Sophist amends the middle period theory of Forms in a way that allows the Forms to enter into relational changes, and by doing so circumvents the final argument of the first part of the Parmenides concerning a strong interpretation of TW and the knowability of the Forms, and the stable objects of knowledge/coming to know paradox of the Sophist.

Consider first the way in which sameness and difference, two of the five great kinds, are treated in the Sophist. The Stranger says that "But I believe you agree that entities are always said to be something either in relation to themselves [auta kath' auta] or in relation to other things [pros alla]." (So.255c)

At Sophist 256ab the Stranger then employs this distinction to show that
one thing can partake both of sameness and difference. One thing may be both the same with respect to itself [kath' auto] and different with respect to others [pros alla]. Consider now what happens if these Forms self-participate. The Form of the same could then be said to be the same as itself while the Form of difference could be said to be different from others. Sameness could acquire its difference (from others) by participating in Difference, while Difference could be the same (as itself) by participating in Sameness. That seems a very happy result.\textsuperscript{53}

Difficulties have arisen, however, concerning the other pair of great kinds, Change and Rest.\textsuperscript{54} For surely the Form of change cannot itself be subject to change?

One way of resolving the difficulty here is to take a cue from the treatment of Sameness and Difference, and apply the [kath' auto]/[pros alla] distinction to Change and Rest. Thus we might be able to predicate both change and rest to one thing; it might be at rest with respect to itself [kath' auto] but changing with respect to other things [pros alla]. Self-participation and cross participation would then produce similarly benign results to the treatment of Sameness and Difference. One upshot of this is that Forms may now be allowed to enter into relational or 'Cambridge' changes without their essential stability being threatened.\textsuperscript{55}

This proposed solution has certain advantages. Firstly, the puzzle concerning how, if the objects of knowledge are stable in all possible respects we can come to know them if our coming to know them involves some change for those objects, is resolved. While the essential nature of the objects of knowledge remains stable, they may enter into relational changes and become known.\textsuperscript{56} Secondly, we seem to have come to a sane resolution of the problem of how Change and Rest relate to each other.

The main objection here is whether the text of the Sophist allows such a resolution. Both Theaetetus and the Eleatic Stranger appear adamant that Change and Rest cannot be predicated of each other.\textsuperscript{57} I have argued earlier though that we cannot always attribute the views that Plato's characters advocate to Plato himself. Theaetetus is being led through a labyrinth of (to him) new arguments so we might expect his opinions to alter, and can hardly directly attribute his views to Plato. Take for instance Theaetetus' initial statements about the nature of being, not-being, sameness and difference. When the Stranger sets out
the puzzles, he has Theaetetus twice state that being is the opposite [enantion] of not being. Yet when he resolves some of the puzzles, the Stranger states that

"When we talk of not being, it seems we do not mean the opposite [enantion] of being but merely something different." (So.257b)

As Theaetetus assents to this, his views are then liable to change on crucial matters. The Eleatic Stranger, on the other hand, does not seem to think that it is a general truth that the greatest kinds are resting. In his criticism of the Friends of the Forms he states that change must characterise real being as well as becoming, and other arguments he uses would seem to require the premiss that Change changes due to its own nature.

That might remove the textual objections, but what positive reasons do we have for reading the Sophist in the way I have suggested? On my reading of Plato's PWP, as a matter of general strategy Plato will sometimes indicate the general form of a solution, or the way to make progress, while leaving some aporiai for his readers to be puzzled by. Here perhaps is a case in point, and we might take Sophist 256ab as evidence of this. The Eleatic Stranger explains his solution to the problem of how sameness and difference may be predicated of the same thing, and goes on to say

"Therefore even if Change itself in some way partook of Rest, it would not be absurd to say that it was at rest." (So.256a)

Theaetetus replies that this is indeed so. That, I suggest, leaves the reader with the task of applying the general solution as applied to Sameness and Difference to Change and Rest.

One way in which this general strategy may work in the Sophist is via what Owen has termed the 'parity assumption'. At Sophist 250e ff the Stranger comments that since both being and not-being have now turned out to be equally puzzling, this offers hope that any solution to the difficulties will cast some light on both. One might well read that as an invitation to the reader to apply the tools used in solving the problem of not-being to the problem of being. To resolve the problem of not-being, the Stranger employs some new ideas on negation, a distinction between identity and predication, and the [kath' auto]/[pros alla] distinction to allow sameness and difference to be read as 'the same as' and 'different from' respectively and so allow both to be predicated of one entity. Now the puzzle about being runs as follows.
A) Change and Rest are complete opposites.
B) Change and Rest jointly and severally are.
C) This is not to say that Change and Rest are changing,
   nor that they are resting.
D) Being is another thing apart from these two,
   embracing both Change and Rest.
E) Being is not Change and Rest both at once.
F) Being, according to its own nature is neither changing,
   nor at rest.

We are now in aporia, as Being appears to be outside of the opposites
change and rest, and so the Stranger goes on to conclude that being is
as fertile a source of aporia as not-being is. It is noteworthy that the
parity assumption directly follows this discussion.68

Now (A) is clearly critical to reaching an aporetic conclusion. It
is used at (C) to exclude the possibility that (B) means Change and Rest
are jointly and severally changing and resting. Secondly, in conjunction
with (F) it contributes to the aporetic conclusion. If we abide by the
parity assumption, and take our cue from the solution of the problems of
not-being, we can deploy the [kath' auto]/[pros alla] distinction
again. This time though, we use it to allow us to read change and rest
relationally, as relative to the thing itself or to other things, and so
not as contradictories. That will then dissolve the puzzle about Being
in much the same way as the puzzle about not-being was dissolved.69

A further advantage of treating Change and Rest in this manner is
that it dissolves another puzzle concerning the greatest kinds. The
Eleatic Stranger appears to treat Being, Sameness, Difference, Change
and Rest as greatest kinds.70 It is generally thought that these are
what the Stranger has in mind when he talks of kinds that blend with all
other kinds.71 However, if we cannot jointly predicate change and rest
to anything, they cannot both be greatest kinds.72 Under my treatment
though, they are jointly predicable of everything, including each
other and so qualify as greatest kinds.

IV

As all that I have so far argued has placed the Timaeus, along with the
Critias, Philebus, Laws and perhaps the Epinomis in the last group of
works that Plato wrote, we ought also to consider the stylometric
evidence on Platonic chronology. My view here is that stylometry can
only ever give us some hypotheses concerning relative dating that we can
look to confirm or disprove by other methods, rather than be the final
arbiter in any dispute. Platonic stylometry might be argued to rest on
some rather shaky foundations. Firstly, we have an author who it would
seem consciously uses various literary styles to achieve the
philosophical effects he seeks. If so, then any correlation between
the incidence of a certain trait and the order of composition of his
works is rendered suspect, and doubt will be cast on any claim that a
stylistic development is unconscious rather than conscious. Secondly, a
common assumption of Platonic stylometry is that the Laws is Plato's last
work, and stylistic affinity to the Laws indicates lateness. What we
know about the Laws is that it was still 'on the wax' when Plato died.
This does not entail that it was Plato's last work though; would we
assume that, e.g., unpublished works found in L 's desk after his
death were all written after all the published works? Further, one
might worry whether we ought to assume that Plato wrote his works
discretely, that e.g only after the last word of the Philebus was
written did he begin to compose the Laws. One might argue that in the
case of the Laws this does not make too much difference as the Laws is
clearly late, even if it is not discretely on its own as Plato's final
work. However, there is little to say that the composition of some of
the more hotly contested works did not overlap. The stylometric evidence
such as it is favours a late dating for the Timaeus, but I would not
place a great deal of weight on it.

Firstly, let us look at the incidence of hiatus. There are six
works, including all my 'late' dialogues along with the Sophist and
Politicus which avoid hiatus to a much greater degree than any of
Plato's other works. If we could take this test as a simple index of
lateness, it would provide good evidence for a late date for the
Timaeus. However, it seems clear from the abrupt switch to hiatus
avoidance Plato was conscious of this stylistic trait, and so there
could be reasons independent of chronology why he uses it in some works
and not others. As Owen argues, the Phaedrus avoids hiatus to some
extent, yet most would place it before the Theaetetus and Parmenides
which do not avoid it at all, so this cannot be an automatic test of
lateness, and he considers hiatus avoidance to be an index of
confidence. While it may be difficult to come up with a really
convincing account of why Plato should switch between hiatus avoidance
and non-avoidance,\textsuperscript{79} the fact that this is a conscious trait muddies the waters somewhat.

A second test is that of prose rhythm. Owen cites this as being both unconscious and favourable to his dating of the Timaeus, but I disagree on both counts.\textsuperscript{80} The sources he cites would place the Timaeus before the Sophist and Politicus, but after the Parmenides.\textsuperscript{81} Prose rhythm, like hiatus avoidance, is very much an on/off phenomenon with no transitionary stages, which would tend to indicate that it is a conscious phenomenon. Moreover, we find in the Politicus that one part is written in one rhythmic style, another part in the other,\textsuperscript{82} and Aristotle comments that the new rhythm ms were introduced in Plato's time.\textsuperscript{83} The evidence of prose rhythm is then inconclusive.

Now let us next examine two tests which arguably examine unconscious traits. Firstly, the comparison of rare words in the Sophist and Politicus with the Timaeus. Campbell's studies here have purported to show that the Timaeus was roughly contemporaneous with the Sophist and Politicus. Owen has criticised this work for its reliance on Ast's Lexicon Platonicum, which is incomplete.\textsuperscript{84} However, Brandwood has approved of Campbell's methods, and Ast's Lexicon is complete enough to give reliable results. Moreover, Prior has investigated this using Brandwood's Word Index,\textsuperscript{85} and has found no significant difference from Campbell's results.\textsuperscript{86} It is hard to see how Plato could have coordinated his use of rare words between dialogues as would be required by the Owen thesis. He would have had to have been conscious to some degree of the relative frequency with which he used each of these words, and have a reason for undertaking such a task. One might suggest that this is an epiphenomenon of other stylistic changes, such as hiatus avoidance. In the Phaedrus though, where to some extent Plato avoids hiatus, there is no correlative change in rare words. Similarly, the Sophist, Politicus and Timaeus agree on rare words while differing greatly on prose rhythm. If rare words cannot be shown to be an epiphenomenon, or a good reason for their coordination provided then there is some evidence here for a late dating of the Timaeus.

So too with synonym frequency. Here it would seem that there are a set of synonyms whose frequency is distinctly greater in the same group of dialogues that are picked out by hiatus avoidance.\textsuperscript{87} Owen's counter to this is that in Socrates' speeches in the Phaedrus Plato uses a style akin to that of the Timaeus, thus showing that he can use this style
when he wishes. The problem with this is that presumably Owen must claim that these synonyms are under conscious control. It is difficult to see though, as with rare words, why Plato would take the trouble to coordinate the use of the synonyms he was conscious of, and hard to believe that he was conscious of all of them. Again, it would seem that synonyms are not an epiphenomenon of hiatus avoidance or prose rhythm.

These two tests point towards the Timaeus being composed after the Parmenides and the Theaetetus, and roughly contemporaneously with the Sophist and Politicus. The more that Plato has to coordinate such factors as rare words and synonyms between varying styles, with little reason to do so, the less plausible it is that he is in complete conscious control of that style. The stylometric evidence then leans in favour of the conclusion that the Timaeus was composed after the Parmenides. It appears to be part of a group of six late dialogues, and concerning their relative ordering I would agree with Billig and Brandwood who state that these works cannot be ordered relative to each other using stylometric methods.

In conclusion then, the Sophist and the Timaeus launch a two-pronged attack on the theory of Forms as we find it in the middle period and introduce a number of revisions intended to circumvent the problems aired in the Parmenides and other dialogues. In the Sophist, we find that the Forms are no longer unchanging in every respect, but enter into relational changes and become known. The new conception of particulars as spatio/temporal entities allied with the homogeneity of space and time and a new conception of the relation between Forms and particulars allows the world of the Timaeus to be one which is amenable to precise mathematical analysis. The gap that TW finds is here significantly closed as Forms to some extent alter and particulars have some stability. Whether this stability is enough for the storming of the final bastion of TW, the notion that we can only have opinion concerning physical entities, will be the subject of the next chapter. There I shall examine the nature of physical entities in the Timaeus and the Philebus and their relation to developments in Plato's views on mathematics in general and the generation of numbers in particular.
NOTES TO CHAPTER EIGHT

01) Although I shall follow custom and refer to this argument as a TMA, largeness regress is perhaps more accurate. 'Man' is not involved here, and 'large', it might be argued, is a specific and loaded example rather than a typical instance.

02) I am working here with Vlastos' revised versions of these three premisses. See Cohen and Keyt (1991) for further discussion of whether these three are formally compatible. As my general position is that Plato is not personally committed to the conclusions of the TMA's, and that the Pm, in line with Plato's FWP, at least to some extent has a maeutic function, I am not too worried about the question of incompatible premiss sets here.

03) Modern logicians have been concerned with finding an infinite regress here, though Plato is perhaps more worried that Forms turn out not to be [hen], but [apeiron plethes], indefinitely many. See here Sayre (1983) p29 ff.


05) Thus for the middle period theory as it occurs in the Rep, it may be fine for the Form of the Good to be good such that we desire it and direct our investigations towards it, but some tenets of this theory are that the Forms are unitary, stable and do not possess contradictory characteristics. Those characteristics are under threat from the SP of Forms such as those of many and change. See below though on possible developments to the theory.

06) See e.g So.251c ff on the communion of Forms, where the point is made that if something does not associate with the Form existence then it will not exist. One problem concerns the motivation of enquiry in the Sym. and Rep; if Good and Beauty are not (respectively or jointly) good and beautiful, why would we desire them, and so why spend enormous amounts of painstaking labour in pursuit of them?

07) See Vlastos (1970) and (1974). See Heinaman (1989) and Malcolm (1991) p65 ff on other strategies intended to explain away unwanted instances of SP, and on whether these strategies will allow us to treat all unwanted instances of 'F-ness is F' as merely apparent cases of SP.

08) Cf. Malcolm (1991) p42 ff. Vlastos (1971) p259 suggests that every Form has to be unitary and immobile, such that any candidate sentence for SP ought to be rejected as only an apparent case if it attributes disunity or mobility to a Form. See below for my disagreements with Vlastos here.

09) One method of attempting to disarm this argument is to argue that as the large itself is intelligible and the many larges are sensible, the mind cannot view (i.e perceive) them in the same way, so the argument falls (see e.g Dorrer, (1989) p190). That is a possible interpretation, but it yields a rather trivial result. Perhaps what is being suggested is that if you already have particulars and a Form before your mind, and you consider them in the same way, then the regress ensues. The interesting question is not an epistemological but an ontological one, not whether we bring these things before the mind by different epistemic
routes (after all, as the Thet. will emphasise, we might remember rather than perceive the particulars and my view of TW in ch.3 does not exclude reasoning concerning particulars), but how we consider them as entities when they are before our minds.

10) See my ch.7 + 9 for discussion of the receptacle and space.

11) See my ch.5 on time, and Tim.50c ff on the receptacle/ space, and the next chapter which will suggest that Plato treats each as a continuum.

12) Up to the Tim, there is no explicit statement of the atemporal and aspatial nature of the Forms. While one might feel that this is vaguely implied by some things that Plato says earlier than the Tim, it is that dialogue which characterises Forms and particulars in terms of space and time rather than treat their spatio temporal natures as by-products of other ways of characterising them. Cf. e.g Vlastos (1969a) p83 ff whose list of the 'categorial' properties of Forms in the middle period (immutable, incorporeal, divine, insensible, accessible only by recollection) omits (quite correctly for this period of Plato) any mention of their aspatial/ atemporal nature.

13) Given more space I would argue that up to the Pm. Plato does treat Forms in general as paradigms (see e.g Vlastos (1954) p248, Wedberg (1955) p37/8, Cross and Woozley (1964) p180/1, Teloh (1981) p8, Malcolm (1991) p64 ff), and that up to the Pm. he fails to distinguish the universal from the paradigm case (see e.g Wedberg (1955) p18, Gallop (1975) p95-7, Bostock (1986) p207, Malcolm (1991) p159 ff). Why this should be so is another matter; several varieties of logico-linguistic error have been suggested, cf. e.g White (1976), Mates (1979), and for a summary and further suggestions see Malcolm (1991) p125 ff.

14) See e.g Tim.28b ff.

15) See my ch.5 for the abundant examples of this in the Tim.

16) See Pdo.100e ff (the small is small) and Tim.56bc (there are physical imperceptibles).

17) See Tim.56bc.

18) Timaeus provocatively tells us that the account of geometrical atomism is "In accord with the correct account as well as the likely" (Tim.56b). Knowledge in the Tim. will be discussed in the next chapter.

19) Further, some complexes of stoicheics are temporarily stable, and some (the heavenly bodies) permanently stable.

20) See Pdo.102d for Large being large and 103e ff for Hot being hot, etc.

21) See Pm.134e ff.

22) See Pm.135a ff.

23) E.g, [panu ge] 'by all means' at Pm.131a + d, 134a or [anangke], 'necessarily' at 132c + e, 134b + c, [adunaton] 'impossible' at 131d, 132b.
24) E.g at Pm.131c.

25) E.g at Pm.132a, 133a, 134b.

26) E.g at Pm.131c.

27) As he is about to begin the second part Parmenides says "If you wish, since it seems that I must undertake the labour of playing this game [pragmateiode paidian paizein], shall I begin with myself and take my own hypothesis?" (Pm.137b). Such games have a 'playful seriousness' and are highly loaded with respect to Plato's PWP.

28) In the light of this, one could ask, is Beauty beautiful in the same way that any particular instance of Beauty is beautiful? One might say that there is aesthetic beauty and a more intellectual beauty; the difference between, say, the beauty of a Constable landscape and that of the mathematics of special relativity. In which case Beauty might be self-predicative in the intellectual sense, and all the Forms might be intellectually beautiful by blending with Beauty. If that sort of analysis works for the Good as well, that means we can still desire Beauty and the Good because they are (in a slightly restricted and intellectual sense) beautiful and good. One problem with denying SP for such things is why we would desire them unless they had such characteristics.

29) Plato continues to use [kinesis] to cover all types of change.

30) While the entities that Plato refers to in the So. have some significant differences to the Forms of the middle period works (which I detail below), I believe that they are still recognisably Forms, and refer to them as such.

31) One could try denying the OOM premiss here for the interrelation of Forms, perhaps arguing that Forms are supposed to explain the properties of particulars and not other Forms. Judging by the So. however, this is not the route that Plato takes.

32) See So.260ab, and cf. Pm.135b.


34) The definitions that follow are derived from Hodges' discussion of the logic of relations, see Hodges (1977) p174-186. A relation is symmetric if for every case where an individual a has the relation to another individual b, it is also true that b has that relation to a. It is asymmetric if for every case it is false that b has that relation to a. It is non-symmetric if it is neither symmetric or asymmetric. p-F participation is clearly asymmetric. F-F participation is presumably non-symmetric as we must use dialectic to determine which Forms do and which do not participate in each other; see So.253c.

35) See e.g So.256ab.

36) Or rather clearly ought to be an asymmetrical relation. It is interesting to note that at Pdo.100d5-6 the p-F relationship is described as presence, [parousia], or as for F-F relations in the So, communion, [koinonia], although he uses [metechein] elsewhere in this work. Both of these could be construed as symmetrical and reflexive, and
I suggest that to some extent the more liberal attitude to SP of the
pre-Rm. dialogues may stem from a failure to consider whether
participation is a symmetrical relation or not. One might expect the
model/copy metaphor to entail asymmetry, but the second TMA uses
resemblance as the relation that links model and copy and this, as Owen
(1953) p318 ff has pointed out is a symmetrical relation. I take one of
the messages of the second TMA to be that one ought to use an
asymmetrical relation for p-F participation, something that the Tim.
with its shift of analogue and characterisation of particulars as
spatio/temporal entities would agree with.

37) E.g the Greek [echein]/[metechein], to have a part in.

38) Again, or rather the relation of p-F participation ought to be
irreflexive. A relation is reflexive if every individual has the
relation to itself. It is irreflexive if no individual has that relation
to itself, and non-reflexive if it is neither reflexive nor irreflexive.
Copying and imaging are clearly irreflexive, while blending may be at
least non-reflexive. Again, dialectic will be needed to distinguish
individual cases. Note that asymmetrical relations are always
irreflexive, while symmetrical relations are not, a point that may be at
the heart of the second TMA.

39) If the relation is spatio/temporal instantiation, as perhaps in the
Tim, then Forms cannot self-participate either. In relation to the
second TMA, if the relation is resemblance (and model/copy just a vague
metaphor) then if things can resemble themselves SP, returns.

40) Assuming here that Plato will be committed to the OOM assumption
both for p-F participation and for F-F participation.

41) See Vlastos (1954) p238 ff, and p238 n.2.

42) Owen (1966b) p207.


44) See my ch.2 for arguments here.

45) See e.g So.253b ff, 254b ff.

46) The means of deciding which Forms will predicate of all others and
which will not is one of dialectic; see So.253c.

47) See Pdo.104a ff where 'three' is perhaps treated as a Form. So.256d
perhaps suggests that one and many are still treated as Forms in that
work, and cf. Plb.14c ff on one and many.

48) There are Forms other than the greatest kinds that are recognised by
the So, and existence, sameness, difference, change and rest may not be
an exclusive list of the greatest kinds; see So.254b ff.

49) I have not discussed the second TMA or likeness regress (Rm.132d ff)
as essentially the same assumptions (OOM, SP, NI) are required for it.
There may be some other lessons to be draw from this argument, though.
That likeness is the relationship used may highlight certain things. It
calls into question the symmetricality of the relation of participation
(1989) p194), and may also ask us to ponder the difference between properties and relations. One suggestion that I do not have the space to pursue here is that the second TMA only produces a regress if we treat likeness as a complete predicate, rather than an incomplete one. We might then look to the So. and Tim. to see how they treat sameness and difference as two place predicates - see my ch.6.

50) What Plato had in mind in the earlier dialogues (see e.g Lys.217d, Pdo.74b, 100c, 102d, Prt.330d, Sym.211a) where he appears to be committed to general SP is difficult to determine. Perhaps he did not have something precise in mind, and was forced to confront these issues and others concerning the theory of Forms by the objections he himself raises in the Pm, leading to the changes that I have argued we find in the So. and Tim. See my earlier note on universals and paradigms.

51) See So.248d ff, and cf. Crt.439e.


53) One difficulty here is why some Forms should acquire [kath' auto] properties in SP and others [pros alla] properties; dialectic is presumably required to sort this out, and it may be that two different self-participation relations are involved.

54) [stasis] is the Greek that I render 'rest' here; cf. my comments on [kinesis] in the previous chapter.


56) See So.248d ff and cf. Crt.439e ff for a similar puzzle. For a discussion of the So. and Crt. on these points see MacKenzie (1986a) p137 ff.

57) Cf. e.g So.249b, 252d, and 255a.


60) Note here that this change of opinion is highly relevant, too; if Theaetetus changes his mind on this pair of 'opposites', he may also change his mind on others.

61) At So.250c ff he argues that Being, of its own nature, neither changes nor rests, with the implication that if Being were identical to Motion it would move of its own nature; cf. Reeve (1985) p51 ff for other examples. It is perhaps worth noting that the proposed solution does not in one way breach the strictures of So.251d6, which rules out Motion resting [pantapasin], 'in every way', and vice versa.

62) This interpretation has the advantage that there is no need to emend the text at this point, as Reindorf and Cornford feel the need to do (See Cornford 1935 p286 n.3).

64) See So.250e "Since being and not-being partake equally in perplexity, there is now some hope that if one can be brought to light either dimly or clearly, then so may the other".

65) See So.257b ff.

66) See So.254e ff, esp 256ab.

67) See So.250a ff.

68) See So.250e.

69) See So.255e ff.

70) See So.252c ff.

71) See e.g So.254bc.

72) Cornford (1935) p286/7 n.3 for instance argues against other views that "Reference to earlier statements asserting that Motion and Rest are incompatible excludes such interpretations".

73) As Macxenzie (1986a) p150 n.67 has pointed out Plato may for effect deliberately echo the style of an earlier work.

74) See below on Owen's arguments about Plato's confidence and the incidence of hiatus.

75) One might ask why this should be so however, especially as the Le. is so different in conception, content and perhaps purpose from the other supposedly late works.

76) Cherniss (1957a) p344 gives the following figures for the incidence of hiatus, all figures per page of the Didot edition. So. 0.6, Plt. 0.4, Tim. 1.1, Cri. 0.8, Plb.3.7, Le. 6.7. Other works include Pm.44.1, Lys. 46.0 (Highest), Pdr. 23.9 (Lowest), Mnx. 28.2, with a typical incidence of 35-45 per page.

77) As Cherniss has argued (1957a) p344 ff the Pdr. overall does not avoid hiatus in anything like as marked a manner as the late works, but it does so more in the conversation than in the set speeches. That means that the figure for real avoidance will be lower, and that it is likely that hiatus avoidance is a conscious characteristic.

78) See Owen (1953) p316.

79) I find Owen's suggestion here possible but not convincing.

80) Billig gives the following figures So.I 48.8%, So.II 65.8%, Plt.I 70.7%, Plt.II 52.0%, Tim.45.6%, Cri. 52.2%, Plb.78.2%, Le. 77.9%. Brandwood gives Pm.37.5%, So. (overall) 55.1%, and otherwise agrees with Billig.

81) Owen is strangely silent on this point; I take it that he would argue that there is no significant difference between the Pm. and Tim. here, and it is only the positive use of these rhythm that matter. However a 12.5% deviation from the 50% norm is quite large; if it is not significant it throws doubt on how significant the other figures are;
cf. Cherniss (1957a) p342/3.

82) In Billig's figures So.II is 236c-260a, while So.I is the rest, and Plt.I is the work as a whole, Plt.II is the myth (268d8-274e4) on its own (the figure for Plt.II is that of Cherniss, working with Billig's criteria). Brandwood (1958) p328 has shown that Billig greatly overstated the difference between the two parts of the So, and should not have separated them; his figures are 52.6% and 58.3% for So.I + II.

83) See Aristotle Rhetoric 1409.

84) See Owen (1953) p314 and esp. p314 n.2.


86) Prior (1985) p192 n.29. Indeed, as Prior argues, efforts to exclude the technical vocabulary of the Tim. may have created artificially low scores for the Tim. in this test, although he notes that Lutoslavski allowed for this, and reached substantially the same results.

87) The synonyms are:

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>[mechriper] against [heos(per)]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>[kathaper] against [hosper]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>[ontos] against [toi ontii]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>[alethos] against [hos alethos]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>[delon hos] against [delon hoti]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>[e pos] against [e ou]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Republic</th>
<th>Phaedrus</th>
<th>Parmenides</th>
<th>Theaetetus</th>
<th>Sophist</th>
<th>Politicus</th>
<th>Timaeus</th>
<th>Critias</th>
<th>Philebus</th>
<th>Laws</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0%</td>
<td>3%</td>
<td>18%</td>
<td>20%</td>
<td>4%</td>
<td>15%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>0%</td>
<td>13%</td>
<td>43%</td>
<td>13%</td>
<td>27%</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>0%</td>
<td>0%</td>
<td>N/A</td>
<td>0%</td>
<td>N/A</td>
<td>20%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>0%</td>
<td>4%</td>
<td>14%</td>
<td>11%</td>
<td>0%</td>
<td>0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>25%</td>
<td>61%</td>
<td>95%</td>
<td>67%</td>
<td>44%</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>43%</td>
<td>69%</td>
<td>100%</td>
<td>100%</td>
<td>17%</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>66%</td>
<td>100%</td>
<td>89%</td>
<td>80%</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>71%</td>
<td>N/A</td>
<td>N/A</td>
<td>100%</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20%</td>
<td>77%</td>
<td>100%</td>
<td>100%</td>
<td>38%</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>86%</td>
<td>100%</td>
<td>100%</td>
<td>47%</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Their use in works before the Rep. is virtually negligible. The source is Mueller (1989) p12 ff, who has reformulated the work of Ritter (1910) p236/7. As Mueller comments, this is only a small proportion of the evidence here.

88) Owen (1953) p314 n.5, p316/7 contends that Plato was conscious of his synonym usage and altered it to suit when he adopted an 'elevated' style; that may be so for some synonyms, but as comparison with the synonyms and the above table shows, it is not so for all.

89) Looking at the pairs of synonyms, apart from the [e pos... e ou] pairing they do not affect hiatus avoidance, and their is no correlation of synonym usage and variations in prose rhythm.

90) See Billig (1920) p250 and Brandwood (1958) p398-400.
In this chapter I wish to trace another strand in the development of Plato's thought, this time relating to how numbers are generated and defined and how the tools that Plato employs here are used in the ontological analysis of physical entities. In short, the second part of the Parmenides sees the germination of some new mathematical ideas which come fully to fruition in the Philebus. On this matter I am largely following and in agreement with the work of Sayre. However, Sayre dates the Timaeus relatively early and sees it playing no part in the development he traces. Here I shall argue that the Timaeus plays an important role in this story and that Sayre is wrong concerning a key element in his interpretation of the Philebus.

The Philebus seems quite happy with the notion that we can have some sort of knowledge of the world around us, although perhaps not the best sort. It is important to understand what it is about the Philebus that allows for such optimism. I shall argue that the Timaeus, though it does not make the same overt comments as the Philebus, contains the same basis for optimism about the possibility of knowledge of the natural world. Both are engaged in a project of reformulating Pythagorean notions of how mathematics relates to the natural world, and the Philebus applies the advances of the Timaeus to perceptible qualities as well as to bodies. I also attempt to draw together the threads of the interpretation of the Timaeus that I have been arguing for for the last four chapters in relation to chapter four's arguments concerning its structure and purpose.

Sayre has argued that one of the purposes of the second part of the Parmenides is to argue against Eleatic strong monism and for a modified Pythagorean ontology. From Parmenides 137c on, we are presented with eight hypotheses concerning unity, [hen]. Sayre considers there to be two different types of unity in play in these hypotheses. The unity considered by hypotheses 1 and 6 is [me polla alla hen auto einai] (137d2), 'not many but one in itself'. He takes this to mean that this unity exists in and by itself without relation or reference to
anything else. If so, then the consequences drawn from hypotheses 1 and 6 readily follow.\(^5\) The unity considered by hypotheses 2 and 5 on the other hand is said to have being [\(\text{ousia}_\xi, \text{metechein}\)] (142b6),\(^6\) and so has relations to other things. The unity which permits no relations appears to have affinities with the One of Parmenides' poem.\(^7\) However, the consequences that are drawn from the existence of such a unity are highly damaging for the 'way of truth position'.\(^8\)

According to hypotheses 1 and 6, whether this unity exists or not, it has no characteristics, such that in contradiction to the prohibition of Parmenides' poem,\(^9\) 'it is' is no more thinkable or a subject for investigation than 'it is not'. Further, whether this unity is or is not, according to hypotheses 4 and 8 other things have no characters either, even apparently. So contrary to Parmenides' poem, other things are indistinguishable from the one.\(^10\)

Plato also appears to take care to deny that this one can have any of the characteristics that Parmenides' poem accords to it. Hypothesis 1 argues, in the following order, that this one cannot be characterised by limit, shape, place, motion, sameness or otherness, similarity or dissimilarity, equality or inequality, or temporal order.\(^11\) Plato's Parmenides then argues that as we cannot ascribe past, present or future to this unity, it cannot partake in being. This being so, he concludes

"It cannot be named nor accounted for nor opined nor known, and nothing can perceive it".\(^12\) (Pm.142a)

Sayre also argues that the second part of the Parmenides defends two Pythagorean theses, that unity generates number and that number is in some way constitutive of sensible things.\(^13\) This can perhaps be best seen in hypothesis 2, to which Parmenides moves after the breakdown of hypothesis 1. Hypothesis 2 begins from the assumption that if unity exists, it partakes in being (Pm.142bc). Granted this, Parmenides then attempts to show that nothing stands in the way of the existence of number. He argues that if unity exists, it must partake of being which is not the same as unity itself (142b6). Hence the existing thing has two constituents, unity and being. As a pair, each of these is one, and neither is lacking in \([\text{apoleipesthon}]\) (142e1) being. Thus each constituent of unity has two constituents, unity and being, each of which will have two constituents, and so ad infinitum. Thus an \([\text{apeiron plethos}]\) 143a2), an 'unlimited multitude' is generated. This is not yet a number series though, as each thing that is generated lacks unity, forever becoming two (142e8).
Parmenides then makes a fresh start, in which he treats both unity and being as unities (143ab). Their existence though requires a third thing, difference, by virtue of which they are different from each other. If we speak of any pair of these, we speak of them as both and so as two. If these things are two, then each of them must be one. By addition of another one to a pair, it becomes a threesome. According to Parmenides if there are two units then there is twice, and if three then thrice. With the operation of multiplication he believes he can produce any number ("If things are so, do you believe that any number could be left out?" (Pm.144a2)). Thus he concludes "If unity exists, there must also be number" (Pm.144a4).

Hypothesis 2 has considerably more to say though, for Parmenides proceeds to argue that all of the characteristics that were denied to the unity of hypothesis 1 can be applied to the products of the unity that partakes in being of hypothesis 2. As these are the qualities that characterise spatio/temporal entities, it seems that this unity not only generates numbers but also the possibility of spatio/temporal entities. There is here then a two pronged attack on the central tenet of Parmenides' poem. Firstly, it is argued that the existence of the one postulated by Parmenides' poem is indistinguishable from its non-existence. Secondly, nothing that is attributed by the poem to this one can be consistently maintained, not even that this one exists. The problem posed by the second part of the Parmenides to anyone defending the strong monism of Parmenides' poem is that they can neither deny that unity exists, thus denying it any characteristics, nor assert that it does exist without allowing the possibility of indefinitely many numbers and sensible things. As Sayre puts is,

"If the arguments are sound, in other words, it has been shown that the Eleatics are necessarily wrong and the Pythagoreans might just be right." However, there was a further difficulty for the Pythagorean programme, that of incommensurability. Sayre also argues that signs of Euclid's general theory of proportions, which is applicable to both commensurable and incommensurable numbers alike, and whose discovery is attributed to Eudoxus, may be found in the Parmenides at 140c. He comments that

"The close parallel between Eudoxus' definition of proportional magnitudes and Dedekind's definition of rational numbers has been noted by several historians of mathematics."
Sayre sees considerable significance in this for the Philebus, and I shall argue that in addition this is important for the interpretation of the status of the stoicheic triangles in the Timaeus. Firstly, though, let us look at the position of the Philebus.

II

According to Sayre, some of the views that Plato expresses in the second part of the Parmenides are taken up and developed in the Philebus, as well as, more conjecturally, Plato's Lecture on the Good. Sayre's hypothesis is that the [apeiron plethos] which was used to generate numbers in the Parmenides becomes the more general [apeiron] of the Philebus, which under Aristotle's description is the indefinite dyad or the 'great and (the) small'. On this hypothesis sensible things are constituted from the [apeiron] and the Forms. Lacking a relationship to the Forms, sensible things would be 'unlimited' both in the sense of being innumerably many and being without character and limit. This duality in the sense of 'unlimited' is also to be found in relation to the [apeiron plethos] of the Parmenides.

The 'godly method' is then the method of collection and division expounded in the Politicus and Sophist in conjunction with the ontological tradition mentioned at 16c9-10, that things are constituted from the one and many, and from the unlimited and limit. One advantage of Sayre's analysis is that we can give the same interpretation to [apeiron] at 15b5, 16d6, 16d7, 16e1, 16e2 and 17a2, that of indefinitely many single things. Another is that the godly method now deals with the correct 'one and many' problem, of how such unities as man, ox, beauty or the good, while not admitting generation and destruction, can nevertheless have participants that do indeed change. A further strength of Sayre's view is that it accounts for the otherwise puzzling remarks both of Aristotle and other subsequent commentators on the Philebus and on Plato's notorious Lecture on the Good. Sayre argues that many of the theses attributed to Plato by Aristotle and subsequent commentators, which are absent from the early and middle period works, can be found in the Philebus on his account, thus cutting much of the ground from under the 'esotericist' positions.

The key point on which Gosling, Sayre and myself are in agreement, against the view that limit and unlimited are a precursor of Aristotle's form and matter, or the view that the unlimited is a set of
concepts, is that [to apeiron] is a general term for a range of phenomena that can be construed in terms of a mathematical continuum, while the [peras] or limit determines a specific position on that continuum. According to Philebus 25a all things which admit of 'more or less' are to be placed in 'the single group of the unlimited', while everything that 'relates as number to number or measure to measure' come under limit.

The fundamental point of disagreement between Gosling and Sayre concerns the constitution of physical objects. According to Gosling, Plato in the Philebus is concerned with the development of mathematically based [technai] and not with the constitution of objects. According to Sayre, particular objects come into being by an interaction of limit on the unlimited, both being ontological principles. Let us consider the position of the Timaeus relative to the Philebus on these matters. Here I shall argue for a position which combines aspects of both of these views and gives a reasonable account of Plato's development.

The Parmenides and the Philebus in conjunction might be argued to have an account of numbers, of geometrical entities and of the properties that bodies may have. What they do not have is an account of physical body in itself, of how it might be generated, of whether it has physically indivisible minimal parts, and if it does how these might combine together to make up the physical world as we know it. These questions, I suggest, are the province of the Timaeus, which answers the question concerning the generation of physical bodies in a manner that accords with the Philebus.

As we have seen, numbers are produced by the participation of the great and the small in unity, and are unique limits on a continuum. Given that, as Sayre freely admits, we can then generate geometrical entities. If we take two numbers on the continuum, we can then define a line of specific length and so we have extension. If we develop this into two dimensions we are then able to generate all the plane figures, into three and we can generate all of the solids. Now, if it were possible to generate physical rather than abstract plane figures we would arrive at a point where the Timaeus could take over with an account of how the physical world is constituted from two specific types of plane figures, the scalene and isosceles stoicheic triangles. Here we might remember that at 53de the Timaeus was rather coy about the
I argued in chapter seven that this does not necessarily mean that there are further more fundamental physical constituents of these triangles, and it would seem that at the end of analysis by physical decomposition Plato envisages some teleological explanations. It may also be the case that there are some further mathematical/ontological [archai] that relate to the stoicheic triangles. At Timaeus 53b we are told that when the demiurge orders the universe from its primordial chaos, a situation where all that is in it is devoid of 'reason and measure' [alogos kai ametros] (53a9), he 'brings forth an arrangement by means of Forms and numbers [eidesi te kai arithmos] (53b5). Note the similarity of language here with the key passage at Philebus 25a concerning limit and unlimited. There are of course differences between generating abstract geometrical figures and producing actual stoicheic triangles, and here the receptacle of the Timaeus may play an important part. As we have seen earlier, the receptacle is entirely characterless, and under one view is an amorphous substrate. Its characterlessness may well imply that it is a continuum, as discreteness would allow us to point to different parts. That may mean that the demiurge, when he acts with 'ideas and numbers', can cut up the receptacle in the same way that a number line can be cut, and so, although the specific terminology is not used in the Timaeus, imposes limit on the unlimited in a manner that is analogous to the Philebus. It is worth noting here that Simplicius in his commentary on the Physics cites Aristotle in his report of Plato's Lecture on the good as saying that the great and the small was matter. We saw in the last section that what Aristotle terms 'the great and the small' is very likely to be the [apeiron] of the Philebus, and we have seen too the close links between this work and the Lecture on the Good. If we also remember that Aristotle treated the receptacle as prime matter, as did Plato's companion Hermodorus and many others, then we have the equation that (in one case at least) the receptacle = matter = [to apeiron] = the great and the small. This is not to say that the unlimited is identical to the receptacle; rather, one way of using the limit/unlimited analysis is to treat the receptacle as an unlimited continuum and to generate physical bodies from this. Another is to treat pairs of attributes of bodies (e.g. hotter/colder) as continua that may be given a determinate value (e.g. a temperature) by the imposition of limit. If this is so, and the demiurge can divide up the continuous
substrate by means of Plato's version of a Dedekind cut, then it may explain why the stoicheic triangles are perfectly triangular. We might expect, given the model of participation used in the Republic,\textsuperscript{40} that if the stoicheic triangles are 'images' of the 'real' triangle that they should be deficiently triangular, yet there is no suggestion of this in the Timaeus.\textsuperscript{41} So perhaps then one of the tasks of the Timaeus is to investigate the possibility of imposing limit on a continuum of amorphous matter thus generating specifically shaped physical entities which act as physical stoichea, and further to see if such a hypothesis is powerful enough to be explanatoryly adequate for virtually all physical phenomena.

III

If this assessment of the Timaeus is correct, then it has considerable implications for our view of the Philebus. Firstly, it is clear that in the Timaeus at least the precursors of limit and unlimited do have something to do with the constitution of objects, at a more fundamental level than the four element theory or even the theory of stoicheic triangles. It is important to note here that the Philebus at 29a ff subscribes to the four element theory; all physical things are made up of earth, air fire and water. If the Philebus directly succeeds the Timaeus, as seems likely, then it is quite possible that it subsumes the Timaeus' analysis of the ultimate constitution of the four elements. Further, as Sayre has pointed out,\textsuperscript{42} there are five passages (Plb.16c, 25e, 26d, 27 and 27b) which seem to state explicitly that limit and unlimited are constitutive of physical things, and so Gosling's position cannot be entirely correct.

However, this analysis of the Timaeus also generates considerable difficulties for Sayre's position. According to him, the ontological account of the Philebus is more basic than that of the four element theory, the four elements being constituted from the unlimited and the Forms, and if we use the four elements in explanations, this is akin to citing say, molecules rather than primary atomic particles in modern physical explanations.\textsuperscript{43} The difficulty here concerns how limit and unlimited go to make up the four elements. Sayre takes the view that in the Philebus, sensible things are no more than an 'assemblage of qualities', which do not inhere in any body, and these qualities are constituted from limit and unlimited.\textsuperscript{44} The Timaeus position, and one
that I shall argue that we can profitably read into the Philebus as well, is that in one case the unlimited is an amorphous substrate (i.e. the receptacle) which is divided into stoicheic triangles by the imposition of limit (by the demiurge). Those triangles then have properties which can be explained in terms of their structure and motion. So how, using Sayre's scheme, would we analyse the element fire, for example? Sayre notes that Plato does not give us much help with this problem, and says

"The manner presumably is not far removed from that in which Man (and Stone, and any living thing) is said at Theaetetus 157c1-2 to be an assemblage of sensible qualities".45

So a particle of fire can be described as hot, having a specific temperature on the unlimited scale of hotter/colder, and also as having length, breadth, depth and weight, etc in the same manner.46 Is fire though merely an assemblage of its qualities for Plato?

My first objection to Sayre is that it is by no means clear that the position outlined Theaetetus 157c is one that Plato subscribes to. It is part of the combined Protagoras – Heraclitus – Theaetetus position developed to support the contention that knowledge is perception. Directly after the passage that Sayre cites, there is a passage familiar from my discussion of Plato's EUP in chapter one;

So "These views, Theaetetus, do they seem pleasant to you, and do you find their taste gratifying?"

Th "I, at least, don't know, Socrates. For I am not able to understand you, whether you say these things from your own belief or to test me."

So "You forget, my friend, that I know nothing of these things and nor do I claim any of them as my own, as I am barren of theories, being merely a midwife singing over you, providing for you so that you may taste for yourself each of the theories of the wise, until I can help lead your own opinion out into the light." (Tht.157c)

Furthermore, at Theaetetus 157b ff, directly before Sayre's passage and critical to its nature, we are given views which both the Philebus and Timaeus would reject, as they subscribe to the notion of [genesis eis ousia], namely that there is no being and that everything is in a state of becoming.47

Secondly, we ought to consider the following question. Are we to explain hot and cold in terms of the presence or absence of fire, or in terms of a determination of a continuum of hotter and colder? Here we
might think back to the Phaedo and my chapter two. To say that something is hot because it possesses a high score on a temperature scale looks suspiciously like the 'safe answer' of the Phaedo, where something is hot because it participates in the hot. 48

The Timaeus, on the other hand, gives us the 'clever answer', that heat depends on the presence of fire. Further, the Timaeus goes on to explain how it is that fire produces heat in terms of the structure and motion of the fire atom. If we generalise, the position of the Timaeus is that the qualities we perceive can be analysed in terms of the structure and motions of particles. 49

A further problem with Sayre's account is that he does not consider physical entities in contrast to sensible entities. 50 We have seen that the Timaeus distinguishes between sensible objects and those which while physical are below the threshold of human perception. If, as I have suggested the Philebus employs the four element theory, as individual units of those elements are imperceptible, then there are physical and imperceptible entities in the Philebus. 51 Sayre's view is that perceptible entities are assemblages of perceptible qualities. It is difficult to see how one might amend Sayre's view to accommodate imperceptible entities without giving more substance to those entities than Sayre would wish to allow.

Finally, another problem for Sayre is that Aristotle, on whose evidence Sayre relies strongly in other matters, also interprets the great and the small as being matter. 52 A defence for Sayre here might be that Aristotle is imposing his own categories on Plato in his interpretation, but firstly this evidence is intertwined with other evidence about Plato's late views that Sayre accepts, and secondly Aristotle's interpretation actually seems quite reasonable relative to Plato's discussion of the receptacle in the Timaeus. 53

It would seem then that we need to construct a position between those of Gosling and Sayre, and this I suggest would go as follows. The Philebus takes over the analysis of the constitution of physical bodies from the Timaeus, the unlimited (i.e receptacle = amorphous substrate) combining with limit (i.e Forms and numbers) to produce the stoicheic triangles which then combine to from the four elements common to both the Timaeus and Philebus. Contra Gosling limit and unlimited are then in a way constitutive of physical entities, contra Sayre these entities have body and are no mere assemblage of qualities. One of the tasks of
the Timaeus, I have suggested, is to investigate the possibility that the ultimate physical constituents of the universe are amenable to precise mathematical analysis. The task of the Philebus may be to take the further step of investigating ways in which the qualities of those bodies and the phenomena which we perceive may also be amenable to this sort of analysis. This time we treat each relevant quality as a continuum which when it interacts with limit produces a precise, measurable quantity.

This is important because of the [technai] that can be based on this precision. Earlier in this thesis I was critical of Plato because it appeared that while he was interested in the mathématisation of nature, he was not interested in either the mathématisation of science or the quantification of phenomena. If I am correct here, however, it would seem that in the Philebus, at least at a theoretical level he is interested in providing a basis for both. Philebus 55e tells us that if we abstracted all the mathematical content from a [techne], all we would be left with would be [empeiria], an empirical knack learned by experience. Philebus 56a ff praises those [technai] which employ number and measurement against those which employ guesswork, and considers them to be closer to the truth. Earlier in the Gorgias Plato had reckoned that it was the possession of a 'rational account' that distinguished a [techne] from mere [empeiria]. Here we see something which in the next chapter I shall argue is typical of Plato's later development, which is a greater mathematical orientation in explanation. This is not to suggest that the earlier account excluded mathematics or that the later excludes more discursive accounts, the subject matter helping to determine what is appropriate, but rather there is a significant change of emphasis.

Running through Philebus 55e ff is one of the key themes of the later works, the analogue of number/things that have number against geometrical paradigm/representation as the central metaphor for participation, that may provide the basis for this change of emphasis. That we now have a means of precisely quantifying qualities is an advance over the Timaeus, where it might be argued that only matter and motion could be so quantified. The Philebus then perhaps extends the range of [to logistikon], the things amenable to reason/calculation.

A further aspect of Plato's thought in the Timaeus which fits into the programme of development from the second half of the Parmenides to
the Philebus is the question of irrational numbers and measurement. The Pythagoreans treated geometry arithmetically, by attempting to treat geometrical problems as part of the theory of natural numbers, that is as numbers composed of indivisible monads. Thus every geometrical length ought to be expressible as the ratio of two natural numbers. If these numbers represent a length, then if we ask how long something is, rather than measure the distance we count the number of monadic lengths involved. So too, according to Aristotle the Pythagoreans treated physical entities as in some way constituted out of number. The great problem for these projects, as noted in section one of this chapter, comes with the discovery of the irrationality of the square root of two, for here we have a number/length that cannot be expressed as a ratio of two natural numbers, or as a multiple of a monadic length. That Plato was aware of this for not only lengths but for areas and volumes too is made clear by the Athenian's explicit comments at Laws 819a ff.

It has been argued, most notably by Popper, that in response to the difficulties of the Pythagorean programme Plato advocated geometrical rather than arithmetical means for the description and explanation of the world. The part of the Timaeus in this was of proposing a specifically geometrical atomism. As if to emphasise the overcoming of the difficulties dogging the Pythagoreans, the stoicheic triangles have sides of root two and root three. If I am correct about how they are generated, one can clearly see the importance of the new conception of number and the number line that germinates in the Parmenides and comes to fruition in the Timaeus and Philebus. If the demiurge has Plato's version of a Dedekind cut available when he divides up the receptacle/substrate into stoicheic triangles, there is no reason why he should not employ irrational numbers.

It may also be the case that Euclid's elements were more than an exercise in pure geometry, and were intended as an organon of the Platonic cosmos. Proclus for instance comments that

"Some have thought that the subject matter of the various books [of Euclid] pertains to the cosmos, and that they are intended to help us in our contemplation of, and theorizing about, the universe." Popper comments that one of Plato's main contributions is that

"Ever since, but not before, geometry (rather than arithmetic) appears as the fundamental instrument of all physical explanations and descriptions, in the theory of matter as well as cosmology."
It is also notable that Plato gives us a specifically mathematical description of a finite and small number of types of atom, and attempts to explain their physical properties (the heat of fire atoms, etc) in terms of their mathematical properties (acuteness of angles, etc), in distinction to the 'hooks and eyes' men. Plato also postulates that these atoms will decompose into a small number of ultimate physical constituents. This is an idea that has taken over two millenia to come to fruition, as the corpuscularians of the scientific revolution revived the hooks and eyes theory, rather than Plato's.

IV

In chapter seven, having discussed the relation of the status of the stoicheic triangles to the sort of thinking that the world soul does, I commented that there was more to be said on the subject of the relation of the world soul's thinking to the nature of the receptacle. Having seen how the receptacle may be related to the stoicheic triangles and the phenomena that occur in it, let us take up the discussion again.

It might be argued that Plato presents us with four different views of the constitution of physical entities in the Timaeus. Firstly, if we treat the passage concerning the construction of the world soul as talking about ontology, as well as metaphorically about the innate mental abilities of the world soul, then we have a mixture model. The world soul is made up of a mixture of being, sameness and difference, and we might be intended to extend this to the world in general and to other qualities as well. The demiurge might then act on the world in the same way as he makes the world soul to create other phenomena. Phenomena would then simply be collections of qualities, some part of this mixture marked off in some way, without inhering in any matter or any subject.

An analogous position is the one defended by Cornford. According to him, the receptacle should not be considered to be matter, but is merely the place in which qualities occur, 'as fleeting images are seen in a mirror'. The phenomena again are mere bundles of qualities which have no subject and do not inhere in anything.

We might compare these models with the combined Theaetetus - Protagoras - Heraclitus position of the Theaetetus, where there is nothing that holds phenomena together. That is a position that I have suggested Plato rejects, and he again raises difficulties for it here. If the changing things that we see are no more than
collections of qualities, all of which are subject to change, then, as we saw in chapter seven we can make no identifying references and so discussion of the physical realm is prone to collapse. There must be something we can refer to as 'this', rather than having to refer to everything as 'suchlike'. So perhaps Cornford's view is an advance on the mixture model, with the receptacle as the referant of 'this'.

One might also think back to another aspect of my earlier discussion of the world Soul. There I suggested that the basis for the sort of thinking that the world soul does are statements of identity and predication. We have seen too that the world soul can have knowledge as well as true and stable opinions. Now, if the structure of our knowledge and true opinions is in some way isomorphic with the structure of the world, then it may be that the world is structured in an object/property manner that a distinction of subject/predicate reflects. One of the problems with the two models we have seen so far is that they do not allow for the world to be so structured; there are simply collections of qualities, but not objects which have properties. It is difficult, on both of these models, to see what it is that holds a collection of qualities together to make it a definite phenomenon; and if there are no definite phenomena, then any proper discussion of the physical world will be prone to collapse.

The third model that is suggested by the Timaeus might be thought to take some of these points up, and give us a substrate/attribute view to match the world soul's subject/predicate thinking. If we consider the receptacle to be an amorphous substrate, as is suggested by the metaphors employed at Timeaus 50c-51b, then properties will actually inhere in something. This model also has the advantage of being better able to cope with change, for underlying any change in the properties which come and go is the substrate which stays ever the same. Thus some problems with flux, and in addition some Eleatic problems concerning change can be avoided. We now refer to the substrate as 'this', while referring to its attributes as the 'suchlike'.

There is a problem with all of these models, however, which we might describe as the localisation problem. If a quality occurs in the mixture, in a mirror or in an amorphous substrate, why should it be in any one part as opposed to any other, or not in all parts at once? What is it that distinguishes any one part of these models from any other, and allows one part to have different qualities from another?
Here one might wonder how the receptacle is related to the things that are in it and what sort of explaining the receptacle is supposed to allow. This is all the more acute if the receptacle is simply a substrate and nothing more, for it becomes very difficult to talk about. As Timaeus 50c-51b makes clear, we can only refer the receptacle negatively, by talking of the attributes that it does not have. The receptacle so far seems to be too far divorced and unrelated to anything else for it to do any proper explaining. Here we might go back to a point that I raised in chapter four concerning the contrast between the [sungenes] 'of the same family', stricture for explanation of Timaeus 29b, and the 'bastard reasoning' of Timaeus 52b by which the receptacle is apprehended. I suggested there that the problem we are meant to see with [sungenes] explanations is that they are too close to the explananda to do any proper explaining. Here we perhaps see that a 'bastard' explanation, one that is not properly related to its explananda, cannot properly explain either. One might indeed wonder how something that can only be defined negatively and so can take no part in any positive discourse or be related to anything else could be something that would help with explanation, even if it does provide something for properties to inhere in and so acts as a counterpart to the subject/predicate thinking of the world soul.

The fourth model that we are presented with is the one which I have examined at length, that of the receptacle initially treated as an amorphous substrate and a limitless continuum which is subsequently divided into stoicheic triangles by the imposition of a form of limit. The receptacle subsequently can be conceived as the space within which the stoicheics move around and combine with one another.

Here we have some excellent localisation criteria. We have no problem in seeing why one part of the world may have different properties from the next part, how there can be definite phenomena, and how these might change without the problems of flux endangering discourse. What is more, we see the beginnings of a new theory of how it is that bodies have properties. Instead of saying that something is hot because it has a piece of heat in it, or because the property heat inheres in it, we can now analyse heat in terms of the motion and the mathematical structure of atoms and sub-atomic particles as Timaeus undertakes at 61d ff. Similarly, colour is analysed into different mixtures of fire particles.
This is important when we think back to my earlier discussion of the nature of the world soul and the way that Plato treats sameness and difference in the Timaeus. There I suggested that Plato only treats sameness and difference as one place predicates when he is metaphorically attributing some cognitive properties to the world soul, and that otherwise he treats sameness and difference as two place predicates.88

On the first three models we have examined here, one can see the temptation to say that if something is the same (as something else), then either it has a piece of sameness in it (mixture model), sameness is one of its bundle of qualities (mirror model), or it has the property of sameness in the same way as it has e.g. heat or colour (substrate model). With the new model though, this temptation is removed. One might reply that although this perhaps makes some progress, on these grounds Plato might still treat relations such as sameness on a par with properties such as redness. However, if we are to explain properties in terms of the mathematical structure and motion of particles, it is hard to see how one could give a similar analysis to same as one would to red. Rather, one might be led to compare mathematical structure and motion as a basis for attributing a relation of sameness or difference between particles or ensembles thereof.

This new model allows us to analyse the world in an object/property manner that correlates with the subject/predicate thinking of the world soul. What is more, the receptacle is no longer something unmentionable and unrelated to the things that are in it. The imposition of limit on the unlimited generates the stoicheic triangles from the receptacle in a reasonably explanatory manner. While on the second and third models the receptacle was [alogos], here we can give some account of it and its contents in terms of more basic categories, namely here a continuum which suffers the imposition of numbers, which in the Philebus will become limit and unlimited.89

We should also note in all this that the world soul gets its initial grasp on something in a subject/predicate manner. This is by no means to suggest that this exhausts its cognitive powers, for it then has to think about what it has grasped.90 That may allow the world soul some teleologically oriented thinking, linking its subject/predicate propositions together into accounts and weaving these together to provide systematic explanations. This is important, especially as
this model of the world lays emphasis on the good structure of the entities which result from the interaction of Forms and numbers with the receptacle, and suggests that there is not only an object/property structure, but also stability and teleological structure at the most fundamental physical level of the stoicheic triangles.

V

The Philebus seems quite happy with the idea that there can be some sort knowledge of at least some physical entities. Following the discussion of various types of pleasures, we are told

"And so knowledge differs from knowledge, on the one hand concentrating on the things that undergo generation and destruction, on the other on things that do not suffer generation and destruction and are always the same and similar." (Plb.61d)

Furthermore, these lower grades of knowledge are accorded some considerable importance for practical decision making, as the following exchange between Socrates and Protarchus demonstrates

So "Let us suppose then that there is a man who understands what justice itself is, and has an account in accordance with his understanding, and moreover that he has the same sort of thoughts concerning all other things."

Pr "Let that be supposed."

So "Now will this man have sufficient knowledge, having account of the divine circle and sphere, but being ignorant of the human circle and sphere, even if he employs these circles and other rules in house building?"

Pr "We ought to call it a ridiculous state, Socrates, for someone to have divine knowledge only."

So "What is this you say? Are we to throw the unstable and impure skill of the false and circle and rule into our mixture?"

Pr "Necessarily, if we are to be able to find the road home on each occasion." (Plb.62a)

The important thing to note here is that the Philebus does not employ the sensible/intelligible or physical/incorporeal distinctions as criteria for what can and cannot be known, in contrast to other works, and instead employs mutability. In the extreme cases, the Philebus has some affinities with earlier works. The best sort of knowledge is had of those things which are entirely stable, while there can be no knowledge.
of anything that is entirely unstable. In between, however, the Philebus is willing to allow some knowledge of things that change, but show some stability. As with Bostock's comment on being and flux in the Theaetetus, if we ask what allows this more liberal attitude to knowledge, the reply might be a more liberal attitude to being, and in turn to flux. As we saw in the chapter seven, it is possible for things to come into and pass out of being in the Philebus, rather than stay in a perpetual state of becoming. This in turn might prompt us to question the Timaeus' attitude to what we may have knowledge of. The alternative epistemology, as we have seen, is far more optimistic about human capabilities than the statements of 27c-29e, while stopping short of an explicit statement of what may be known. Is there then some critical difference between the views of the Philebus and Timaeus which denies such optimism to the Timaeus? In chapter five we saw the close affinities of these works on the questions of cosmological stability and the mathematical precision of the motions of the heavens. We saw in chapter seven that the Timaeus rejects radical flux, and is entirely happy with a notion of [genesis eis ousia]. We can also note from chapter six that the Philebus operates with a similar conceptions of mind, discourse and the sources of false judgement. Other important similarities lie in the roles of the demiurge, teleology, harmony and intelligence. We have seen the affinities between the unlimited to the receptacle, between limit and Forms and numbers. We might also liken the pattern which the demiurge seeks to impose on the world with the actions of the demiurge as the Philebus's fourth class of what is responsible for the interaction of limit and unlimited, and the world of the Timaeus with the Philebus's third class of mixture. We even find in the Timaeus that what is good always has due measure [to kalon ouk ametron] (Tim.87c), a point emphasised at length in the Philebus.

As we have seen, the Philebus subscribes to the four element theory, and the elements in the Timaeus are generated by the action of limit on the unlimited continuum of the receptacle viewed as a substrate, producing the stoicheic triangles and hence the four elements. The Timaeus lacks the fourfold analysis as applied to properties though, which allows us to precisely quantify and so perform reasoning/ calculation on them, so perhaps in the Philebus there can be knowledge of more things than in the Timaeus.

One might argue that what the Philebus has and the Timaeus does not
is the method of collection and division. Indeed, one of the major tasks of the Philebus may be to formulate the new cosmology and metaphysics in such a manner that the world it postulates is amenable to this method of investigation. However, while collection and division is not explicitly mentioned in the Timaeus, it may well be that we do in fact see this method in action, interestingly at the point in the Timaeus that most prefigures the limit/ unlimited analysis of the Philebus, namely the discussion of physical stoiche In the Philebus' discussion of collection and division at 16c ff, letters and syllables play a prominent part in the exposition, and Socrates is highly critical of those employing this method who proceed directly from unity to an indefinite number without considering the steps between. Timaeus too is highly critical of those who directly posit four elements, telling us that these are in fact not even syllables, let alone letters. In chapter seven I argued that the full hierarchy here as far as the Timaeus is concerned is physical phenomena - agglomerations of atoms - atoms - atomic planes - stoicheic triangles. Whichever way up we take unity and indefinite number here, it is clear that there are many intermediary steps in the analysis, and although not called so in the Timaeus, this may be a case of investigation by collection and division.

So while the analysis of the Philebus may allow more things in the physical realm to be known, and has the method of collection and division explicitly on hand, there does not seem to be any fundamental difference between the two works that would deny knowledge of at least some aspects of the natural world to the Timaeus. Whether the alternative epistemology of the Timaeus allows humans to generate some knowledge here is another question, that I shall come to shortly.

VI

Firstly though some remarks on the results of the Theaetetus' discussion of knowledge would seem to be in order. The Theaetetus rejects the notion that knowledge should be equated either with perception or with true belief. It also discusses the Meno's contention that knowledge is true belief with an account. Plato appears to hold two principles, that knowledge requires a [logos], (KL), and that knowledge must be based on knowledge, (KBR). Such a view must be able to deal with certain regress arguments; to know something we must have an account, to know the account we must have a further account, etc. According to Socrates' dream at Theaetetus 201d ff, the regress is
finite and terminates with basic elements which lack accounts. If they lack accounts, then they are unknowable. As far as the physical world is concerned, it is notable that the Timaeus argues that there are basic elements, the stoicheic triangles, but these can be given teleological and mathematical/ontological accounts.\footnote{101} There is not then a specific problem here with the physical world; the physical 'atoms', here taking 'atom' in its more literal sense as indivisible fundamental entity, can have accounts as well as names, though of course there may still be a problem with logical atomism, which would beset any claim to knowledge.\footnote{102}

The Theaetetus next examines three interpretations of [logos]. One, that it is any statement is quickly rejected,\footnote{103} as is the notion that a sufficient [logos] here would enumerate all of the elementary parts of the known thing.\footnote{104} Attention then centres on the idea that to give an account is to state the way in which the known thing differs from everything else.\footnote{105} This notion is assailed in two ways. Firstly, as unique referring descriptions are necessary for true opinion, they cannot be sufficient for knowledge.\footnote{106} Secondly, if we require knowledge of something's difference from everything else, then our definition of knowledge becomes circular; knowledge is true opinion with knowledge of difference.\footnote{107} So the Theaetetus ends aporetically.\footnote{108} Whether Plato himself was in aporia, or merely wished to make his readers think harder, is another matter of course.\footnote{109} Various ideas have been proposed for how Plato might himself have resolved this aporia, and here I am largely in agreement with Fine, who suggests that we might attempt to eliminate 'knowledge' from the definiens by considering what a knowledge of difference might amount to.\footnote{110} Thus Fine gives a revised definition of knowledge as

"Knowledge of x is correct belief about x with the ability to produce accounts properly relating x to other suitably interrelated objects in the same field."\footnote{111}

Here we might consider Plato's favourite letters and syllables analogy. In order to know how to spell, say, Theodorus, it is not enough simply to enumerate the elements (letters) of 'Theodorus', nor to be able simply to distinguish its letters from each other. Rather, what is required is an ability to interrelate each letter with others.\footnote{112} This too is of course susceptible to regress arguments, if KL and KBK are still in play.\footnote{113} However, as we saw in chapter two, the regress may be circular rather than linear, and if that circle is large and

232
informative enough, the regress may be virtuous. The difference between
this and say the view of the Republic and earlier works is that where
the Republic requires only one definitive account to convert opinion
into knowledge, the interrelation model requires several accounts. One effect of this might be to blur the distinction between true opinion
and knowledge; for how many interrelated accounts do we need to produce
in order to convert true opinion into knowledge? This though would fit
reasonably well with my picture of Plato's development. The Republic,
adhering to the old view distinguishes sharply between knowledge and
belief. The Philebus on the other hand, adhering to the interrelation
model is happy to allow varying degrees of knowledge, perhaps related to
the number and quality of the interrelating accounts we can give. As
suggested earlier though, our knowledge may also be related to the
relative stability of its subject, and to the amenability of the subject
to reason/calculation. The Timaeus appears as an intermediary here,
postulating stable and mathematically precise stoicheic triangles, which
lend their stability and precision to at least some aspects of the
phenomenal world, most notably the heavens. The Philebus, I have
suggested, goes a step further by introducing a means by which we can
treat properties in a mathematically precise manner.

One interesting question here is whether for Plato locomotion is an
aspect of an object that may be known, the point being that it is
possible to produce an invariant description of some motions. Certainly in the Republic there is a contrast between the 'ideal'
motions of the heavens, the 'real speed and slowness in true number and
all true patterns' (Rep.529d2), which are the 'real entities' (529d1),
and being apprehensible only by 'reason and thought' (529d4), are
contrasted as objects of knowledge against the visible motions which
undergo deviations. That might be taken to say that the problem is
not with motion per se, but with unpredictable motion which deviates
from any invariant description. I have argued though that Plato's new
position in the Timaeus is that the motions of the heavenly bodies are
amenable to precise mathematical description. So perhaps, in the
special case of the heavens, where there is no decay of the bodies, and
no interaction with any other physical bodies, we can have knowledge of
locomotion. This is very much a special case though; all other composite
bodies will be susceptible to decay as their dissoluble bonds suffer
more wear and tear, and, especially at the micro level, susceptible to
collisions with each other that we will not be able to predict, such that we cannot produce invariant descriptions of their motions.

VII

Let us now consider whether the alternative account that the Timaeus generates allows for the possibility of knowledge of (at least some aspects of) the world about us. We can approach this matter via two questions. In the Timaeus, is the nature of the world such that knowledge of it is possible? Secondly, is the nature of the human mind such that it is able to attain such knowledge?

In chapter six I examined a key passage concerning the world soul which attributed it the ability to form true and stable opinions about anything physical that it encountered. I argued that if so, then there can be nothing intractable about the nature of the physical, or the nature of opinion that prevents such opinions being formed. In subsequent chapters I have argued that the theory postulating qualitatively stable stoicheic triangles as the ultimate constituents of the physical world would indeed allow the world soul to form such opinions. These opinions are formed by an exhaustive analysis of sameness and difference, though as in the Theaetetus, such an analysis does not amount to knowledge. Is it possible though for the world soul to convert these true and stable opinions into knowledge?

According to Timaeus 37bc, the domains of opinion and knowledge for the world soul are [to aistheton] 'the sensible' and [to logistikon] 'the accountable/ calculable' respectively. It is notable that at this point these two categories are not associated with other distinctions that characterise the TW view or even with each other's counterparts. This leaves open the possibility that there are at least some entities that fall under both [to aistheton] and [to logistikon]. Their existence would open up the possibility that opinion concerning some of [to aistheton] might be converted into knowledge. In particular here we might to compare the [ta logistika], 'things amenable to reason/calculation' that the circle of the same works with at Timaeus 37b ff and the [logismoi], 'calculations' that we are to make at 47b ff, and we might also be reminded of Theaetetus 186c, where Socrates states that

"Knowledge is not then in the sensations, but in the process of reasoning [sullogismoi] concerning them; for it is possible to apprehend being and truth in this manner, but impossible otherwise." (Tht.186d)
It is important to consider what the range of [to aistheton] is as far as the world soul is concerned. At Timaeus 37a we are told that the world soul makes judgements about everything that it encounters, whether that thing becomes or is eternally the same. This highlights a difference between the world soul and our own, which is that the world soul does not have a perceptual threshold. Thus atoms, atomic faces and stoicheic triangles are all be part of [to aistheton] as far as the world soul is concerned. Stoicheic triangles, as I have argued, are qualitatively stable, mathematically precise, and may be given an account in teleological or mathematical/ontological terms. It is the stability of the stoicheic triangles, and their relation to language, that allows the world soul true and stable opinions of them when it perceives them. In line with the Theaetetus, perception and true opinion do not of themselves constitute knowledge. However, we now have something, namely the world soul's opinion, which is intellectually apprehensible to the world soul. If the contents of that opinion are amenable to reason, then that is something which can be worked on by the world soul's rational orbit. The world soul may then perform calculations and interrelate accounts such that our true and stable opinions concerning physical entities which are stable and amenable to reason may be converted into knowledge.

What though of us mere mortals? Presumably if we can form some true and stable opinions concerning some physical entities which are amenable to precise calculation and/or may be given a teleological account, then the possibility of the conversion of opinion to knowledge is open. This brings us back to some of the material of chapter six. The problem that humans face is that in distinction to the world soul, they have fallible innate abilities to form judgements of sameness and difference, and these fallibilites lead us in to error. There were two causes of such mistakes in the case of perceptible entities, perceptual illusions and the imperfections of our own mental revolutions. Perceptual illusions do not appear to have bothered Plato greatly. Such things are mentioned in the Republic at 602d ff, but Plato seems quite happy that 'measuring, weighing and counting' will enable us to avoid any difficulties here. While such illusions may lead us into making false judgements, there is great optimism in the Timaeus that we are able to correct such judgements. So too there is optimism concerning the possibility of correcting any imperfections in our own mental revolutions which lead to error.
One problem for humans of course is that there are some important entities which are beyond our perceptual threshold. Unlike the world soul we cannot perceive the stoicheic triangles, so the behaviour of their ensembles will be more of a mystery, as they will appear to be in flux. We can have a general theory about stoicheic triangles, but unlike the world soul we cannot perceive individually where they are, what their motion is and what their state of bonding to anything else is. However, we do have perceptual access to one set of stable and mathematically precise entities, namely the heavenly bodies. Timaeus has some very interesting things to say about how we might use our observations here. He tells us that

"God devised and gave to us vision in order that we might observe the rational revolutions of the heavens and use them against the revolutions of thought that are in us, which are like them, though those are clear and ours confused, and by learning thoroughly and partaking in calculations correct according to nature [logismon kata phusin orthotetos], by imitation of the entirely unwandering revolutions of God we might stabilise the wandering revolutions in ourselves." (Tim. 47b)

The use of the plural throughout this passage strongly suggests that both types of our mental revolutions are under discussion here. To calm one type requires true opinion, to calm the other requires knowledge. The implication here is very much in line with what I argued theoretically concerning the world soul. If we can arrive at some true and stable opinions of the heavens, based on our observations, and then make some calculations and teleologically interrelate accounts then hopefully we will have some knowledge which will help to calm our rational revolution. One may feel that this reads a lot into this passage, but the same points are emphasised as Timaeus begins his summary at the end of the work, at 90b ff. It is by learning the harmonies and revolutions of the universe (no account of which could be given if it were not for the gift of eyesight, according to Timaeus 47a) that we can come to rectify all the revolutions within our heads. If this is correct, and it does accord well with all that I have argued concerning the alternative views that the Timaeus may be suggesting to us, then in certain limited circumstances the Timaeus does sweep away the last piece of TW, the notion that we can only ever have opinion concerning physical entities.

236
VIII

In chapter four I argued that we perhaps ought not to treat the Timaeus as giving us unmediated Platonic doctrine, considering both Plato's PWP and the nature of the introductory pages of the Timaeus itself. To this end I suggested that the initial statement of the strong TW view made by Timaeus might give us grounds to question where the epistemological difficulties concerning the physical world lie, what is due in terms of accounts of the physical world, and what is the range and relation of the sensible, the intelligible, sensation and reason. I also argued that the Timaeus bears some interesting resemblances to Parmenides' poem, and that given Plato's PWP and his attitude to Parmenides, this might indicate that Plato wishes us to pursue certain questions, perhaps with some prompting from the text. I further suggested that the Timaeus sets up an agenda for the discussion of some of the views put forward in the Republic, specifically those on cosmology, epistemology, philosophy of mind, the nature and extent of TW and the relation of mathematics to the world. As we have seen in the preceding chapters, if we are willing to look carefully at the Timaeus and countenance the view that it has more to say than the preliminary statement of 27c-29e, then the Timaeus has much to tell us about these matters.

As I have argued in chapter five, there are important changes in cosmology and the way in which mathematics relate to the world. Whatever approach we take to the Timaeus, one thing seems clear which is that the heavenly bodies move in a stable manner and are amenable to precise mathematical description. It would appear that there is also a significant move in Plato's thinking concerning degeneration from the conceptions of the Phaedo, Republic and Politicus to those of the Timaeus, Philebus and Laws; something which, I have argued is accompanied with a change in attitude to the inevitability of moral, social and political decline. In chapter six I discussed the alternative epistemology and philosophy of mind of the Timaeus, embodied in the world soul/human soul analogy. This places much greater emphasis on tractable problems with our own minds rather than intractable problems in the nature of the physical. In chapter seven we have seen Plato's thoughts on the ultimate constituents of the physical world, their stability and their relation to language. What Plato's earlier position here is is difficult to determine, though the Theaetetus too appears to reject radical flux. The Timaeus' theory allows for a flux of
perceptible objects, while lending the world an important measure of
stability. How much in each case depends on the strength of the bonds
between the stoicheic triangles, giving complex entities varying degrees
of stability. In chapter eight I suggested that the Sophist has a
complementary task in investigating relations between Forms and ways in
which the Forms might undergo some change, while the Timaeus
investigates the spatio/temporal nature of particulars and ways in
which they may exhibit some stability. In this chapter we have seen how
the Timaeus might fit into the strand of Plato's mathematical/
onological development that links the Parmenides and the Philebus.

The TW position, whether it be the one of the Republic or the more
extreme one sketched by Timaeus, clearly plays no part in Plato's final
conception of the way things are. The final nail in the coffin is the
notion, covert in the Timaeus but overt in the Philebus, that we can
have knowledge of at least some aspects of the natural world. One
important facet of Plato's development here is that while the Republic
treats four distinctions, namely knowable/opinable, intelligible/
sensible, incorporeal/physical, stable/changeable as making the same
division of entities, later works, in particular the Timaeus, do not.

One of the advantages of this interpretation of the Timaeus is that
it makes that work more consonant with the style and concerns of the
other late dialogues. The stylometric evidence points to the Timaeus
being late, and my arguments concerning cosmology and the relation of
mathematics to the world indicate that the Timaeus ought to be placed in
a group with the Philebus, Laws and Epinomis. I hope that other
arguments I have developed here make it more natural to place the
Timaeus in such a position in terms of the evolution of Plato's thought.
At the outset of this thesis, I suggested that it is something of a
quandary why, if the Timaeus is one of Plato's later efforts, it does not
have more affinities in terms of style and concerns with the other late
works. I have argued that if we take the Timaeus as giving us more than
one hypothesis concerning the nature of the world and the sort of
accounts we can have of that world, then it has some very interesting
affinities with the concerns of the Theaetetus, the Cratylus and the
Sophist, as well as the Parmenides. In this chapter I hope to have shown
that the Timaeus has affinities with the second part of the Parmenides
and the Philebus.

This then is a summary of the changes in Plato's thought concerning
the natural world that take place between the Republic and the Philebus. The implications of these changes for how we ought to investigate the natural world and what sort of results we might expect to generate from such an investigation will be the subject of the next chapter.
NOTES TO CHAPTER NINE


03) See Sayre (1983) p37 ff. This sits well with my account of the Pm; see my ch.4. For other views, see e.g Grote (1875), Taylor (1926), Cherniss (1936), Cornford (1939), Ryle (1939b), Robinson (1942), Peck (1953), Brumbaugh (1961b), Runciman (1965), Owen (1972), Allen (1983).

04) The unity of hypothesis 6 [oude me metechei ou sia s], 'in no way partakes of existence' (Pm.163c7) and [meden autoi dei einai], 'nothing exists in relation to it' (Pm.164a5); cf. Pm.141e.

05) Here I agree with Sayre (1983) p44/5 that the traditional pairing of hypotheses 1 + 2, 3 + 4 etc is incorrect and violates the instruction of Pm.135e ff that we should consider for the same thing the consequences of its existence and non-existence. As hypotheses 1 + 6 and 2 + 5 consider similar unities (on the criterion of whether they partake of being or not) they should be paired together; cf. e.g Owen (1970) p86.

06) The unity of hypothesis 5 is knowable (Pm.160c7) and [diaphoron ton allon] 'is distinguishable from others', so enters into relationships.

07) The One of Parmenides' poem is entirely undifferentiated and has no relation to anything else as it is the only thing that exists. So too this may be critical of Forms if we conceive of them as such unities (cf. Pm.132a1, 132c6, 135b9), and note that the conclusion of this hypothesis, that such unities are unknowable, is similar to the conclusion of the final argument of part 1 at Pm.134b ff, and cf. my ch.8 on similar arguments in the So. I keep separate any views put forward in Parmenides' poem (whether from way of truth or seeming) from any view attributed to the historical Parmenides; see my ch.4 on Parmenides and Plato's PW.

08) The ultimate rejection of this unity is at Pm.141e9, 'Such a unity can in no way partake of being'.

09) See e.g Fr.8/8ff.

10) Cf. Fr8/1, Fr7/1, the One exists, the others do not.

11) See Pm.137d-141e. Some examples of what the Pm. may pick up, in the order given;
1. Fr8/26, 8/31, 8/32, 8/43, 8/49.
2. Fr8/43.
3. Fr8/26, 8/29, 8/31, 8/49.
4. Fr8/26, 8/29
5. Fr8/29
6. Fr8/43
7. Fr8/44, 8/49

Concerning (8), I disagree with Sayre. [eplachthesan] at 8/26 is surely logical rather than temporal, especially as coming to be and perishing are never anywhere in the first place to be driven away by true belief. As a back up (see n.43 p51) he cites [palin] at Fr.5 ('It is as one to
me where I begin, for I shall return there again'), but again this may be logical sequence in the discussion rather than temporal sequence in Parmenides' world. Against this we must weigh Fr.8/5 ff which explicitly denies that the one exists in time.

12) Cf. Pm.164b.

13) Sayre is not alone in detecting Pythagorean sympathies here; see Cornford (1939), Raven (1948), Gosling (1975) (cf. Sayre (1983) p144) and Aristotle Metaphysics 987a ff where he says "The Pythagoreans stated that things exist by imitation of numbers, while Plato says it is by participation, thus changing the name. However, what participation in or imitation of the forms might amount to they jointly neglect to investigate", although see Cherniss (1959) and Vlastos (1953) for a contrary view.

14) Unfortunatly prime numbers cannot be produced in this manner, (cf. Aristotle Metaphysics 987b34 where he notes this difficulty, and Sayre (1983) n.50 p280). He needs addition as well as multiplication here, though as he uses addition to produce three from two and so twice and thrice, there should be no great problem.


17) Euclid tells us that it was "The discovery of Eudoxus, the teacher of Plato", (See Heath (1947) pp 112-113).

18) Sayre (1983) p105, cf. Gosling (1975) p166 ff. Sayre gives the following explication of a Dedekind cut on p106: "A cut exists between any two classes so composed that all the members of the first class (A1) are less than all the members of the second (A2). If A1 contains a largest member n (alternatively, if A2 contains n as a smallest member), then that pair (A1, A2) demarcates the rational number n. There are other cuts, however, established by pairs of classes such that A1 has no smallest member and A2 no largest... A cut produced by any pair of classes (A1, A2) such that A1 has no largest member and A2 no smallest member corresponds to an irrational number."


21) See Aristotle Physics 187a17, and cf. Metaphysics 988a7 ff and 109b13 ff, and Sayre (1983) p96ff. Simplicius (151.7-8) commenting on Aristotle's lost work 'On the Good' says that Aristotle recorded Plato's notion that the indefinite dyad was the great and the small; cf. 453.28 ff where Simplicius alludes to Plato's lecture on the good and equates the indefinite dyad with the great and the small and with [to apeiron]. So too Alexander, Theophrastus, Porphry; see Sayre (1983) p96 ff.


23) The manner in which the 'godly method' is introduced at Plb.16c10 would lead us to expect a link between it and a consistent reading of [apeiron]; cf. Sayre (1983) p124. As the 'godly method' has been responsible for everything so far discovered (Plb.16c), it would seen
reasonable to link it to previous methodological discussions.


25) Sayre (1983) p84-95 (cf. p167/8) argues that the following five theses are attributed to Plato by Aristotle in the first six sections of book one of the Metaphysics (on other ancient commentators see p76/7, 149-155): (1) Numbers are generated by the participation of the great and the small in unity. (2) Sensible things are constituted from the Forms and the great and the small. (3) Forms are constituted from the great and small and unity. (4) The Forms are numbers. (5) The Good is Unity. My only disagreement with Sayre here is over (4), which I believe to be an (understandable and perhaps typical) misinterpretation on the part of Aristotle.

26) Gosling attributes variants of this view to Jowett (1953), Ross (1951), Taylor (1956) and Hackforth (1945); cf. Crombie (1963), Striker (1970) and Sayre (1983).


31) Here I shall argue that while the Tim. has a great many affinities with the Plb, the Plb has the more developed position and should be dated later. Contrary to Sayre (1983) p187, p238 ff et passim, I find that the Tim. can be dated late and has a role in the development he traces.

32) See e.g Sayre (1983) p155.

33) See Sayre (1983) p113 and p154/5. So too one can characterise an instant of time as a Dedekind cut on a time line; cf. Pm.156d and Sayre p114, and my ch.5 + 8 on the uniformity of time as well as space.

34) Cf. my discussion in ch.7.

35) Cf. Aristotle de Anima 404b23 and Metaphysics 1086a10 on Forms and numbers.

36) At Plb.25a we find [metroin], [arithmos] and a [logos] derivative. In ch.5 I noted the proliferation of the use [arithmos] and [metros] in the Tim. something that we find too in the Plb, and indeed the Epin.

37) See e.g Aristotle Metaphysics 987b18 ff. Porphyry (248.1) also reports that Dercylides reports Hermodorus (i) as saying that Plato considered matter to exhibit 'the More and the Less, along with the Great and the Small'. Perhaps, as Sayre suggests this is influenced by Aristotle's view; see below on Aristotle's interpretation of the Tim.

39) This too seems to be Aristotle's view; cf. Metaphysics 987b18 and 992a11 for the receptacle and the generation of lines and planes, etc, and de Anima 404b15 ff on the constitution of perceptible entities. How reliable Aristotle's accounts are here is another question of course.

40) Cf. my ch.3 and 5, and see e.g Rep.510dff, 529cff, and also Ep.VII.342bc.

41) Cf. Patterson (1985) p7, Bostock (1986) p87, Malcolm (1991) p111. Whether the universe of the Tim. is perfectly spherical (Patterson, yes, Malcolm, no) is a moot point, but hopefully this section and the next will answer Malcolm's question, "Why would the demiurge be successful in fully implementing such a status for the components of a lower being such as earth, when... he fails to attain sphericity for the cosmos itself?"


47) Sayre's discussion of this matter (1983) p212 ff is unconvincing as he deals only with Cornford's long outmoded position. See also Sorabji (1988) p44-47. There is of course a major debate to be had between Burnyeat's A and B readings of this part of the Th. (see his (1991)). Here I merely indicate my preference.

48) As I have argued in ch.7, the Tim. too is concerned with the vacuity 'safe' answers.

49) See e.g Tim.63e ff where sights, sounds, textures and smells are analysed in terms of the properties and motions of particles.

50) See here Sayre (1983), esp. p174 ff, though throughout Sayre refers only to sensible and not physical entities.

51) I would argue that in addition to individual units of the four elements there are their physical parts (complex triangles, stoicheic triangles) which too are imperceptible. I do not press this though, as Sayre accepts that the Plb. employs the four element theory (see his (1983) p142/3), though he might wish to deny that the Plb. version is committed to imperceptible entities.

52) See e.g Aristotle Metaphysics 988a ff.

53) There is also independent testimony on this matter; see my n.37.

54) Perhaps the Plb. does not give us an account of the generation of objects, but gives us a means of thinking about their qualities which both resolves the problem of the compresence of opposites (see here Plb.25d11 esp.) and allows us to precisely quantify the qualities of objects. It is worth noting that the [apeiron]/ [peras] analysis is at its best in dealing with polar pairs of qualities, such as hot/ cold,
the sort of thing that as we saw earlier were a prime motivation for the introduction of the theory of Forms.


56) Cf. my discussion of [techne] and [empeiria] in ch.3.

57) See e.g Grg.465a, 500e.

58) In particular Plato's conception of the Good becomes more technical and mathematical.

59) As Gosling comments, this line of approach may commit Plato to a mathematical science of grammar, a point which Sayre criticises his interpretation on. There seems to me no major difficulty here, though. Mathematics will apply as much as a subject permits, and there are aspects of grammar that are mathematically treatable. Secondly, if Plato is interested in a [techne] of speech, this certainly is mathematically treatable, as discussed above, as contra Sayre vocal sounds can be treated as limits on an unlimited continuum.

60) Cf. my ch.5 here.

61) Gosling (1975) p155 and p186 has produced a list of points concerning methodology and limit and unlimited which ought to be accommodated by any interpretation of the Plb. As in general I follow Sayre on these two concerns, see his discussion a (1983) p268 ff. Sayre takes his main advance over Gosling to be the accommodation of the several passages which explicitly state that limit and unlimited are constitutive of sensible things; see above for my position here. I take the main advantages of my view over Sayre's to be that we need not be committed to his view of the Tht, and that we can interestingly integrate the Tim. into the development of Plato's later thought.

62) See Popper (1952) p75 ff.

63) See e.g Aristotle Metaphysics 987b11-13.

64) Plato is well aware of the irrationality of several numbers; see Tht.147c ff, where the square roots of three, five, and seventeen are mentioned, along with a general term ('oblong numbers') for all numbers with irrational roots.

65) Cf. also Epin.990d ff on numbers and modelling.

66) See Popper (1945) p248 n.9 and (1952) p87ff.

67) See Popper (1952) p88.

68) Procli Diadochi in primum Euclidis Elementorum librum commentarii p71, Popper's translation.

69) Popper (1952) p88.

70) See e.g Tim.61d ff.

71) See Tim.35a ff, 37a ff.
72) I would argue that Plato's EW and the structure of the Tim. invite us to extend such suggestions for ourselves, and then to return to the text to try out the full views.

73) See here Tim.36b-d on the operations the demiurge performs to create the world soul.

74) See Cornford (1937) p180 ff.

75) Cornford (1937) p181.

76) Plato might also be thought to raise difficulties for the models of participation needed to underwrite such views; see e.g. the dilemma of whole and part and the analogy of the sail in the first part of the PM.

77) See esp. Tim.37b, and Cf. my ch.6.

78) This of course is the way that Aristotle and others take it; see Sorabji (1988) p32-36.

79) See Tim.50c ff.

80) One additional problem for the mixture model is that variations in the mixture are seen as an unfortunate accident (see Tim.41d where variations in the homogeneity of the mixture are used to account for personal intellectual differences), where we need some positive principle to differentiate between parts of the mixture and to give different parts different qualities. It is worth noting both from the PM. and the PLB. that if things are not limited in some way, they become unlimited, and lose their spatio/temporal characterisations.

81) So too with Cornford's mirror model.

82) Again, especially do with Cornford's model, where the relation between receptacle and phenomena seems highly tenuous, and the receptacle cannot even claim to be the subject of which a quality might be predicated; things merely happen in it in some manner.

83) Tim.51ab recognises the difficulties here too, worrying how something that is invisible, unshaped and all receptive can partake of the intelligible. No answer is offered to this problem.

84) Note that at Tim.50d the receptacle is likened to a mother, the 'source' to the father and what is engendered between the two, the offspring.

85) As Cornford (1937) p181 points out, the receptacle is sometimes referred to as that 'in which' [en hoi] things are made, and so that the receptacle cannot be a substrate or matter. If we reckon that Plato is giving us several versions of the receptacle for us to juggle with and decide the worth of, then there is no need to choose absolutely; we can have an account both of substrate and what happens to that substrate, and the space that that substrate may be in.

86) At Tim.61d ff we are told concerning fire that the "Thinness of its sides and the sharpness of its angles and the smallness of its particles and the speed of its motion, by virtue of all of which it is energetic and divisive, always cutting keenly whatever it encounters, these must
be accounted for by recalling the origin of its shape, and it is rather this and no other property that divides up our bodies into small pieces and which naturally gives it the quality we call heat and supplies its name. One may feel that it pushes this passage too hard to find the idea that all qualities can be so analysed, but Plato makes suggestions for us to try out generally, and this passage could well do service as promoting a general scheme of explanation.

87) See Tim.67d ff.

88) See Tim.35a ff for metaphorical usages, and Tim.37 and 44a2 for what I have argued in ch.6 are relational uses.

89) We can then give an account of number, if need be, tracing its generation back as in the second part of the Parmenides.

90) When it first encounters something, the world soul determines all its relations of sameness and difference and then its circles spin (i.e think) before it produces knowledge or opinion; see Tim.37a ff, esp. 37b8–c2.

91) According to Aristotle, Plato thought that "Concrete things [ta pragmata] are apprehended in some cases by mind, in others by knowledge, by opinion, or by sensation, and the numbers are the forms [eide] of these things [pragmata]" (De Anima 404b26), though cf. Metaphysics 987a32, 1078b11.

92) Plb.15a tells us there are indeed things that undergo no change (are exempt from all becoming and destruction). Exactly what the entities are at 15a need not concern us (cf. Gosling (1975) p84, Guthrie (1978) p207, Striker (1970) p78 ff), as we merely need to note that they exist.


94) See esp. Plb.28d ff, and my ch.5 on harmony.

95) Cf. Sayre (1983) p135 n.23. Sayre though equates mixture with becoming in the Tim. This cannot be quite correct as the mixture of the Plb. contains things which have undergone [genesis eis ousia], and so are no longer becoming. I believe the equation of Plb. mixture = the result of the imposition of numbers and Forms on the receptacle to be correct, but that for both the Tim. and the Plb. this includes the results of [genesis eis ousia] as well as things that are becoming.

96) See Tim.46bc.

97) Here I agree with Fine (1979b) p366/7 and others that while Plato speaks of knowing objects he tends to speak interchangeably of knowing x and knowing what x is (see e.g Men.78c, Tht.147b), so 'a knows x' can be easily transformed into 'a knows what x is' and again to 'a knows that x is F'.

98) See e.g Tht.206c9, and cf. Men.97d ff.


100) See e.g Men.98a3, Pdo.76b, 78d, Rep.534b, Sym.202a5.
101) Notable too that the Tim. employs the letters and syllable analogy; cf. e.g Th.201e1, 202b7 and Tim.48bc, and passim references to the two basic triangles as stoichea. Note also the Theaetetus' strange claim that these elements are perceptible, and my comments in ch.7 about the move away from perceptible stoichea in the Tim.

102) See my ch.7 on names and he stoicheic triangles. I take it that the teleological and mathematical/ontological accounts here would count, as Fine (1979b) p317 has put it, as logos k, that is explanations that will help to produce knowledge rather than logos s, mere sentences about elements which may or may not be true.

103) See Th.206d ff.

104) See Th.206e ff.

105) See Th.208c. As noted before, we might compare this with Tim.37ab where even giving an account of all of the relations of sameness and difference, not just those that uniquely mark it out, is insufficient for knowledge.

106) See Th.209de.

107) See Th.210a.

108) Socrates comments "And so, Theaetetus, knowledge is not perception, nor true judgement, nor true judgement with an account" (Th.210a).

109) See my comments in ch.4 on Th.157c and 210c and their relation to Plato's PWP, and to Pdr.275b.

110) See Fine (1979b).

111) Fine (1979b) p394.

112) See e.g Crt.424c ff, Plb.18b. Note that in both these instances when we produce interrelating accounts we have a knowledge of letters and syllables.

113) Some have argued that Plato drops KL, or only adopts it in the Th. for aporetic purposes, and instead believes that we can have some knowledge of the basic elements by some form of non-discursive intuition (see e.g Robinson (1950) p52-5, Crombie (1963) p113 ff, Runciman (1963) p40). This would be rather strange on my picture of Plato's earlier development, for I have argued in ch.2 that the 'intuitionist' theory of recollection is quickly abandoned in favour of a coherence theory of truth based around the good; cf. my ch.6 on propositional thought in Plato generally, and my ch.3 on propositional thought in the Rep.

114) Bostock (1988) p243-250 has argued against Fine that while Plato may later adopt the interrelation model (p245-248), there is insufficient evidence to consider it to be the Thet.'s answer to the problems raised. As all that I require is that Plato does adopt an interrelation model, whether here or later, shall not go into this matter. There is also a question as to whether the interrelation model replaces KL or explicates it (see Fine (1979b) p367-9, and n.4, 16, 20, 22); all I require here though is that KL in the sense of a single definitive logos is rejected.
115) See e.g. Plb.61d, 62a ff.

116) See above on knowing objects and propositions.

117) Plato would lack the mathematical tools (i.e. differential calculus) to deal with all motions but should be able to deal with most.

118) See e.g. Rep 530ab, and see my comments in ch.5 on [paralattein] at 530b3.

119) So too to calculation, and to teleological and mathematical/ontological accounts.

120) See Tim 37a ff.

121) So too the relation of the receptacle to what is in it allows the world to be structured in such a way that the subject/predicate thinking of the world soul can get a grip on it.

122) See Tim.37ab.

123) See Tht.208c ff.

124) The other prime candidate here are the heavens which are again qualitatively stable, perceptible to the world soul and amenable to precise calculation.

125) As with my argument concerning the 'two worlds' interpretation of the Rep. in ch.3, we can of course opine intelligible entities and move on to a knowledge of them. As far as humans are concerned, stoicheic triangles are intelligible yet physical. Timaeus does not claim knowledge of their structure, and will welcome anyone with a better account of them 'as friend rather than enemy' (Tim.54a).

126) See e.g. Tim.49c ff, where 'we see, so it appears', earth transforming into the other elements, and nothing appears to stay the same as the elements cyclically pass into each other.

127) If this is so, it would go a long way to explaining the emphasis that the Epin. places on the study of the heavens.

128) Though if we are to believe Aristotle Metaphysics 987a32 ff, Plato was at least to some extent influenced by Cratylus and Heracliteanism in his youth. For opposing views here, see Bolton (1975) who argues that Plato was committed to radical flux up to the Tht, and Jordan (1984) p48-66.
At the outset of this thesis, I raised several questions concerning the evaluation of Plato's philosophy of science. The usual criticisms have been that Plato was antipathetic to the investigation of nature, feeling that it could produce no worthwhile results, that his views were overly teleological, that his methodology was anti-empirical, that he discouraged careful observation, and that he effectively substituted mathematics for physics. Against this, there is the question of the extent and the value of his achievements in the attempt to mathematise nature and investigation. In this concluding chapter I shall examine the implications of the arguments advanced in this thesis for our assessment of Plato's views concerning the investigation of nature.

One matter that we are now in a better position to discuss is the complaint that while modern science shuns teleology, Plato was the progenitor and arch-exponent of teleological explanation, the Timaeus being a 'teleologist's manifesto'. There are several ways in which we might approach this matter. Firstly, the distinction between Plato's views and a realist conception of modern science may not be so clear cut as might appear at first sight.

If we are to take a realist approach in the philosophy of science, then it would seem that we need to make certain assumptions about the nature of the world.¹ The world must be at least partially comprehensible to human beings,² and if the mathematically framed laws that modern science seeks express some reality, then the world must both be law abiding and structured in such a way as to be amenable to mathematical analysis. Relative to the many other logically possible universes, any postulated by a realist philosophy of science will be in some sense providentially ordered. That may be a good thing in itself, or merely good for human beings.

The sort of universe that Plato postulates certainly has many of these features. In the Republic, it is the Good that lends complete comprehensibility to the noumenal realm.³ If, as in the Phaedo the
physical universe is ordered in accordance with the Good,\(^4\) then it must provide that realm with at least partial comprehensibility. In the earlier works as we have seen there are two compromising factors here. Firstly, the cosmos has a tendency to degenerate, and secondly physical bodies will not always behave in a perfectly regular manner.\(^5\) We have seen that in the Timaeus and later works these factors disappear such that the physical world is a more comprehensible place in later Plato. The formulation of the notion that the world is at least in principle fully comprehensible and that the key to unlocking that comprehensibility lies in mathematics is in itself, one might suggest, an important moment in the history of the philosophy of science.\(^6\)

Plato's views are given a strongly teleological flavour by the fact that in the middle period works the Good he invokes is a highly ethical and aesthetical one. Here though, one might ask two questions. The middle period works that tell us most about the Good, the Republic and the Symposium, are concerned mainly with politics and ethics on the one hand and erotics and aesthetics on the other,\(^7\) and at best only discuss investigation in general rather than the investigation of nature in particular. Could it be the case that when Plato is concerned specifically with physical investigation that he uses a different conception of the Good, one that is perhaps more mathematical in its orientation? Secondly, might it be the case that Plato's views on the Good develop towards a more mathematical conception of the Good? In this context Aristoxenus' comments on Plato's lecture 'On the Good' may be of some considerable interest. He says that

"Each came expecting to learn something about the things which are generally considered good for men, such as wealth, good health, physical strength, and altogether a kind of wonderful happiness. But when the mathematical demonstrations came, including numbers, geometrical figures and astronomy, and finally the statement, Good is one it all seemed to them, I imagine, utterly unexpected and strange."\(^8\) Sayre has argued that the comments attributed to Plato in his Lecture on the Good can be understood with reference to the views he puts forward in the Philebus. It is evident early on in the discussion of the Good and the good life that neither can be equated with any one thing exclusively, such as intelligence or pleasure, but must consist of a mixture. As the discussion draws to a close and the Good is brought into view, and Socrates comments that
If it is not within the power of one idea to hunt down the good, let us grasp it with three, beauty, proportion and truth, and let us say that all these as a unity among the elements of the mixture are most correctly held responsible, and it is on account of the goodness of these that the mixture itself has become good." (Plb.65a)

At 66a ff Socrates and Protarchus proceed to rank intelligence and pleasure against the three of this unity. First come 'measure, the mean and what is appropriate' (66a7), second are 'proportion, beauty, completeness, sufficiency' (66b1), third come 'wisdom, intelligence and understanding (66b6), fourth are 'knowledge, skill and right opinion' (66b8) and finally come the most pure forms of pleasure. Now we know from earlier in the Philebus that measure is achieved by the imposition of limit, which is equivalent to participating in unity. So if measure is the primary constituent of the Good, then as measure is participation in unity, so in one sense unity might be equated with the Good. This conception of the Good, found in the Philebus and the Lecture on the Good is clearly differs from the position of the middle period, and presents a more technical and mathematical view of the Good. When we then talk about the good structure and arrangement of the universe, we are more likely to refer to mathematical notions such as proportion and due measure rather than ethical or aesthetical criteria. If this is correct, then it considerably narrows the gap between Plato's teleology and a realist conception of modern science.

A second problem for any realist philosophy of science is the underdetermination of theory by empirical evidence. As it is always possible to generate an infinite number of theories which fit the data, this evidence on its own cannot determine which is the 'true' theory. In practice scientists choose the mathematically most simple and elegant theory, and theories which are likely to fit with other high-level theories that we hold. The difficulty for the realist is to give a rational justification for such a process. If it is rational to assume that the universe is comprehensible, though, and rational too to propose ways in which the universe is comprehensible, then perhaps we can generate some criteria for theory selection. If we assume that the world has a unified and simple structure, we ought to select simple hypotheses which will aid theoretical unification.

In chapter two I discussed the learner's paradox of the Meno and argued that one of the difficulties it poses is given that we do not
know the answer to our problem, then what sort of candidates should we put forward. Now while this clearly is not the same problem as the modern one of underdetermination, it does bear certain similarities. We could produce any number of candidate hypotheses, and also be at a total loss as to where to start testing any of them.\textsuperscript{14}

Plato's answer to this in the Phaedo is that we should put forward theories that are 'healthy' and are likely to cohere with our other beliefs, and the critical tests will be in relation to those other beliefs. As before, the discussions of the Phaedo, Symposium and Republic have a distinctly ethical/aesthetical feel to them. However, if we feed in the later, science oriented conception of the good then the coherence criteria become more mathematically oriented. A particularly important example here is the theory of geometrical atomism. Timaeus knows nothing of sub-atomic structure, and has no perceptual access to such micro entities, yet produces some precise mathematical proposals from the assumption that the demiurge will have arranged things in the best possible manner.

Another approach to the Timaeus on this matter might be to recognise that Plato's myths are often more ontologically extravagant than some of the more hard-nosed arguments that he presents. As we saw in chapter one, McCabe has argued that this may be part of Plato's PWP, setting up a tension between parsimony and profligacy for the readers to investigate for themselves.\textsuperscript{15} While the Timaeus may itself lack a parsimonious arm in relation to teleology, there are other late works, notably the Theaetetus which can provide the contrast here.\textsuperscript{16} As McCabe has argued though, the Timaeus gives us a teleological overkill, invoking both intentionalist and natural models where just the one might be thought adequate.\textsuperscript{17} One of the challenges that the Timaeus sets its readers then may be a question of How much, and what sort of teleology do we require in order to generate explanatory adequacy? If this is so, and we read the Timaeus as a challenge rather than as a simple statement of cosmology, then there is considerable scope for paring down its profligate teleology.

The point of these arguments is not to attempt to assimilate Plato to modern science, as clearly there are irreducible differences with Plato's teleological programme. Rather, they are an attempt to narrow what some have depicted as a yawning chasm down to a reasonable gap on this matter. This is all the more urgent because if we dismiss Plato's
work as telological, and label the Timaeus as the 'teleologist's manifesto' we are likely to miss some of the affinities that Plato's views bear to a realist conception of modern science. It would seem that Plato asks, and provides interesting answers to three of the key questions for any realist philosophy of science.

1) If the world is comprehensible, then what is it that creates and sustains this comprehensibility? The clash of the orthodox and alternative views present in the Timaeus can be seen as a debate on the question, Is the world fully comprehensible? The alternative account goes on to propose reasons why the world is comprehensible, and can be seen as answering the following key question, If we can comprehend the world, then what must the world, our minds, and the relations between them be like for this state of affairs to occur?

2) If the world is mathematically structured, then how is it so structured? If my arguments concerning the relation of Plato to Pythagoras are correct, then Plato's answer is the world is geometrically rather than arithmetically structured. That, as Popper has noted, is a contribution to our conception of the universe that has gone virtually unchallenged right down to the present day.

3) What criteria should we appeal to when we are framing our hypotheses, and given a number of hypotheses which are empirically adequate, what criteria should we use to choose between them? Which of them should we select for further testing, and what tests should we select? According to Plato we ought to form 'healthy' hypotheses with the Good in mind, and choose the hypothesis which best coheres with our other ideas and our notion of the Good. As we have seen, Plato's idea of the Good becomes increasingly technical and mathematical.

There is also the question of to what extent is Plato speaking metaphorically when he talks of God and of the Good. He certainly would not be the last figure in the history of science to speak in a highly metaphorical manner here. Einstein comments that

"In this sense alone I am a deeply religious man. I cannot conceive of a God who punishes and rewards his creatures, or has a will of the kind that we experience in ourselves... I am satisfied with the mystery of the eternity of life and with the awareness and a glimpse of the marvellous structure of the existing world, together with the striving to comprehend a portion, be it ever so tiny, of the Reason that manifests itself in nature."

He further says that
"Certain it is that a conviction, akin to religious feeling, of the rationality or intelligibility of the world lies behind all scientific work of a higher order. This firm belief, a belief bound up with deep feeling in a superior mind that reveals itself in the world of experience, represents my conception of God."²¹ Any attempt to push Plato down this path though must of course contend with Laws X and the strictures against atheists.²²

A second approach to Plato's teleology is to place his views in their historical context. It has often been argued that the significance of the Timaeus, for instance, lies in its being the first extant statement of a thoroughgoing teleological cosmology.²³ There can be no doubting Plato's influence here which was to spread over the next two millenia.²⁴ While the overtly teleological world picture has been abandoned, as I have suggested above, some of the foundations that Plato laid for cosmology and investigation still have relevance to modern realist positions. One must remember here too that Plato did not eschew mechanical explanations, and that as argued in chapter seven, his conception of the atomism, advocating the explanation of the atoms' phenomenal properties in terms of its mathematical properties, a small number of basic types of atoms, and a small number of sub-atomic particles is considerably closer to the modern view than other ancient atomists or indeed the 'hooks and eyes' men who first revived the ancient idea.

II

Perhaps the most common complaint against Plato has been that he denigrated observation or even that he banned it entirely from the sort of enquiries that he envisaged. The evidence for such a view is perhaps strongest in the Republic, at 530b6 in particular. However, I have argued that the allegories of line and cave suggest a much more dynamic approach to investigation, one that begins with the world about us and involves the interrelation of sensibles and intelligibles, the investigation of each being necessary but not sufficient for us to master a given discipline.²⁵ One important implication of this is given a TW view of the Republic, there is no demarcation for investigation between the two realms. This serves to undermine the notion that Plato's science deals solely with intelligible objects and so eschews observation, and the view that it deals solely with physical entities and so can aim no higher than opinion. We also saw in chapter

254
three that the passage at Republic 529d ff illuminates a distinction between doing and teaching astronomy, and assumes that doing astronomy necessarily involves an empirical investigation, or at least an acquaintance with the data. It would seem from comments in the Epinomis and Timaeus that Plato was indeed acquainted with Egyptian astronomical data. I have also argued that Plato's middle period attitude to the regular behaviour of physical bodies does not entail that he would have been dismissive of detailed observational work. As his views on this matter change by the Timaeus, this is not a major concern.

If these arguments are correct, we need to assess the Republic's views on investigation (as opposed to the education of the guardians) in terms of a necessary initial empirical approach followed by a move to the consideration of the relevant intelligibles as part of the same discipline. This gives it a potentially much more reasonable methodology, observation followed by abstraction and mathematisation, than has been allowed for in some of the literature. We might be critical though of the way in which hypotheses are subjects for discussion, not empirical testing, even if they are initially based on observations. One might distinguish between contexts of discovery and justification, accepting that Plato allows some empirical input to the former but not to the latter. This is not entirely clear cut, though; one reason for doubting a hypothesis might be its inability to accord with the phenomena without being able to give an account as to why it does not, and the Socratic elenchus allows the use of concrete examples.

One might well argue though that while Plato does not at any stage ban observation from investigation, his attitude to observation gradually becomes more positive. This I think is so, and perhaps the easiest thing to do here is to quote in full a passage which I have discussed in part in other contexts, and compare it with any of the many passages in the Phaedo which are somewhat disparaging towards sense perception. Timaeus tells us that

"Sight, in my opinion, is the cause of the greatest benefit to us, as not a word of our current account of the universe could ever have been given if neither the stars, the sun, nor the heavens had been seen. But now sight of day and night, of months and the cycle of the years has procured for us number and the concept of time, and has also led us to
seek the nature of the universe. From these we have derived philosophy, and no greater good has or will come as a gift from the Gods to mortal men. This, I assert, is indeed the greatest good of eyesight... God devised and gave to us vision in order that we might observe the rational revolutions of the heavens and use them against the revolutions of thought that are in us, which are like them, though those are clear and ours confused, and by learning thoroughly and partaking in calculations correct according to nature, by imitation of the entirely unwandering revolutions of God we might stabilise the wandering ones in ourselves."

(Tim.47a)²⁹

Against this there is the much quoted passage of Timaeus 68d where Plato has Timaeus say that it would be useless to make any experimental test³⁰ to determine the proportions of the constituents of certain colours. The important thing here would seem to be that we are told that to make such an attempt would be to betray an ignorance of the nature of men and God, as God can blend the many into one and vice versa, but no man can. Plato cannot then be talking of how an artist mixes pigments to produce a new colour on his palette.³¹ Rather, it is more likely he is referring to the mixture of the various grades of fire particles which go to make up a colour.³² One possibility here is that as neither God nor the world soul have perceptual thresholds, they are able to perceive, and in the case of the demiurge manipulate atoms in a way that men cannot. Men are restricted to large scale agglomerations of atoms, and so, without the indirect techniques that are a feature of modern but not ancient science, would be hopelessly clumsy in attempting to determine the (small) number of grades of fire particles that constitute a colour.³³ If one is to attempt to make out an anti-experimental charge against Plato, one will need more evidence than Timaeus 68d ff, which contrasts what God can do against what men are capable of.

Plato's views on observation are by no means perfect from the viewpoint of modern science, but it should be clear that Plato did not ban observation from investigation and that observation came to have a more prominent role in the writings of the later period.

III

A major contention of this thesis has been that there was a significant change in Plato's views concerning cosmology and the way that mathematics relate to the natural world. If my arguments here have been correct, then we may be able to identify two highly significant events
in the history of man's investigation of the cosmos. Firstly there is
the change from the conception of a degenerating cosmology to one that
is entirely stable. Exactly how widespread the idea that the world,
humans and society were caught up in some slow but inevitable decay was
among authors (e.g. Homer, Hesiod), philosophers (e.g. Empedocles) and the
public in general is too broad an area of speculation for this thesis.
We may fairly say though that it was a reasonably common notion, and
earlier I noted Plato’s allusions to Hesiod in his description of
political decay in the Republic.\textsuperscript{34} Later Plato though is unequivocal;
the solar system is entirely stable, and there is no-one and nothing to
blame but ourselves for political, social and moral decay.

Secondly, there is the change to the idea that the natural world is
amenable to precise mathematical analysis. We have seen too how the
later Plato takes an interest in reformulating Pythagorean ideas to suit
his own ends. If this is correct, then Plato laid the basis for the
geometrical world view that we now take for granted rather than the
arithmetical one of the Pythagoreans, and laid the theoretical basis for
a world where physical entities can be measured as well as counted. In
this Plato may have done the history of science a great service, and
surely this is the view of Plato that the later astronomers took.
Otherwise, it would seem strange that they struggled so long and hard to
account for the phenomena in terms of epicycles, eccentrics and equants,
when on the Plato’s earlier view of the heavens they might simply have
taken a less complex set of circular motions to be the true, underlying
ones, and dismissed any deviation from these by the observable heavens
as aberrations due to the intractable nature of the physical world.\textsuperscript{35}

How much Plato makes of this mathématisation is of course a
different question. Lloyd has argued that we should beware of the
pitfalls of assimilation.\textsuperscript{36} On the question of the mathématisation of
physics we should beware of being so generous to Plato that we
assimilate him to Archimedes or even Galileo. Thus Lloyd argues that his
earlier work was overenthusiastic in representing Plato’s advocacy of
the mathématisation of physics.\textsuperscript{37} On this matter I would wish to agree
with Lloyd, at least for Plato’s middle period. Plato’s major concern in
the Republic is with the cognition of the Good, and the ways in which
mathematics may aid this, rather than with the mathématisation of nature
or science.\textsuperscript{38} There is little evidence that at this stage Plato was
interested in the quantification of phenomena, or that he wished in
general to describe physical processes by mathematical equations.\textsuperscript{39}
Applying the converse of Lloyd's argument though, we ought to be careful not to assimilate middle period Plato to those presocratics who did not envisage an important role for mathematics, or even, as I have argued, to the Pythagoreans.

With the later period though, we have a different story with the full mathematisation (and within this geometrisation) of nature in the Timaeus. Further to this, Plato also seems to be embarked on the mathematisation of investigation and explanation. As argued in the last chapter, there is a marked difference in the emphasis given to role of mathematics in the [technai] between the early and middle periods and the Philebus. So too in this chapter we have found that Plato's views on the nature of the Good undergo some change and become markedly more technical and mathematical rather then ethical and aesthetical. If we merely look to the Good of the Republic and the Symposium, we run the risk of missing the different emphases of the Timaeus and Philebus. If I am correct in arguing that one of the tasks of the Timaeus is to postulate mathematically precise ultimate physical entities, and that one of the tasks of the Philebus is to produce an ontology that in addition allows for the precise quantification of perceptual phenomena, and that this allows a greater role for mathematics in investigation and explanation, then perhaps Plato lays the philosophical basis for the likes of Archimedes and Galileo to carry further. So while Lloyd's assessment may be correct for Plato's middle period, perhaps the later works show some further progress.

IV

One perennial worry about Plato's philosophy of science is whether he believed that the investigation of nature could yield any worthwhile results. On some accounts, the Timaeus states that such work is a mere childish amusement, that here we can only have a likely account, and can aim no higher than to have unstable opinions concerning the physical, sensible and changeable things that make up the world about us. The question of what Plato may mean when he uses [paidia] and its cognates is something that I have dealt with at length in my discussion of Plato's FWP and its relation to the Timaeus. Rather than relegating the Timaeus to a mere harmless diversion, it elevates it to a serious work where we perhaps ought to be looking beyond the playful, suggestive facade to the arguments and debates running beneath the surface.
Even if we take the epistemology of Timaeus 27c-29e at face value, it is still possible to make out a case that the investigation of nature will produce some worthwhile results. As reason has won at least a partial victory over necessity, the world has some order and comprehensibility to it. While we may only have opinion of the physical world, Timaeus often claims the account to be the best possible, and of course the physical world itself is the best possible. Timaeus 68e ff also tells us that we must seek the necessary aitiai for the sake of the divine, for without the former we will not be able to come to know the latter, so the investigation of the physical world has some purpose and worthwhile result. The fact that Plato attempts a thoroughgoing teleological treatment of the physical realm should convince us of his seriousness in this matter. As Lloyd has argued, whatever Plato feels to be the difficulties with the physical world and with its cognition, it would be wrong to paint so bleak a picture of his views as to assimilate him to the sort of view expressed in Parmenides' poem.

However, while this sort of account may represent one strand of Plato's thought in the Timaeus, a large part of this thesis has been concerned with arguing that the Timaeus has more to offer concerning the sort of accounts that we might be able to give of the natural world. We have seen that there are important changes from the middle period concerning cosmology and metaphysics, and there is also the Timaeus' assault on TW. The Timaeus' version of TW seems to require that the relevant parts of four distinctions (incorporeal/physical, intelligible/sensible, stable/changeable, knowable/opinable) are coextensive with each other. However, the Timaeus postulates entities which are physical but not sensible (atoms, complex triangles, stoicheic triangles), and those that are physical but qualitatively stable, both sensible and insensible (heavenly bodies, stoicheic triangles).

This dissolution of TW opens up the question of what we can have knowledge of. Stability remains a requirement for knowledge, so we might now ask whether physical and sensible things have sufficient stability. I have argued that the ultimate physical constituents, the stoicheic triangles are indeed qualitatively stable. The strength of the bonds between these triangles, in conjunction with the wear and tear that they will have to undergo determines how long lived ensembles of stoicheic triangles will be. In the extreme case of the heavenly bodies the bonds are totally stable and so the heavenly bodies have complete qualitative

259
stability. In between, the ensembles that constitute human beings have a temporary stability, and so we will ultimately decay and die. The great advantage of the theory of the Timaeus is that by postulating some qualitative stability at the most basic level, well below the threshold of human perception, the theory can then account for both phenomenal flux (the cycle of the elements) and phenomenal stability (the unchanging heavens). Taking this in conjunction with the Timaeus' new views on the relation of mathematics to the world and to cosmological decay, one might suggest that in relation to the problems with the cognition of the physical world there is a relocation from intractable difficulties with the physical to tractable difficulties produced by the nature of the human mind. The Timaeus provides us with an alternative epistemological hypothesis in the analogy of the world soul and the human soul, one that is far more optimistic than 27c. It may well be that the Timaeus envisages that we can have some knowledge of the physical order, at least in astronomy. This knowledge, as the Philebus suggests, may not be of the same stature as some other types, but will be knowledge nevertheless. The Epinomis is even more enthusiastic about the possibilities that may be opened up by the investigation of the heavens. Plato's later position then is that the investigation of at least some natural phenomena will lead to some knowledge of those phenomena. This knowledge may not be of the finest sort, but according to the Philebus it will be an essential part of the good life. While Plato himself may have been a philosopher rather than a scientist, he can hardly have been antipathetic to the investigation of nature nor felt that it could provide no worthwhile results.

V

Plato's most important contribution to the philosophy of science was undoubtedly his attempt to mathematise our conceptions of nature and how nature should be investigated and explained. His role here has sometimes been downplayed, as it has been argued that he only partly mathematised nature, and did not mathematise enquiry. While this criticism might be levelled at the middle period, I hope my arguments here have shown that in the later period the world is fully amenable to precise mathematical description, and that with changes to the nature of the Good and the new mathematical orientation of the [technai] in the Philebus, that Plato envisages a greater role for mathematics in investigation and explanation.
In practical terms, Plato's greatest contribution was to astronomy, where his programme of explaining the motions of the heavens by regular, circular motion was to set the agenda for the next two millennia.\textsuperscript{46} However, we must not forget some of the more subtle theoretical contributions either. The shift from a Pythagorean arithmetical conception of cosmology to a geometrical one was an important move in the history of science. If it is correct that Euclid's elements were developed as an organon of this cosmology, then there may have considerable beneficial side effects as well.\textsuperscript{47} So too Plato took on what appears to have been a commonly held notion (and one that perhaps influenced his earlier thinking), that the universe is subject to a slow but inevitable degeneration, and gave us a stable cosmos and solar system.

Plato was also actively engaged in answering theoretical questions posed by the presocratics. The Timaeus, as I have suggested we approach it, can be read as an extended meditation on such questions as the relation of appearance to underlying explanation and the consequences of postulating 'two layers', that is an imperceptible micro-structure for the phenomenal world, for the status of our sense perceptions. So too the Timaeus investigates questions concerning flux, change and stability raised by Parmenides and Heraclitus. Plato is also interested in developing a mathematically based atomism in sharp contrast to those proposed by the presocratics.\textsuperscript{48} Another presocratic problem that I have suggested exercised Plato was that of if physical bodies act in a perfectly regular manner, why do they do so? Plato's answer is that bodies possess real dispositional properties in virtue of which they behave as they do.\textsuperscript{49}

Here we see something which I have suggested is typical of Plato's approach. When confronted by some of the key questions in the philosophy of science, Plato frequently opts for proto-realist solutions. This possibly stems from a deeper philosophical commitment to realism. Plato might often be thought to be asking; If there is knowledge, then what must we assume about the world, our minds, enquiry and the relations between them? In chapter two we saw that while Plato pays due heed to parsimony, he feels the need to postulate further entities, active minds, and a rich account of enquiry and explanation. The assumptions about enquiry in general are made quite early in Plato's career, in response to Meno's paradox.\textsuperscript{50} When we examine the implications of
Plato's teleological conception of enquiry for the philosophy of science, we find an interesting proto-realist position. He has strong teleological guidelines for the formation of hypotheses, for the selection of tests for those hypotheses, and the criteria beyond empirical adequacy that we might use to judge these hypotheses.\(^5\)

The conflicting accounts of the Timaeus and the development of the later ontology and cosmology might be thought to spring from the question, if there is, and if there is not some knowledge of the natural world, then what assumptions are we required to make? The Timaeus then investigates questions concerning the ultimate physical constituents of the world, their stability and relation to language and how we might account for phenomenal flux and stability. So too it investigates the mathematical structure of the world as a basis for teleological explanation, and considers why it might be that bodies act in a regular manner, if they do so. In each case one might argue, Plato comes up with proto-realist solutions to the problems here. As I commented at the outset of this thesis, this is not to argue that Plato was in fact a realist.\(^5\) Rather, this is a useful and interesting way of looking at Plato's contribution to scientific thought. Plato produces highly teleological answers to many problems, and these a modern realist would reject as there are less extravagant ways of theorising the comprehensibility of the universe and providing coherence criteria for enquiry. The advantage of this approach though is that we can discern the sort of problems that Plato was trying to solve, and his general strategy for answering them. If we are careful not to throw out Plato's proto-realism with his overly teleological bathwater,\(^5\) we find much that is of philosophical and historical interest in Plato's proposed solutions to key problems in the philosophy of science. While Plato's conception of science may be a long way removed from some modern positions, there are some interesting affinities with modern realist approaches.

As for the more specific charges against Plato, I have argued that it is simply not the case that Plato advocated a methodology for investigation that was devoid of empirical input, and there is no evidence that he either denigrated or discouraged careful and prolonged observational work.

The charge that Plato effectively substituted mathematics for physics is intimately related to the previous one. It is simply not the
case that Plato thought that we could conduct the investigation of nature in the same a priori manner as we would nowadays investigate mathematics. Plato's great contribution to science was his mathematisation of nature, and of the [technai]; but as we have seen, the [technai] all have a critical empirical component.

Finally, it can hardly be the case that Plato was antipathetic to the investigation of nature, feeling that it could produce no worthwhile results. The Timaeus can be read as a discussion of the question, What is due in terms of accounts of the natural world? The alternatives to the view of 27c ff that Plato proposes have considerably more epistemological optimism, to the point where we can have some knowledge of the natural order, the prime candidates being the heavenly bodies. The acquisition of such knowledge will help bring our mental revolutions into their proper orbits, and so aid us to live a good life. 54

VI

In chapter one, I argued for a particular conception of the way that Plato writes philosophy. Undoubtedly there is more work to be done here, both in refining this conception of Plato's FWP and arguing its corner against other views, as well as in applying it to the interpretation of Plato's works. I would not claim to have provided an exhaustive account of the interplay of the various aspects of Plato's FWP in Timaeus, let alone any of the other works that I have touched on more briefly.

In applying my analysis of Plato's FWP to the Timaeus, I suggested that this would open up some interesting interpretational possibilities. I certainly cannot claim to have exhausted them here, even in the limited field of Plato's philosophy of science. I have concentrated on astronomy, largely because it is easier to trace significant developments in Plato's thought here, and because it is important to be able to explain the special status it is accorded in the later works. There is considerable work to be done on other disciplines however, both as they develop in Plato's thought and as they occur in the Timaeus, and indeed the Philebus. In addition, there are many other philosophical issues related to those I have raised concerning the alternative accounts of ontology, cosmology, epistemology and the mind that need reappraisal. So too there is much to be done in determining the relation of the alternative positions of the Timaeus to Plato's middle period works and his other later works. I have argued for a late dating for the
Timaeus on the grounds of changes in cosmology and the relation of mathematics to the world. These arguments generate a late group comprising of the Timaeus, Critias, Philebus, Laws and Epinomis. So too I have attempted a brief reassessment of some of the other arguments concerning dating relative to the alternative accounts of the Timaeus. Clearly there is more work to be done here, but the notion that the Timaeus is both late and forms an integral part of Plato's post middle period development, with important and interesting relations to the transitional period works is certainly worth pursuing.

In contrast to many accounts of Plato's development, I have concentrated on Plato's views concerning sensible and physical entities rather than Forms. Again I would not claim to have exhausted the possibilities here, and there is further work to be done both in investigating more of the later dialogues in detail, and in extending the programme to Plato's early works. The notion that Plato does make significant changes in his ideas concerning physical entities is worth further investigation, for as I have attempted to argue in this thesis, it may give us an important handle on Plato's development. There is only so much that one can do in one thesis, but I hope to have raised some interesting new lines of enquiry for the study of Plato, and his views on the investigation of nature in particular.
01) This is something generally agreed upon by both realists and instrumentalists; see e.g Maxwell (1984) and (1993a + b), Van Fraassen (1980) and (1989) for a view from either side here.

02) See Maxwell (1984) ch.9 for a discussion of full and partial comprehensibility.

03) See e.g Rep.507a ff.

04) See Pdo.97c ff and my ch.2.

05) See my ch.3 and 5.

06) In principle fully comprehensible, because perhaps in practice only the world soul can appreciate the full comprehensibility of the world; for humans there are limitations of perceptual threshold and computational power which will prevent a precise knowledge of the micro world. This does not prevent us though from forming precise general principles, nor as the Plb. makes clear, from having useful knowledge concerning the natural world. One aspect of this full comprehensibility as noted at the end of my ch.5 is that as bodies behave in a regular manner, there may be necessary connection between events.


09) Note that [metron] and its equivalents are also used in a very positive evaluative sense in the Tim.

10) One would like to be considerably more specific about the increased role for mathematics in investigation and explanation, but unfortunately Plato is very vague here, just giving us theoretical outlines of a greater mathematical orientation.

11) The latter may still be relevant though (aesthetical considerations may be important for modern scientists too; there is certainly a disposition to believe that the most beautiful, elegant theory ought to be correct, including theories about how the cosmos is structured). One might here consider that when Timaeus describes the construction of the world soul (see Tim.35e ff), he does so primarily in mathematical terms of proportion and due measure with other consideration subserviant.

12) This leaves open the question of whether the Plb. (and so too perhaps the Tim.) represent a change of position or of emphasis from the middle period; I would incline to say both.


14) Test in the Platonic manner of searching for a higher hypothesis.


16) One might argue that what is missing from the Tht. and sabotages its attempt to define knowledge is not so much the theory of Forms but
rather the assumptions required to generate some teleology in order to get coherence truth and/or systematic interrelated explanations off the ground. Such a contrast between Tht. and Tim. requires that the Tim. is an integrated part of Plato's post middle period strategy, something I hope to have provided arguments for in this thesis.

17) On the intentionalist model, someone finds something to be for the best, on the natural model something actually is best; see McCabe (1993) p63/4.

18) As we saw in ch.5, Van Fraassen (1989) ix considers problems like this to be crucial to any realist view of science.

19) See Popper (1952) p88.


22) One might question the function of the Le. here. Whatever Plato's personal theological views may be, he may feel that it is for the best that society in general believes in the Gods, and so following the Rep, the Le. tells a 'noble lie'. Again in the Le. though, the notion of God(s) is inextricably linked to regular, mathematically precise behaviour in the heavens (cf. e.g Le.820e ff, 891b ff, 966d ff).

23) Before we condemn Plato, we might consider whether it was clear at the time of writing that the investigation of natural phenomena would be better furthered if all concerned eschewed teleological explanations.


25) Thus Plato does not, as Farrington's (1936) p127 states, "Substitute mathematics for physics".

26) See my ch.3 for examples.

27) See e.g Rep.602e.

28) That raises the question of how closely the method of hypothesis follows the elenchus; cf. Pdo.101d and the method of the early dialogues.

29) Hardly an expression of the "Positive contempt for observation" that Thomson (1948) p101 attributes to Plato.

30) The Greek is [basanon], Tim.68d3. LSJ give 'a test to try whether something was genuine or not... enquiry, esp. by torture'.

31) A point seemingly entirely missed by Crombie (1963 vol II) p228/9 in his invective against what he sees as Plato's attempt to 'shield his theory from falsification'.

32) I use 'colours' here loosely, as it may well be that the Greeks had a different conception of colour to our own.
33) I would agree with Lloyd (1968) p82/3 and (1987) p140 n.133 that Plato's language is dangerously ambiguous here, and he does not distinguish as sharply as he might between the possible types of blending.

34) See. Rep.546e ff. Plato is well acquainted too with Homer and Empedocles; indeed Aristophanes' speech in the Sym. may well satirise Empedocles' views, and as I have argued earlier, the Tim. may well be critical of Empedocles' four element theory. Hesiod also crops up at Epin.990a as one who is not a true astronomer, being someone who has only 'observed settings and risings' rather than studied orbits.

35) Farrington (1936) p127 ff argues that Plato's view that the heavenly periods bear no exact relation to each other was thoroughly reactionary, as it was likely to discourage precise observation and theorising. This may be so for the position of the Rep. (though as I argued in ch.3, it is not necessarily so), but I hope to have shown that this is clearly false for the Tim. and later works.


37) And so too the Lecture on the Good.

38) Koyre (1943) p404 makes this distinction in discussing Plato's influence, though strangely he does not apply it to Plato himself.

39) Astronomy may be an exception here.

40) Perhaps because Plato was a philosopher and a theoretician rather than a practising scientist.

41) They would cite Tim.59d here.


43) On the standard interpretation of the Tim, I would agree with Lloyd (1987) p136 n.117 and Cornford (1937) p29 ff against Taylor (1928 p59) ff and Sambursky (1965) p1 ff that the account that Tim. gives cannot be converted to a fully satisfactory one and is permanently deficient.

44) See e.g Tim.27d ff.

45) The problem of the compresence of opposites still remains however, and so the need for a resolution persists; we have Forms in the Tim, and whatever Plato has in mind (Forms or a later development from Forms) in the Plb. The new theory of how things have properties in the Tim. (see my ch.9), analysing them in terms of the structure and motion of particles, as well as the limit/ unlimited analysis of properties in the Plb. may well render particulars somewhat less cognitively suspect.

46) Indeed, even some of those instrumental in the overthrow of regular circular motion for the heavenly bodies, and here one thinks particularly of Kepler, would claim a strong Platonic influence.

47) See my ch.9, Popper (1952) p88 and Procli Diadochi in primum Euclidis Elementorum librum commentarii p71.

48) See my ch.7 on the relation of Plato's atomism to Empedocles' four element theory.
49) One might note here Plato's satirical attack on Empedocles' views on evolution in Aristophanes' speech in the Sym.

50) Here Plato might be thought to be confronting another problem that troubled the presocratics, that of the relation of conventional to natural truth.

51) Here of course we are talking of Platonic hypotheses and tests. One problem, for the philosophy of science is to produce a theorisation of scientific progress. For Plato, progress in an investigation might be equated with the ascent of the line in the line allegory (which as I suggested in ch.3, also might provide a model of a disciplines development and prescriptions for its future pursual). Scientific progress overall would be theorised in terms of linking disciplines together in the search for the general theory, and its relation to the Good.

52) Though one might note that Plato does interpret theoretical and unobservable entities realistically; e.g the geometrical atomism is no mere theoretical construct to account for phenomena.

53) As I suspect some of Plato's more positivist/instrumentalist/nominalist critics have been only too happy to do.

54) See here Tim.44c; those who correct their revolutions become sound and faultless, those who do not return unperfected and unreasoning to Hades. Cf. Tim.90b ad fin, esp. 90d. One might speculate that by learning what is good about the universe, and by strengthening our mental orbits, we can better obey the injunction that in order to become good we must have mastery over our emotions rather than be mastered by them.
ACKRILL, J.L.

ADAM, J.

ALLEN, R.E.

ANNAS, J.

ARCHER-HIND, R.D.

BALLWE, L.

BARNES, J.

BEDU-ADDO, J.T.

BERGER, F.R.
Bernadete, S.

Bestor, T.W.

Billig, L.

Bluck, R.S.

Blundell, M.W.

Bolton, R.

Bonjour, L.

Bostock, D.

Bowen, A.C.

Brandwood, L.

Brisson, L.

Brocker, W.

Brumbaugh, R.S.

Bulmer-Thomas, I.

Burge, E.L.

Burger, R.

Burkert, W.

Burnet, J.

Burnyeat, M.F.

Bury, R.G.

Calder, W.M.

Callahan, J.F.

Calvert, B.

Carter, R.E.

Cherniss, H.F.
(1936) The Philosophical Economy of the Theory of Ideas, in R.E Allen
Crombie, I.M.  

Dampier-Whetham, W.C.  

Davis, M.  

Davis, P.J.  

De Waele, J.  

Desjardins, R.  

De Santillana, G.  

De Vogel, C.J.  

De Vries, G.J.  

Dicks, D.R.  

Dies, A.  

Dombrowski, D.A.  

Dorter, K.  

Dreyer, J.L.E.  
Duhem, P.
(1908) To Save the Phenomena. Originally 'Sozein ta phainomena; Essai sur la Notion de Theorie Physique de Platon a Galilee' (Annales de Philosophie Chretienne, 1908), translated by E. Doland and C. Maschler, Chicago 1969.

Edelstein, L.

Einstein, A.

Fahmikopf, R.

Farrington, B.

Ferguson, J.

Ferrari, G.R.F.

Field, G.C.
(1933) Plato and Natural Science. Philosophy 8, 1933, pp 131-141.

Findlay, J.N.

Fine, G.
(1979a) False Belief in the Theaetetus, Phronesis 24, 1979, pp 70-80.


Fish, S.

Fisher, J.

Frank, E.

Frankel, H.

Frede, D.

Frede, M.


Frege, G.

Furley, D.J.

Friedlander, P.

Fujisawa, N.

Gadamer, H.G.

Gaiser, K.  

Gallop, D.  

Geach, P.T.  

Gill, C.  

Gill, M.L.  

Gisinger, F.  

Goodrich, W.J.  

Gosling, J.C.B.  

Graham, D.W.  

Griswold, C.L.  

Grote, G.  

Gulley, N.  

276
Hodges, W.

Holland, A.J.

Huby, P.M.

Hume, D.

Irwin, T.H.

Jackson, H.

Joad, C.E.M.

Jones, W.H.S.

Jordan, R.W.

Jowett, B.

Kahn, C.H.

Ketchum, R.J.

Keyt, D.


Lee, H.P.O.  

Lennox, J.G.  

Letwin, O.  

Lewis, F.A.  

Lloyd, G.E.R.  

Lombard, L.B.  

Long, A.A and Sedley, D.  

MacClintock, S.  

Malcolm, J.  

Mann, W.E.  

Mates, B.  
Matthews, G.B.  

Mattei, J-F.  

Maxwell, N.  

McCabe/ Mackenzie, M.M.  

McDowell, J.H.  

McKim, R.  

Mills, K.W.  

Mittlestrass, J.  

Modrak, D.K.  

Mohr, R.D.  

Moline, J.

Moravcsik, J.

Morgan, M.L.

Morrison, J.S.

Morrow, G.R.

Mourelatos, A.P.D.
Mueller, I.

Murdoch, I.

Murphy, N.R.

Nahnikian, G.

Nehamas, A.

Neugebauer, O.

Nikolic, M.

Nussbaum, M.C.

O'Brien, M.J.

O'Brien, D.

Pangle, T.L.

Pannekoek, A.

Patterson, R.

Peck, A.A.

Peck, A.L.

Penner, T.

Petersen, S.

Philip, A.

Pluss, P.

Popper, K.R.

Post, L.A.


Rosenmayer, T.G.

Ross, W.D.

Rowe, C.J.

Rudebusch, G.

Runciman, W.G.

Ryle, G.
(1939a) Plato's Parmenides, Mind 48, 1939, pp 129-151.

Sambursky, S.

Saunders, T.J.

Sayre, K.M.
Scaltsas, T.

Schleiermacher, F.

Scott, D.

Sellars, W.

Shiner, R.

Shipton, K.M.W.

Shoemaker, S.

Shorey, P.

Simplicius.

Skemp, J.B.

Smith, J.E.

Smith, N.D.

Solmsen, F.

Sorabji, R.

Stenzel, J.

Stocks, J.L.

Stokes, M.C.

Stough, C.L.

Strang, C.

Striker, G.

Szlezak, T.A.

Taran, L.

Tarrant, H.

Taylor, A.E.
(1939) The Decline and Fall of the State in Republic, VIII. Mind, NS 48, 1939, pp 23-38.

Taylor, C.C.W.

Teloh, H.

Von Fritz, K.

Von Leyden, W.

Wasserstein, A.

Westerink, L.G.

Waterfield, R.A.H.

Wedberg, A.

White, N.

Whitehead, A.N.

Wieland, W.

Wiggins, D.
Trevaskis, J.R.

Turnbull, R.G.
(1955) Aristotle's Debt to the Natural Philosophy of the Phaedo.
Philosophical Quarterly 8, 1955, pp 131-143.
(1978) Knowledge and the Forms in the Later Platonic Dialogues.
Proceedings and Addresses of the American Philosophical Association 51,
pp 735-758.
Philosophy 6, pp 1-14.
(1988) Response to Professor Fine's Critique of 'Becoming and
(1989) The Third Man Argument and the Text of the Parmenides. In Essays
in Ancient Greek Philosophy III, edd J.P Anton and A. Preus, New York

Van Eck, J.

Van Fraassen, B.

Vidal-Naquet, P.
(1978) Plato's Myth of the Statesman, the Ambiguities of the Golden Age

Vlastos, G.L.
(1939) The Disorderly Motion in the Timaeus. In Studies in Plato's
379-420.
1965 pp 231-264.
(1956) Postscript to the Third Man: A Reply to Mr. Geach. Reprinted in
1965 pp 279-292.
(1964) Creation in the Timaeus: Is it a Fiction? In Studies in Plato's
401-419.
(1965b) A Metaphysical Paradox. Reprinted in Platonic Studies, 2nd
(1969a) Reasons and Causes in the Phaedo. Reprinted with revisions in
(1969b) Self-Predication and Self Participation in Plato's Later Period.
Reprinted with revisions in Platonic Studies, 2nd edition, Princeton
(1969c) Plato's "Third Man" Argument. Reprinted with revisions in

Williams, C.F.J.

Williamson, H.

Wittaker, J.

Wright, L.

Yoh, M.

Zeyl, D.