DESIGN ABILITY;
A SURVEY OF ARCHITECTURE SCHOOLS
RECRUITMENT CRITERIA

Thesis submitted for Examination for the
Degree of Master of Philosophy

by

PETER NARDINI

BARTLETT SCHOOL OF GRADUATE STUDIES
UNIVERSITY COLLEGE LONDON
UNIVERSITY OF LONDON

1997
ABSTRACT

DESIGN ABILITY; A SURVEY OF ARCHITECTURAL SCHOOLS RECRUITMENT CRITERIA

This research is concerned with the often criticised quality of the design of the built environment. It is interested in the ability or lack of ability of the individual to produce good building design. The research is in four main sections

Section 1. The Cultural, Historical, Social and Educational Factors in the Architects Role.
The first section is a review and analysis of the cultural position, the professional role, and the social historical perception of the architect. This assists in identifying what attracts individuals to embark on courses in architectural schools. The schools are also surveyed and an account given of their regulations, their curricula and what they may be looking for in their applicants. Their performance while in charge of their students is reviewed through published statistics. Then their graduates are examined in order to establish whether they believed their education was of benefit.

Section 2. Overview of how Historians, Authors, Critics, Architects and Others Report the Architectural Profession.
The second section is an overview of how historians, authors, critics, architects and designers from different professions have viewed the activities of the production of building and other types design. This reviews various process, procurement and style/type models. However, the information available has more to do with the practicalities rather than an analysis of or recipe for producing quality design.

Section 3. The Psychological Aspects of Design Ability.
The third section researches design ability in the field of psychology. This was necessary because of the problems encountered in discovering from participants and observers of Architecture what good design is, or what some individuals have which can produce design of exemplary quality. It was believed necessary to turn to the field of psychology for amplification and elucidation. Creativity and giftedness were studied and a series of relevant recommendations analyzed and reproduced which could be of use in identifying those individuals who would benefit from creative design courses.

Section 4. The Field Study.
In the fourth section a field study was undertaken at nine schools of architecture to discern what procedures were used to identify possible design creative individuals. As well as collecting basic statistics, interviews were constructed to identify what battery of views and concepts individual tutors bring to the selection of students. This protocol produced a response which suggested that all too often admissions tutors were using a form of self imaging in selecting students for their courses.

From these four sections the conclusion develops the view that within the area of architectural pedagogy there may be several firmly believed axioms concerning an individuals design talent which are never publicly acknowledged or rationally discussed. It is clear that the subject requires ventilation and research, therefore this paper suggests recommendations for change.

Peter Nardini
ACKNOWLEDGEMENTS

This research would not have been completed without the skills and energies of Dr. Julienne Hanson to whom I will be forever indebted. I would also like to thank Maria Nardini without whose level-headedness the work would never have been finished.
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PART 1

THE CULTURAL, HISTORICAL, SOCIAL AND
EDUCATIONAL FACTORS IN THE ARCHITECT'S ROLE
CHAPTER ONE

1.1.1 : INTRODUCTION

Everyman's work whether it be ... architecture or anything else...
is always a portrait of himself.

Samuel Butler 1835-1902

This research is attempting to define why much of current architectural design is often thought by the media (television, radio, journals, magazines and newspapers), politicians and also by a large proportion of the general public to be of poor or mediocre quality. Each of these agencies have offered varying degrees of criticism ranging from the ferocious to the gentile. Is there a problem with design, is it real or imagined? Of course architectural criticism is an ancient art, Weilman (1976) references debates between Pericles and Athens over the final designs for the Acropolis, and later between the Senate and Nero ... on the rebuilding of Rome. There has always been criticism and discussion, even if it has not always been recorded.

However more recently architects in the UK and overseas have received a mauling at the hands of their critics. This may be due to the impact of the media, plus a nostalgic view of the past in these times of rapid change. Whatever the impetus for criticism, it should be noted that this concern with declining standards of architectural design is not confined to the United Kingdom. The number of periodicals which have assaulted both architects and their buildings are literally too many to list. However the Times (1986) noted that:

"Let down lamentably by their architects, a generation of children are consigned to the dustbins of their inner city concrete estates".

The Sunday Times (1986), stated that architects should be forced to live in their own designs to see how they liked them. The Sunday Telegraph (1989), likened much of modern architecture to a modern Dante's Inferno without the excitement. Since the late 1980's the Sunday Times has been giving its "worst examples of architecture in Britain awards". In 1992 they stated that attempting to form a short list of the worst buildings from the examples that had been sent was particularly difficult "because they were all dreadful".
The more popular papers provided acres of text condemning the results of what architects had provided for people, at all levels in the spectrum.

In North America similar consideration has been given to what the C.B.S. (Colombia Broadcasting System) (1988) has termed, "the failure of american architects to facilitate the community with nice places to live and grow up". The American Institute of Architects were disquieted by this, and also by printed media attacks. Many Universities held workshops and conferences to discuss why there should be such negative public commentary. Bunka (1991) considered that the weakness of many architectural graduates related to:

"the propensity of schools to absorb as many students as wanted to study", (p.29).

He went on to infer that there were so many students of such disparate ability that the available staff were not up to teaching them. On another tack at an American Architectural symposium, Maass (1991), suggests that graduates are now so concerned about obtaining work and money that any noble ideas on design and how it affects the community have probably long gone.

Mass's observation probably refers to an international phenomenon in a recessionary situation, but in Europe Martini (1992), at the European Architects conference in Rome (1992) produced an interesting thesis. He suggests that within the European dimension it is the "massification" of architecture that has ensured the alleged failure of most modern architectural design. By "massification" he was referring to the explosion in the number of architecture schools following the second world war, and then the swamping of the schools with students through political expediency. He states that "massification" is the case in every European country except France and Spain which have very tightly controlled architectural professions. The 1992 European Architectural Conference also considered the problems involved with training so many students of such varying ability, the result being a lowering of design quality standards. There were no conclusions from the conference.

So, it does seem that there is a genuine international concern among the public that suggests that all is not well with the design of the environment built over the last fifty years. Although architects have argued their case, there appears to be an overwhelming opinion which says that the evidence of the built environment shows that architects have lost their way. If this is accepted, then there are others who must share the responsibility and who have also contributed to this failing quality. These must include planning officers, quantity surveyors and the clients who commissioned the work. However, the final responsibility
still rests with individual architects, as it is they who have produced the solutions to the design problems.

Before we approach the problem of poor building design, it must be affirmed that there are numerous new buildings which have been well designed and are accepted and liked by those who use them. The designers of these buildings are not the point of issue in this research. What is of interest is those individuals who seem genuinely incapable of producing “good design” but who nevertheless also become qualified, registered and practising designers. What is good design anyway and can it be taught?

1.1.2: ASSESSING ARCHITECTURAL SUCCESS

There has been some research which has attempted to analyze success in architecture. This has been carried out by psychologists including Guildford (1959), MacKinnon (1962), Stringer (1967), Getzels and Jackson (1970), Abercrombie (1972), Schein (1973), Archer (1978), Crosier (1984), Sternberg (1988) and Grover (1989) Lawson (1990). Many of the researchers have produced profiles of eminent architects and other accumulated data from schools of architecture and from architectural practices. While most of the above authors have observed what "success" is (this will be developed later) in some form or other; they have not attempted to identify or ascertain what good design is. Perhaps it should be stated that many individual buildings and architects are often acclaimed for their work. However the acclaim may well have other factors or agendas. For example marketing i.e. "A great building by a great architect" can help sales, or it could be fashion. "A fine building that reflects the Age" - in order that it reflects the products or lifestyles being sold in it. Although when these fads or trends end, what remains can often be a "quirkish" building that in time can appear ugly and irrelevant. So the analysis of "successful" needs the setting of careful parameters in order to produce objective or meaningful data. None of these researchers have tried to analyze what "design quality" is or if it is measurable. Indeed, McKinnon states that "there are probably some things ('design quality') (author's parenthesis), which are incapable of measurement". We need to discuss whether this is the case.

Not withstanding McKinnon's view, schools of design worldwide are actually in the business of grading or measuring design talent and award their honours degrees accordingly, from 3rd class pass degrees to first class honours degrees and of course occasionally failing a few. May it not therefore be possible to make an assessment either by a single test or series of tests to identify this talent before the start of the design course to prevent the inclusion of some individuals on the course who have no design ability?
At a simple level there are idiomatic expressions which describe incompetence, intellectual and physical inadequacies such as; having two left feet, being cackhanded and suffering from tone deafness or colour blindness. A more exact description of the extent of incapacity could possibly be drawn up by devising a scale from zero to one hundred. For example, a person could be said to be 80% tone deaf, i.e. he could hum a tune albeit in the wrong key but would never be capable of playing an instrument professionally or becoming a prima donna or other soloist. Could it be the same for design?

In order to establish what criteria schools use to select students, this thesis, through the literature and field study will attempt an analysis of and differentiation of the techniques used by schools of architecture in the selection processes they use for their courses. The research will concern itself with how schools of Architecture assess the potential of their prospective students and whether they carry out an analysis of the students' spatial, creative and intellectual aptitudes to become designers of "ability." The research will also attempt to catalogue any such tests which are discovered and identify how the schools use them or it may show why so many schools, perhaps through faulty or slack selection procedures, apparently select individuals with low design ability to their courses.

It is also possible that the apparent inability of schools to produce large numbers of creative (design adept) graduates may lie in the nature of the courses themselves. Do schools place an emphasis on varying facets of the built environment, such as the environmental sciences, materials technologies, social or design history, law or conservation? The schools may therefore select students specific to their taught specialities. It may also be the case that schools have no formal objective method of student selection. Without any objective method of analysis or procedures for assessing candidates' abilities the whole process may be very "hit or miss". If no assessment is carried out as Gartshore & Mayfield (1988) identified it could take up to nine years of development and training for an individual to find out that he or she is not a complete designer. They may be proficient in many skills but as Gardener (1982) notes they may not be designers.

It is therefore important to investigate why individuals chose to study architecture. If it is a desire to design, then why architecture and not industrial design or graphic design. Could it possibly fulfil an ego need which is only satisfied by designing large rather than small objects? It may be the level of social acceptability. 'Architecture' has historically been the preoccupation of the leisured classes and pursued for its own sake.

The research also investigates the practice of architecture and its value in relation to architectural design, and how the work environment influences design. Nevertheless, it is education which is ultimately responsible for the qualification, registration and the practice
of all architects, therefore research into selection techniques, tutors methods for choosing candidates and the perceived; versus the real importance of design creativity in the "everyday life" of architectural schools will be the main focus of critical investigation.

1.1.3: THE CULTURAL DEBATE

As noted in the introduction, there is a growing public perception and debate on the quality and condition of the built environment. Interest has focused on current design and its impact, internally on the users and externally on the community which the building serves. Specific interest in the U.K. has centered on the scale, nature and style of several prominent schemes. The debates themselves address mainly the aesthetics of styles and what would be considered appropriate in one location or another. However, this research will not attempt to evaluate the aesthetics of styles. There is a multiplicity of subjective views and there could never be any one agreed 'end product' nor could there be any final statement on what would be accepted as an agreed universal aesthetic. What is important is that, whatever aesthetic is chosen, it be well executed so that the designer can bring an improvement and delight to the scheme.

A building may be successful in other significant design areas, which are perhaps more important to the client. For example it may be exemplary in its function, in the efficient use of energy, in the exploitation of appropriate building technologies, in having been an inexpensive edifice to construct, or even at micro levels, the roof will keep the rain off, and the well fitted and sealed windows will keep the draughts out, but even so, it may not satisfy the community's requirement to have an attractive building in its midst.

Designing a building is not dissimilar to designing a car or a kettle, but its design is not determined by market forces though demand for the buildings themselves is the result of market forces ie. buildings are seldom built for their own sake, but rather to house some process, ie. manufacture or living. The design or the designer is chosen by reputation, by previous experience or by scale of operation, i.e. large buildings require large practices to produce them. However once chosen the designer commences the design with very little reference to anything other than a first hand knowledge their own needs allied to an awareness of previous and probably more importantly current design styles.

This important freedom which society allows the building designer to exercise is of the utmost importance. As Scruton (1988) suggests, it is a presumed two way understanding. If architects keep the worst excesses of their egos in check, the public lets them practice. However when this understanding breaks down it is generally the architect who receives the blame. This breakdown of understanding in recent years has given architect's
generally, an unenviable reputation. Therefore to take the cultural debate further it is necessary to examine the education process and industry. A detailed examination will follow later. However considerable resources are spent by Central and Local Governments on Building Design Education. At the time of writing there are thirty nine Schools of Architecture in the UK spread between various types of educational institutions. They provide an extensive training which requires up to five years in full time education. If at the end of this period the schools are turning out graduates who do not always exhibit adequate design ability then the schools must assume some responsibility.

In addition however the role of the architect in the United Kingdom also needs to be analyzed, because the number of elements involved in the total building procurement model are so extensive that to produce a good design solution can have many routes. This complexity is reflected in the possible number of research scenarios available to the author. Indeed the elasticity of a model required to produce good designers could approach infinity. Therefore within this research, after taking advice the issue of selection of students for architectural courses will be the prime consideration.

Before examining the education process in depth it is necessary to discover why an individual chooses a career in architecture, particularly when it appears to be so badly remunerated in comparison to other careers which take a shorter time to qualify, such as law, accountancy and engineering. The Times 6th October 1924 reported that "The architect is among the lowest paid of the professions yet it still attracts many young men and women to its long and arduous training" and further the Economist 20th June 1977 reported that:

"Even partners in private practice can only expect to earn £7,500 per year at about the age of 35, this does not compare at all favourably with equivalent positions in other professions".

The Report of the Royal Commission on Doctors and Dentists, Remuneration (1960) investigated the "career earnings" of various professions and found that architects not only showed the lowest figure for total career earnings, but that at almost every age the average earnings of architects was lower than those of other professions. Disturbed by this, the R.I.B.A. (1962), instituted their own survey into the situation and the result was "The Architect and his Office", a survey of organization staffing, quality of service and productivity presented to the Council of the Institute. It determined that if architects were worried about their incomes, they have only themselves to blame. More than half the visited offices made no systematic attempt to control the time and money spent by themselves on the design and supervision of their work. This last report is interesting as it identifies a possible divergent/convergent conflict, i.e. the generalist/specialist divide.
The saga of architect's remuneration continues. In Building Design magazine, (B.D.) 14th August 1992, it reports that 'Architects current earnings' records that again: 'architect's earnings show considerable disparity from other professions between individuals of similar experience'. Wild (1992) in BD on the 4th September stated:

"However the financial rewards in architecture always have been poor and are now approaching the ridiculous. My own income as a principal in private practice has for some time been less than most of the tradesmen on the sites which I have to supervise". (P.11) and also,

The RIBA needs urgently to address this problem, so they can explain to me, or any prospective student why it is going to be worth all the effort to qualify in the first place. If one were to include in any calculation the loss of earnings for the minimum of seven years prior to commencement, it would add overwhelming evidence of the injustices of this profession. (P.11).

Colin Ward (1976), after an analysis of the quality of work contributed by architects to society, particularly housing, came to the conclusion that it was abysmal and noted that

"Through its own experience society has placed such relatively low value on the services of the architect". (P. 104).

Such reports on low salaries and a possible reason for it should discourage individuals from entering the profession. What then is the attraction of the career? The complexity of the design process has already been touched upon. So where has the social and cultural perception of the architect as artist, designer and leader come from?

1.1.4: STUDENTS' PERCEPTION OF THE ARCHITECT'S ROLE

Why do individuals aspire to architecture? What do they identify as of worth within the working of the career role. Designing and producing buildings should be a major element of the individuals motivations, however there are other elements to consider. For example SIOD (1987) Hall Jones (1989) and other socio economic tables rank architects highly in their lists of social prestige. Architects rank with surgeons, judges and diplomats in terms of occupational prestige. Architectural careers always rank in social perception in the top 10% of occupations. Often in the public mind remuneration reflects social prestige but as identified previously, research seems to show that (except for a very small minority) this is not the case in architecture. Indeed architects appear to be some of the lowest paid professionals in the United Kingdom. One therefore needs to ask why architecture and its practice should be deemed to have such social prestige, as this must also be a contributory element in any career choice?
So why is the role of the architect often perceived in such glowing social terms when the financial remuneration of the task is relatively bleak in comparison with other professions. Why has this high social prestige developed? In order to explain the dichotomy, perhaps it is necessary to provide a short historical review of the role.

For many people, the image of the architect is set in an historical framework identified by the remaining ancient, medieval and more recent architecture which forms the essential recognisable core of so many cultures and civilisations. In this way, most people come in contact with architecture with a capital "A". Many nation states rely on the tourist trade often attracted by this architectural legacy as a major part of their economy. Egypt and the Pyramids, Peru and the Inca cities and even the UK with its palaces, cathedrals and fortress architecture. The importance of building design on the past and what we see about us, must influence those individuals who are interested in a career in Architecture.

Within the context of the research, it is important to clarify the nomenclature of the 'architect'. The term architect is polymorphic in character. It has meanings both abstract and real beyond the title referring to a building designer. For example "God being the architect of the Universe" and, "he was the architect of the final victory!" These idioms are common place but all add further positive dimensions to the title... Architect 'masterbuilder'. In order that the social perception of the title 'Architect' be more fully explained it is important to identify part of the historical context for the title. This may help in establishing the issue of the social perception of the architect's role social

Ancient Egypt provides one of the earliest surviving sources of documentation on its buildings. In the ancient kingdom, the role of building designer was well established. The step Pyramid of Zoser, which was completed in 2778 BC is the world's first large scale monument by King Zoser's architect Imhotep. Indeed according to Bannister Fletcher (1963), in the twenty-sixth dynasty Imhotep was defied. A vast number of temples and other monuments which abound in Egypt are designated to an architect and where they are it is due to their usually intimate connections with the Pharaohs. This identifies the social eminence of many of these early designers, certainly they appear to be from the upper echelons of ancient Egyptian society.

The title architect is attributed to the Greek 'masterbuilder'. Unquestionably, the supreme example of the 'Golden Age' in Greek architecture is the Parthenon on the Acropolis in Athens. Built between 449-432 BC, its architects were Ictinus and Callicrates. These architects were jointly and separately responsible for many other outstanding buildings. By the year 440 BC it was recorded that individual designers were being commissioned by the city states to produce certain types of building. These architects were part of a group of
designers who generally executed temples, theatres and other important buildings. The individual consulting architect had arrived. The genius or talent of the architect was plainly recognised and pursued. The title Architect had significant kudos firmly attached to it, and so it was to continue through the Roman period. The Roman architect Vitruvius dedicated his 'Treatise on Architecture' to the Emperor Augustus and under his patronage the text was widely circulated and used in understanding the design and construction processes of buildings. Many individual Roman architect's names remain to this day, suggesting something of their social significance and identifying the social prestige of the role. The social prestige of the architect was by 400 AD, well established. Raised to a God in Egypt, powerful men in the Greek city states and finally friends of the Roman Emperors, the enterprise of the architect had developed a reputation of nobility and power.

In the medieval period the designers of the great cathedrals were known as 'Masters of the Cathedral', not as master masons. There is the clear indication that these architects were men of letters, of high social standing and underwent a specific period of specialist training. Some of these 'masters' were of noble birth and often even the Bishops themselves. They had high social status and there is little doubt that these designers were in great demand throughout the Holy Roman Empire.

By the eighteenth century in England the 'Grand Tour' had become a 'must' for the nobility, the landed gentry, the wealthy dilettante and the fashion conscious of the upper classes. During this period because of its social prestige, the role and title of Architect, was often claimed by everyone who had an opinion on building design and the current "taste" and fashion. It is important to note, as do Higgins and Jessup (1963) that the architectural role was also identified as a superior "upper class" or at the very least an upper middle class occupation. It was a role for gentlemen, the aristocracy could certainly not be seen to come into contact with artisans and the lower social orders. This is clearly identified by Higgins and Jessup (1963) (see diagram 1 overpage). The gentleman architect, a person of taste who would become a "buffer" between the social classes. This is in large part, the reason for the 'architect' being seen a socially acceptable upper class traditional role.

The impact of the Industrial Revolution had a dramatic effect on the building industry and the architectural fraternity. The demand for buildings outstripped the designers capable of providing them. This led to the formation of the Royal Institute of British Architects (RIBA) to separate builders from architects and to provide a forum for discussion and to provide an enlightenment on the importance of good design in the built environment. However due to the ever increasing scale and complexity of the building industry the old social divisions began to wither and with the development of other building professions...
new social landscape came into existence. Diagram (2) overpage identifies the more complex relationships encountered in the building process in the 20th century, where the old social order has changed and the old class divide has been replaced by a contractual one.

What is apparent from this short retrospective is that throughout recorded history the architect/building designer, has always been credited with a social prominence. The researcher would suggest that it is, in many cases this social context that attracts many people to its ranks. It is access to the 'Queen of the Arts' without actually having to get

Diagram after Higgins and Jessup (1963).

Diagram 1 Social Divisions of the Building Industry
until the 20th Century still showing the social class divisions.
Diagram 2. The Building Industry in the 20th Century; divisions are much less obvious. The division is now contractual rather than that of the social class divisions as seen in the previous diagrams.
down into the mess of paint and clay and Architecture is presumed art without the perceived social risks of being an itinerant artist. The social aspects of the role can be identified at this stage as being a strong motivator and therefore an important element in any overview as to why individuals may choose a career in architecture. The question must be asked whether those entering into training as architects are actually aware of the realities of the career role. 

Nardini (1978), was concerned with this question. His hypothesis was that architecture and the architects career role within the building team are misunderstood by many of those entering the architectural profession and that it was this lack of understanding of the detail of the role which lead to confusion and dropout at a later date. He suggested that problems can arise from the architects' dual function; that of esoteric, creative/innovative designer on the one hand and on the other that of the more mechanistic coordinator, detailer and administrator.

Nardini carried out an investigation into the attitudes and perceptions of the architects role among university freshers, final year students and Architects. There were 64 first year students, 30 sixth year students and 11 registered architects in the survey. The results highlighted the design/administration dichotomy. In other words where the 'natural' designer, the 'design creative' individual being defined by Guilford (1954) and Hudson (1966) as Divergers and the administrative type of individual being a Converger. Thus, moving from the school of architecture environment to the office environment it is possible that the 'average' student, trained to be a diverger, imaginative, creative almost anarchic, find themselves in a more constricted, practical and more mechanistic almost convergent environment. This could lead to what is termed Goal Displacement, thus some individuals may experience an actual psychological shock from which many never recover, thus they may leave the profession for ever.

Nardini's investigation concluded that during the progress of the architectural course the students (view of the role) changed considerably. The results to some the questions are collated and are to be seen below.

Is architecture a vocation?

<table>
<thead>
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<th></th>
<th>1st year students</th>
<th>6th year students</th>
<th>Architects</th>
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<tr>
<td>Yes</td>
<td>73%</td>
<td>Yes 62%</td>
<td>Yes 52%</td>
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<td>23%</td>
<td>No 32%</td>
<td>No 45%</td>
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Is architecture a business?

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Should architects specialise?

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<td>50%</td>
<td>Yes 61%</td>
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What proportion of any project should be aesthetic design?

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<td>30%</td>
<td>Yes 20%</td>
<td>Yes 15%</td>
</tr>
</tbody>
</table>

State of architecture in Britain:

<table>
<thead>
<tr>
<th></th>
<th>1st year students</th>
<th>6th year students</th>
<th>Architects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>10%</td>
<td>Good 30%</td>
<td>Good 50%</td>
</tr>
<tr>
<td>Average</td>
<td>57%</td>
<td>Average 54%</td>
<td>Average 20%</td>
</tr>
<tr>
<td>Bad</td>
<td>33%</td>
<td>Bad 16%</td>
<td>Bad 30%</td>
</tr>
</tbody>
</table>

Do you want to be an architect?

<table>
<thead>
<tr>
<th></th>
<th>1st Year students</th>
<th>6th year students</th>
<th>Architects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>74%</td>
<td>Yes 64%</td>
<td>Yes 40%</td>
</tr>
<tr>
<td>Don't Know</td>
<td>26%</td>
<td>Don't Know 11%</td>
<td>Don't Know 60%</td>
</tr>
<tr>
<td>No</td>
<td>No 22%</td>
<td>No</td>
<td>No</td>
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</table>

Is architecture art based?

<table>
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<th></th>
<th>Yes 62%</th>
<th>Yes 47%</th>
<th>Yes 30%</th>
</tr>
</thead>
<tbody>
<tr>
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<td>18%</td>
<td>Don't Know 30%</td>
<td>Don't Know 30%</td>
</tr>
<tr>
<td>No</td>
<td>20%</td>
<td>No 23%</td>
<td>No 40%</td>
</tr>
</tbody>
</table>

The questionnaire noted that in many areas there had been a specific change in attitude and in other areas a gradual but less obvious change. However it did identify that the architect respondents had considerably changed their attitudes from those first year students. This
should be viewed in the context that these architects were the survivors of the lengthy and arduous educational process. From the few examples cited it is clear that many first year students are at best artless and at worst misinformed about their prospective careers. This initial innocence is problematic.

Why individuals chose to become architects is unclear. There are no specific central values, Art, prestige and leadership appear to be balanced by poor remuneration. Low social value of the role and a long and arduous training appear to contradict each other. However what is clear is that there is a fair degree of ignorance and romanticism of the role on the part of students entering the profession. This could possibly lead to uncertainty and regression later if role expectation and fulfilment is not met thus leading to poor design. See Maslow (1960) in one of the later sections of this research.

1.2.1 : EDUCATION FOR BUILDING DESIGN AND ARCHITECTURE; THE EDUCATIONAL FRAMEWORK

In order to proceed it is important to establish the background to the current training and educational processes which a prospective building designer must pursue to take on the role. During and following the uneven demise of pupillage, (which to an extent acted as a market and quality control mechanism) and the growth of part time and later full-time schools of Architecture, the Royal Institute of British Architects (RIBA) established the framework and the examination syllabuses which could be taken by external examination at the RIBA Central or Regional Headquarters. This gave the RIBA the ability to "moderate" the examinations and thereby to control the numbers of practising architects entering the profession. For many reasons this was seen as unsatisfactory by the Heads of Schools of Architecture, (HSC 1960) who demanded and obtained "recognition" of their courses in architecture from the RIBA. This provided the schools with exemptions from the set RIBA examinations; and students passing the schools examinations would automatically be offered membership of the RIBA and the Architects Registration Council of the United Kingdom (ARCUK).

The schools would suggest that tighter controls on the syllabus and more individual teaching of students should give good results. However, in the early days before universal recognition of architectural schools the schools would tutor individual full time students for the external examinations and achieve no great success. Student attrition rates are indicated later. Yet RIBA recognition of schools is dependent on the schools syllabi being similar to the RIBA educational requirements for training to become an architect; stages A to E. So why did exam pass rates improve through the recognition process? Regrettably there appears to be no clear answer to this question. Following the RIBA 1958 Conference, the
RIBA regulations for qualifications necessary for admission to architecture courses are as follows overpage.

(A) For entry to a design course at any "recognised" school of Architecture, in a University, Polytechnic or Art School the initial requirement is that the prospective student must have 2 "A" level GCE's and a minimum of 3 "O" level GCSE's or 3 grade A or B GCE's. Two of the subjects at either level must be English language and Mathematics. The above are the minimum standards as determined by the RIBA and ARCUK for their examinations.

However many universities and other colleges demand much more. This also relates to the type of first degree offered. A Bachelor of Science degree may require that the "A" levels are appropriate to the science tripos, from "A" levels Maths, Physics, Chemistry etc. It is also a similar picture in the Arts faculties. Not all schools of architecture require art, Music or other creative subjects. The area of admissions to schools of Architecture will be developed later in this paper.

(B) Three years full time education at a University, Polytechnic or Art College, generally ending with an honours degree in Architecture. BA (Hons) or BSc (Hons) depending on the College's regulations. This generally gives exemption from the RIBA's part 1 examination.

(C) One year in Practice; spent in an architects office or other recognised employment in the building industry. Usually the student must present a paper on his activities and maintain a log book of his or her work experience.

(D) Return to College for two years, though several institutions offer only one year with a much more strictly controlled 'year out'. At the end of this second term of full time education a further certificate is awarded, it can be Bachelor of Architecture, a Diploma in Architecture or a Masters degree. This generally gives exemption from the RIBA's part 2 examination.

(E) A further year in Practice during which the student normally returns to college for a short management and law course. At the end of this second year, or whenever he has satisfactorily completed the requisite two years of
his 'log book' recording his work involvement they can then take 'The Professional Practice and Management' examination which exempts the candidate from the RIBA part 3 examination.

The schools' exemption examinations are also recognised by the Architects Registration Council of the UK (ARCUK). Upon successful completion of all three examinations the student can then apply to ARCUK for entry to the Register of Architects. Registration then allows that individual to use the title Architect. Similar education processes apply to Europe and the Americas.

Background

Before the 1956 RIBA Education Conference, there were no criteria or entrance requirements at all to become an architect other than the schools' own criteria, generally 5 'o' levels. But in that year the RIBA defined the future of the profession and determined that normal university entrance requirements should be demanded of anyone entering the profession. This was introduced for various reasons including what Weeks (1987) considered "a need for academic status". Many schools of architecture were to move into universities and later into Polytechnics. There are now very few schools of architecture in free standing schools of art; though previously the majority were located in such establishments.

Entry Requirements

The RIBA (1994) state that entrance requirements depend on the institution in which the school of architecture is located. University Schools offering either a Bachelor of Science as distinct to Bachelor of Arts degree usually require a science subject at advanced level in order to fulfil the universities regulations for the degree of BSc. Colleges of Art specifically require art at some level. However with the large number of mature students, NBVQ, and other diplomas and certificates provided by applicants giving admission; there are (in many institutions) not thought to be many specific subjects which a budding architect must have before he/she begins his/her career. Most, (though not all) colleges state that they require some form of evidence or portfolio of creative work.

Conflict Between Theory And Practice In Education
Most schools of architecture offer a dual type of instruction. Primarily, the education of an architect is seen by those who begin their architectural courses to be vocational though this may no longer be the case on the part of many of the staff and part of the educational establishment. What is a vocation, it is defined as:

"An action of God in calling a person to exercise some special (spiritual) function, or to fill a certain position; divine influence or guidance towards a definite career, the fact of being so called, one directed towards a special role in life; natural tendency to, or fitness for, such work". (Shorter Oxford English Dictionary).

Consequently individuals who enter the course for this reason do not at the end of it intend to become anything other than architects though clearly over the duration of the course and the pressures of the job market this premise may change. In the UK this creates duplication of tasks. The RIBA established visiting boards in order to validate the 'vocational' aspect of the school. Then the University or college has visiting boards to establish the educational value of the school. Gartshore and Mayfield (1988), suggest that it is often the case that visiting boards are played off against each other. The academic boards are being told that their school's weakness in academic purpose is due to this 'vocational' nature, and the professional boards are being advised that the course is not solely vocational, but should be a more broadly based academic course. The result is that their students, while provided with 'an education' are not always welcomed by employers or by academics. It then becomes a classic "theory versus practice" or education versus practice scenario (RIBA Journal 1983). However this Education-Practice debate is not unique to Building Design or Architectural education. Simon HA. (1981), Pacey (1983), and Dore (1986) all record similar 'estrangements' in management, education and technology respectively. Teymur (1978) has attempted to define the problem. He suggests:

"That in the architectural practice there is a fundamental absence of theoretical tradition. Mainly due to this absence it has been incapable not only of sustaining any plausible conception of 'theory' and 'practice' but also of recognising its incapability. That is partly why I find it necessary to state not an alternative architectural conception of these terms but a theoretical conception of architecture as a specific practice. In this sense Architectural Practice is a practice constituted by all necessary professional and disciplinary processes, activities and relations in and around building production, namely, the decision making on, designing building, financing, studying teaching and, to a certain extent, using and exchanging buildings. This complexity is a real phenomena. It can neither be understood nor explained by reducing it to one of its elements, ie. the architectural office practice; or by fragmenting it into separate activities (only to seek relations between them afterwards)". (P. 7).

Teymur's view is interesting for two reasons. Firstly this overall holistic view of what architecture may be, is shared by most authors including, Vitruvius (AD 72), Lutyens (1948) Whittaker C. (1952), Oakley D. (1970), Pattrick M. (1971) and Richards
(1974), all suggesting a "unique interdependence" between the parts inseparable and inviolate. However while this may be true for very small projects it is not at all true for large projects where a project team will be in operation, each team member being responsible for their own area of expertise. Indeed the RIBA Job Book (1988) identifies in sections A and B a responsibility on the part of the architect to advise his client of the possible requirement of other participants in the design team; including structural engineers, civil engineers, quantity surveyors, interior designers, lawyers etc. etc. It then ceases to be a phenomenon in the holistic romanticised idea of the architect as total controller. The project then becomes a complex management task. (Any resulting phenomenon there may be, arises from the psychological impact the building has on the individual or collective psyche). Probably because most authors on architectural values or criticism subscribe to this holistic view of the model, Schools of Design often fail to allocate sufficient resources to applying the various sections or fragments to the whole. The majority of resources in terms of students time go on studio or design. This was reported by ACSA 1980, RIBA 1984, HMI Report 1985. In Europe it is not the same as Professor Kussgen (1986) stated:

"In the Federal Republic we do not have the meddling by professional people (bodies), it just complicates everything. The school is just that; it provides an education an aid to thinking, that is more important than learning about the trivia of massed detail. We want our students to be thinkers who can solve problems not quote rules".

The Effect of Student Numbers on College Success

In the UK, in order for a course to be available it must have a minimum number of students enrolled before the course can begin. It can also attract more funds if additional numbers of students are available to the course, (if certain types of student or foreign students are on the course etc. etc.). This is not necessarily the case in Germany. It may also be possible that this requirement for minimum student numbers may affect scholastic results insofar as resourcing may also be a factor in the continuing student dropout rate in schools of architecture. An Admissions Tutor in a University noted:

"I am concerned that I can get enough students on the course, which from their 'A' level results, suggests enough intelligence to get through the course".

A Head of School stated:

"What is important is to keep numbers up, transfers to other schools (under part 1) may be difficult to sustain in future unless we get a sufficient influx (from other schools) here". (1989)
Both these statements identify the situation. Numbers must be maintained in order to ensure the continuation of courses. Crux (1980) observed that any school with a high failure rate throughout the course would:

(A) "Be unjust to their own students in relation to what goes on in other schools;

(B) "Would risk obtaining the reputation for being a hard school which would then not attract students or worse, have the current student body leaving to go to other easier schools, thus reducing student members and so endangering the very existence of the courses and thus the school".

High student numbers in the first year of whatever quality of student, allied to a higher than average attrition rate in comparison to other courses, allows for a levelling out of average numbers over the course and thus the preservation of the institution.

Schools are not only places for training architects but are also places for employing staff. On average most schools have up to twelve full time staff excluding secretaries and technicians. There are also sizable numbers of part time staff in attendance one or two days a week. Taken across thirty nine schools in the UK, this represents a large section interest in the education industry. It is probable that in the context of supplying the future needs of the industry there are too many Schools of Architecture. The RIBA 1982, 1987, 1989 has reported the fact many times, and the related professional press regularly carries arguments for and against closing many schools down. It was generally felt that there would be too many architects attempting to practice in a relatively inelastic market, but this thesis is not about numbers, it is about the quality of the design ability of those who do qualify. Added to this problem of oversupply there was also the issue of the cost of a five year first degree course which requires funding nationally compared to the more common and cheaper three year first degrees offered in the majority of other courses developed considerable demand for change. The idea that the final two years should become a masters course was argued by the funding bodies but not accepted by the architectural community, however the pressures for change were becoming more powerful.

1.2.1.2 DEVELOPMENTS IN ARCHITECTURAL EDUCATION

However since those early conferences and the student/building industry market supply problems, there have been considerable changes in the processes and systems involved in the building industry. Construction in the United Kingdom has gone through the longest recession in recent history. This has had the effect of 'shaking out' huge numbers of clients, builders and suppliers, not to mention considerable numbers of building
professionals including architects. With this shrinkage there has come a need to redefine the traditional role of the architect and the possible routes to qualification.

Following several inconclusive conferences in the 1980's and early 1990's which were formulated in response to those pressures mentioned above, the RIBA commissioned the Burton Report (1992) which was an attempt to review the whole process of architectural education and qualification. There has been continuous arguments concerning the qualities inherent in an undergraduate architectural degree, regarding its breath and intellectual contrast between artistic and scientific subjects, while having substance should not presume to be of specific value. Indeed the proposed new move to more knowledge specific subjects will be of greater worth to the individuals concerned. The Burton report made forty five recommendations for the improvement of architectural education and helped develop a continuous dialogue on the educational framework which exists in schools of architecture in the UK. Of particular interest to this research were recommendations 34, 35, 37, 38 and 39. These are as follows:

34 The part 2 examination while preparing the individual to become a professional architect should also encourage a diversity of knowledge based specialisms.

35 Diversity is to be encourage in relation to developing specialist subjects at all levels of the academic course.

37 Linkages with other related academic courses within a modular structure should be developed possibly leading to joint Honour's and professional registration.

38 The assessment of interdisciplinary studies and their application to courses should be continuous and relevant.

39 Commonality between built environment courses should be reviewed in order that were possible, joint path ways could lead to Part 1 exemption.

This represents a considerable change of educational approach from the original 1950's educational programs devised by the RIBA and student conferences. It would suggest that future students may be able to specialize in knowledge specific subjects parallel to their design studies.

Since 1992 the recommendations of the Burton Report have been under review and this in turn has led to an overall assessment of progress under the chairmanship of Professor Stanfield-Smith. An important position paper was produced by the RIBA in May 1997 concerning a way forward for the architectural profession. In this paper Colbourne identifies changes which have taken place based on the Burton Report regarding admission procedures, the Part 1, Part 2 and Part 3 qualification programs. The 1997 position paper calls for the introduction of and highlights the advantages of the concept of multi
disciplinary education. This recognises what the author referred to earlier as the divergent-convergent dichotomy that many graduates may not eventually be design centered in their task but rather, will be managing, detailing or inspecting the designs of others. Indeed the RIBA suggests that 70% of time in architectural practice is spent in managing and administering projects. Recognising that this happens and attempting to act on it is step forward, and in order to cope with this reality the concept that students should or could be prepared for it by allowing a multi disciplinary approach to qualification following Part 1 is a positive change.

This could mean that following the Part I examination, students, depending on their personal interest developed over the first three years could then specialised in their Part 2 course. These knowledge base specialism could be as varied as; professional management, conservation studies, environmental sciences, interior or cinema/theatre set design. The student in order to qualify for ARC UK registration and RIBA membership would be required to undertake a prescribe set of course subjects and their chosen specialty. Such graduates will then proceed to a new upgraded professional qualification examination using their specialty as an element for their final submissions.

In terms of the contrast between the divergent and the convergent personality this new radical approach (if adopted) will be of great benefit to future aspirants to the architectural profession. The question remains as to why when it is recognised at a post Part 1 level that many students may be more able within a convergent approach to the profession and perhaps could possibly end up never having a design role why they chose to do Architecture in the first place. Maybe they would have been better doing a first Degree in Building Economics and then a Master's degree in project Management (a possible four academic years) rather than Architecture which is a minimum of five years. The individual having taken the former direction would probably be more effective and happier in their role. This research would question why this can not be recognized at an earlier stage, say at post 'A' level pre Part 1 stage?

1.2.2 : DEMAND FOR ARCHITECTURAL EDUCATION

Another area which needs further clarification is the number of student applications to schools and the pressure on places. This will help establish the real problems in recruiting and selecting the candidates for architectural design courses. Gartshore and Mayfield (1988), identified that schools in general stated that applications for their courses were of order of between eight and ten applicants for every place. HMI (1985) found that on average prospective students make at least five applications to schools. Nardini's (1977)
research identified that on average each student accepted three offers while Mayfield (1991) suggested that most of the students he interviewed had accepted at least two

Schools of Architecture now have 'clearing houses'. With UCCAs data should not be difficult to determine exactly what the real demand is, i.e. how many places are actually available, set against the verifiable number of students who apply. As at 1993 the author has been singularly unsuccessful in obtaining them. Overseas and certain mature students tend to make separate direct applications. So, are demand patterns accurately reported?


"While students were articulate and helpful in expressing opinions about architectural education they were in some difficulty when asked to comment on the role and significance of other construction disciplines".

"Some graduates are not suited by aptitude or ability for the diploma course. Schools should exercise greater care to ensure that they select for the diploma, only those candidates who have the potential to profit from further educational provision".

The second paragraph is important because it requires the schools to enter into selection procedures; to make reductions in numbers and therefore, on a national scale, to close down some postgraduate courses. There is also the obvious question of why if the Government Inspectorate had determined that, a percentage of the students proceeding to the diploma course were unsuitable so to do, at the time it was possible that the DES was trying to shorten courses and reduce student numbers, however the question must be asked, what were they doing on the degree course in the first place? Again, the confusion arises between the vocational and the academic poses of architectural education. If there were a reduction in the number of postgraduate courses in the UK, then those schools which lost their courses could eventually disappear, as students at those schools without such postgraduate courses would be seen to be in a less preferential position (whether it be true or not) than those students at schools with courses which led to full registration as an architect.

1.2.3 : STUDENT ATTRITION RATES
Fisher and Wigfall (1976) found in their survey that there was also a degree of disillusionment amongst students entering into and later leaving architectural education, one of their respondents stated his first impression of office practice was:

"A period of almost total disillusionment. I felt that the three years previously spent might never have happened, they have so little relation to what I was supposed to be doing". (P. 29)

However, Fisher and Wigfall also found that approximately fifty two percent (52%) of their respondents were satisfied with their experience up to and including practical training while some thirty five percent (35%) of the same survey were "very dissatisfied", the other thirteen percent (13%) being "neutral". The author would report that this did not include any of the dropouts or failures, as the survey was taken among the survivors!

Robert Fisher and Valerie Wigfall in their major report (which according to Fisher (personal communication 1982) was completely ignored by the RIBA and the schools of architecture) was sponsored by ARCUK to identify why so many candidates for architecture courses either failed to complete the course or having completed it, no longer practiced as architects. They were also interested to find out why so many individuals did not continue their course past one level. Fisher and Wigfall noted:

"The number of respondents who have reached full architectural qualification (RIBA part III) within eight years of commencement of study, represented 46.7% of the 1960 cohort and 49.6% of the 1964 cohort. The evidence suggested that a substantial number took longer than the minimum time to qualify (a further 23.8% of the 1960 cohort took between eight and thirteen years to qualify fully). (P. 36).

Fisher and Wigfall (1976) note:

"At the time of the survey (1975) 29.5% of the 1960 cohort and 40.3% of the 1964 cohort had still not reached RIBA part III. This was after a period of thirteen years and nine years respectively, following the commencement of study". (p. 51).

This identifies that 40% of students holding the RIBA part II examination had not continued to part III and registration as an architect. Why had so many, after so many years study and application (six years to part II) apparently 'lost interest' in becoming architects. This confirms Nardini's investigation and the suggested "goal displacement" which many students experience. They further identified at 19% of those who registered as architects in the '60 and '64 cohorts had left architecture completely.

Fisher and Wigfall were mirroring Alan Rudolf's (1958) earlier call for a greater concern about the huge dropout rate in the USA from architecture courses. Rudolph (1974) stated:
"One of the great problems that we have is in assessing the students ability before we get him (pre politically correct time) and we worry a great deal about the attrition after he is in. We take about one in every five who apply. Our attrition rate over the next five years is 60%. Now I have talked to people in the field and I don't think this is essentially greater than elsewhere. Though there is some variation but it worries me and it worries the administration, the cost to us the community and the student is incalculable".

Rudolph identified this problem at the Pratt Institute in New York which like most North American schools is a private college. In the academic year 1989-1990 the tuition fees were $9500. At a recent visit to Pratt (1989) the researcher, in discussion with the head of school established that in the previous two years there was a similar attrition rate on the full time course, as the details overpage show.

Pratt Institute's Student Continuity

<table>
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<tr>
<th>Average Number of student in first year</th>
<th>November 1983</th>
<th>118</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of students</td>
<td>November 1986</td>
<td>92</td>
</tr>
<tr>
<td>% Attrition Pratt institute</td>
<td>To November 1986</td>
<td>22%</td>
</tr>
</tbody>
</table>

Average Number of students in 1st year (over 3 yrs) | November 1986 | 110 |

Average Number of students in 3rd year (over 3 yrs) | November 1989 | 89  |

% Attrition Pratt Institute. To November 1989 | 17% reduction in students |

(Includes additional 42% of original student cohort which had left, their places taken up by direct entrants in years 2 and 3)

The statistics on the original cohort are difficult to gather beyond 2nd year now because of Pratts policy of keeping numbers up by attracting other continuing, (foundation) readmitting and transfer students from other courses and colleges. These figures are close to Rudolf's original figures. This is doubly interesting because:-

(A) One could assume that US students paying for their own education would be very motivated to continue.

(B) If that is the case in the USA what of the British situation, where almost all students have their fees paid and also receive an allowance (grant) for living
expenses? Do students (who would drop out if they were in the USA) continue their studies as it is the easiest or least painful thing to do?

The RIBA (1989) statistics do not bear this out. 1986 national statistics are overpage for full time students in a continuing cohort.

<table>
<thead>
<tr>
<th>1st year</th>
<th>RIBA part 1</th>
<th>RIBA part 2</th>
<th>RIBA part 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>all institutions</td>
<td>examination</td>
<td>examination</td>
<td>examination</td>
</tr>
<tr>
<td>1427</td>
<td>1178</td>
<td>914</td>
<td>793</td>
</tr>
</tbody>
</table>

1427 students started and 793 finished.

The RIBA figures show that from the start of the course in 1978 through to a possible finish time in 1985 shows a 45% non completion rate. These figures are adjusted to allow for students who take additional time out in training but do eventually finish the Part 3 (some take up to an additional two years).

**Medicine and Law.**

How do other professions compare in their drop out and failure rates. Simply due to the equal duration of the training (seven years) medicine is often quoted as the most relevant vocational career. The British Medical Association Education centre quoted the following overall course completion rates. For every 100 starters 81 finish the course and 74 end up practicing in the field of medicine for life. The law society too produced the following data on their success rate. This was for their undergraduate courses in law. For every 100 starters 87 finish. It can be seen for both the above vocational professions that the drop out rate for architecture is consistently higher.

Why then do so many students fail to complete the course and why do many architects leave the profession? This is particularly relevant when it could be argued that the students are supposedly the “creme la creme” (i.e. the ones offered places) of those who applied to the schools and also considering that the student architects have invested so much time in their education! One contributory factor may be that the selection procedures used for admission to schools of architecture are not identifying students with the appropriate skills, drives and motivations. What are the selection procedures used and are they the right ones?
1.3 : ACCESS TO EDUCATION

1.3.1 : INTRODUCTION

Architects provide an important contribution to society, relating to the spatial and aesthetic quality of the environment. The precise contribution is often a point of contention although without doubt the profession is responsible for the spatial qualities of a large part of the physical environment. Colman (1990) in her research has gone as far as to suggest that the quality of the built environment can be responsible for certain behaviour patterns exhibited in the community. If this is the case, there is evidence to suggest that the architect as the designer of the built environment has a responsibility that is immeasurable. This being so, the selection of those who are trained for entry to the profession, and their education and training

1.3.2 : SELECTION

The research has noted that anxiety has been expressed by many authors relating to the high drop out rates of ex-graduates, from both graduate and post graduate architecture courses. Allen, (1959) Patrick (1961) and Fisher & Wigfall et. al.). This high drop out rate leads to the question of why it is allowed to develop. Perhaps the term 'allowed' is not appropriate as it suggests there is an awareness of the situation. However it seems that the reverse is true and it is necessary to examine the whole process of student/college selection procedures. On selecting students:–

Taylor (1951) states that:

"It is ridiculous to believe that architects are born with a pencil in one hand and a T square in the other. They are ordinary human beings, perhaps slightly more human than the majority of people. Nor at an early state does their horoscope indicate that they are destined to become architects, second Christopher Wren's. (P.40).

McCloughlin (1962) continues:

"Most career decisions are made between the ages of 16 and 20, though many arrive at earlier and some later with marked success. There are periods when young people hope for some measure by which they can gain assurance, some categorising of mind and aptitude by others that will place them neatly in or out of a profession. Looking for future architects is indeed like hunting for needles in haystacks, a process made even more difficult because many of the needles do not shine at an early age". (P.17).
McCloughlin suggested that attempting to look for future architects is perhaps a futile chase, and he hypothesizes that his answer to the question about how the profession can spot a future architect is that: "it cannot". The future architect has to tell the profession that he is arriving. So how is it that students elect to become architects and how do schools select their students. Selection is a two way process and it is the student who first identifies his own motivations, interests, direction and his capabilities to undertake particular and general tasks with enthusiasm and enjoyment, or otherwise. From these various pointers a particular career role may suggest itself immediately. The student may receive counselling, in an amateur way from his parents, his friends or from his own researches. Klein (1975) and Herriot (1984) both state that students seldom seek out professional advice for their choice of career. Tilley & Wolf (1976) developed the idea of flexibility in career choices, identifying a lack of decision in early career choice. This may also be true later on in a career, when choices are hindered by the material demands and restraints of family development and the growth of the need to retain material gains. Herriot also refers to other aspects of career choice including the student's perception of his own esteem, the opportunities for advancement, remuneration, change, travel. Herriot regrets that the 'Career Development Inventory' (a scale of occupational prestige based on the social perception of the job and unrelated to career income) usage is probably unique outside academic departments, yet as a career development tool, an understanding of its five principal parts would assist any student in identifying a plausible career choice.

However, such diagnostic and 'objective' testing techniques cannot accurately quantify the "human spirit". For example, an individual who wants to obtain a commission in the armed services may do so with a sense of 'adventure and patriotism'. The 'rationale' that it may lead to his premature and possibly very painful death does not seem to put him off. This human factor is often the only decisive factor for a career choice. As was stated earlier, many first year architecture students actually had no idea as to the real career role of an architect, and they were also confused in their identification of ultimate work patterns. A great deal of romanticism was identified which had its roots in the great Renaissance architectural revival, allied to an awareness of social prestige. The average student had not realised that the technologies of construction and the role of an architect had changed considerably. As an elementary analysis this appears to show that most of the students interviewed, had shown little resourcefulness in the ability to make occupational decisions, and they reflected a preconceived, rather than an objective view.

There are two sides to every selection situation and we have so far touched on the prospective candidates' possible needs and intentions. On the other side there are the schools of architecture and design which will now be reviewed.
Before the war higher and university education was deemed to be elitist prerogative. Hatfield (1948) identified this as being a major weakness in the culture. Following the second world war there was an urgent need to expand not only the number of architects but also the number of architecture schools. This was because of the vast amount of rebuilding work required not only because of direct bombardment but also for the re-orientation of industry. The post war Labour government and the Robbin's Report on education; dramatically changed the context of education, attempting to make it a universal right in a democratic society.

With the growth of the architectural profession came a demand from the profession for more control. Following the war the various schools were able to offer courses with varying academic criteria. The university schools of architecture required university entrance requirements, generally the equivalent of 2 'A' levels. Polytechnics and Technical Colleges needed only, as Clayton (1978) puts it, an 'interesting portfolio'. This lack of rigour and universal standards was unacceptable to the professional bodies involved. This opened a debate on the correct mode of selection. In medicine a similar pattern evolved, the two extremes of which were reported by Jacobs (1980) to be.

1. Education is a universal right and anyone, given average intelligence and the right motivational drives can be trained to do almost anything.

2. Medicine (Building Design) is a vocation and only certain people have what it takes to be able to do it.

The first view was very much a result of the anti-elitist ideas generated after the second world war, allied to the Robbins report and demands for universal education. The second, was very much the attitude of the universities and the old 'atelier' type of office trained education system. Neither were of course completely right. The universalist model was adopted with modifications throughout the United Kingdom. This was due in the main to a series of conferences in the early 1950's and 1960's.

1.3.3: TRAINING AN ARCHITECT (The Academic Direction)

At the 1956 Architectural Education Conference (also titled the Heads of Schools Conference, or HSC), the direction, criteria, philosophy and detailed syllabusis were set out, by which architecture has since been taught. However in the context of this research a more important debate on how to select candidates for entry to the new educational processes did not take place.
As the research identified earlier Taylor and many other authors had already determined that searching for promising architects was a waste of time and energy. Better to allow aspirant architects to apply and select those deemed to be appropriate, entry to the hallowed sanctums of architecture schools. On the face of it, it appears reasonable, but then if self selection is an appropriate form of selection, why is there such a dropout rate? and also why does there appear to be a far from satisfactory performance from many practitioners?

Kay, Professor of Psychology at the University of Sheffield, in a discussion at the 1956 Heads of Schools Conference on the subject of selection of students for schools of architecture stated:

"You cannot waste money on selection in as much as it’s about the most important decision any individual is going to make, so to this extent, I mean as a community it is quite one of the most important problems we can tackle and if in fact at the end of it all we can tell a man that he can go and be an architectural student, it is not a waste of time in the general sense. I think in all these things it is the question whether we can specify the criteria which we want and if we ask and find that you as architects having conducted your investigation find a lot of general qualities are those which will make good architects, well then, let’s have them, let’s know about them". (P.92).

Indeed Kay pre-empted Liam Hudson's "Contrary imaginations" (1966) with his identification of "a lot of general qualities". Indeed this "divergent" concept is probably correct, though the conference did not develop it any further. His statement that you cannot waste money on selection (unless you know what you are selecting for) was not properly developed. This was the opportunity for the architectural profession to enter into deep analysis about itself but the moment was lost. The keynote speaker, Jane Abercrombie who was not a trained psychologist, but had entered psychology from a background in biology; contended that looking for or putting labels of 'types' of people was not appropriate. Rather, she took the view that rather than searching them out, she would;

"As a biologist I think that we can do an awful lot to people to make them good architects or doctors and that we should put our efforts into that". (P.93).

Even more strongly Kenneth Campbell Head of the old GLC Department of Architecture, at the same debate agreed with Abercrombie that the important thing is to take the normal intelligent person and make him a good architect, he argued:

"I think this can be done and I feel rather strongly myself because I have seen so much time wasted on this problem of finding if a man is going to be a good architect which stems from the opinion that an architect is a rather special marked off person, I don't think we are divinely appointed people. I think we do a divinely important job, but I think it's one which quite a large proportion of human beings properly trained could do. (P.91).
This is a personalised generalisation which has little concrete evidence to support it. Certainly it can be argued that any intelligent person properly trained could exercise the role of the architect in many situations except one, and that is the role of the designer. Campbell's view which appeared to be the prevailing philosophy at the time, may be related to the construction industry in which large numbers of anonymous buildings being designed by licensed architects, erected by local authorities and speculators. Both the commercial and domestic fields have suffered, yet the awareness of badly designed tower blocks, the massive housing estates of the inner cities and the profitable but faceless and characterless office blocks of the 70's and 80's challenges the notion that any intelligent person can become a good designer. They can be trained to put up buildings but that is not the same thing.

The following HSC 1958 conference raised the entry requirement to non-university courses, to those required for university entrance (i.e. 2 'A' levels and 5 'O' levels). It also increased the proportions of non design subjects in the syllabus and interestingly it also proposed that the schools could offer a variety of education systems, as long as they remained broadly within the RIBA syllabus. Without these specific limitations laid down this allows for considerable flexibility (as already reported in this research, and the criticism that comes with it from the HMI). The RIBA (1958) conference proceedings again gave no indication of the specifics required (i.e. has an individual the ability to design or not?) only the minimum admission procedures.

The next major conference in 1970 (HSC 1970) again laid down a series of concepts which it was believed would have laid the foundations for a more integrated building industry. But by 1970 there were no further discussions on the selection of students. It was now accepted that searching for designers was not appropriate; better to try to train those who applied to be good ones; even though there was no control over this due to the flexibilities introduced at the '68 conference. That subsequent to the '56 HSC conference there were no speakers or debate about design ability or skill; only on teaching such skills and thereby hopefully discovering ability later.

The RIBA conferences opened the gates to anyone with the minimum education qualifications but not necessarily the ability or vocation. The "massification of building design had begun. However proportionally, the quality of the built environment did not improve, indeed in the early years following the acceptance of Abercrombie's views (she had not yet tested them), the media agreed that the quality of the design environment collapsed.
Traver (1908), Montmasson (1931), Oakley (1970) and others have stated that a designer should have intuitive qualities which enable him to design. If so, to suggest that these qualities can be learned (as most schools of architecture do) is probably the crux of the problem as the great many unsympathetic buildings around seem to show. The author, in discussions with colleagues in other design professions such as industrial, interior and furniture design etc., has identified similar problems and concerns. Perhaps this paper could be taken more broadly and related to 'design' as a universal attribute. Many of the arguments concerning the architectural world are also of importance to other design areas.

1.3.4 : SELECTION OF A COLLEGE BY THE STUDENT

Having established that schools of architecture do not seem to have a hard set of criteria by which to select prospective entrants to the profession, the question arises as to how students select a school of architecture. Cropley (1967) suggests that design could be dependent on particular cognitive processes pertaining to certain individuals, or it may be that everyone has this design ability to a greater or lesser degree. If it is the case should there be a minimum level required to enable an individual to proceed to a design career? Are certain levels of ability required to deal with a specific scale of design problem i.e. a door knob or a national sports complex or it may be that the competent designer can use his 'talent' to design anything great or small. Hatfield (1948) believes that to be the case, an intuitive designer he suggests can design anything. However, design capability does not seem to feature in the priorities by which students select their schools and courses.

All schools are expected to provide a minimum curriculum necessary to educate for a career in architecture and in the great majority of cases this is adequately handled. The RIBA and the multifarious degree awarding bodies inspect the courses, normally every five years with the intention of ensuring their quality and relevance. However, different boards visit different schools so there is always a danger that the standards may possibly vary around the country.

Garfield et al. noted that students apply to courses in particular centres for many reasons. Some because they are near home e.g. Belfast, Huddersfield, others because they are in regional or national centres, which offer different opportunities and freedoms e.g. London, Edinburgh and Liverpool. Some offer social esteem e.g. Cambridge, and others offer historical connections e.g. Canterbury, York and London. Some offer specialities, such as engineering, environmental physics, structures, graphics, art, or history. As noted these are seldom defined by the particular institutions. This lack of reporting has been
commented on and criticised by HM Inspectorate of Architecture Schools (Report 1985). Therefore these specialisms cannot be included as a reason for student choice. In their report, the HMI (1985) were very critical. In paragraph 12 they note:

"In choosing a particular school, candidates find it difficult to differentiate sensibly between courses that claim for example, to be design centred, technology centred or art based!".

They also identified in further sections, (20, 21, 22 and 23) that the varying degree of inputs in technology, between differing schools was notable.

1.3.5: SELECTION BY THE COLLEGE

Once the student, for whatever reason has made his or her decision on which colleges they are interested in attending, they make application through the university clearing scheme which is now the main method of selection. Each educational establishment sets its requirements relating to a points system. A student who has more than the required number of points will generally be offered a place automatically. Those with weak 'O' levels and marginal subjects at 'A' level can be interviewed. (The points system and Universities and the Polytechnics responses will be developed in the following sections).

All surveyed schools stated that they used interviewing to determine a marginal candidates suitability. This was done after the school had ascertained that the candidates academic ability was already the minimum to be able to finish the course. The value of the interview alone, in order to establish validity, is fully discussed by Herriot (1989) who states that the number of possible biases and inaccuracies which would make the "true measurement" (ie: the qualitative analysis) distorted, are immense. As is the problem with all attributional analysis, it tends to be iconoclastic in nature. Thus, the particular interests and other needs of the interviewer tend to mask an objective view of the candidate or the vocations abilities or demands. Only two of the schools reported that candidates were interviewed by a panel of three tutors, which makes the overall assessment of each candidate a little less polemical.

However, the RIBA (1989) states that in no school was there any serious attempt to involve any form of psychometric analysis to determine ability. This again stems from the problem of determining a proper model for the architect or building designer. Educational establishments tend to recruit candidates who they believe can complete the course. Their views on a candidate's abilities to design generally tend to be related to the production of an 'O' or 'A' level portfolio of artwork and then by "taking a view", as to the candidate's possible potential to convert the portfolio work to design. Cropley (1967) argues strongly against this simplistic view. He suggests that being good at art is no real indicator as to
whether a candidate will be good at design. As he states, the processes are different. Mason (1987) noted that like Europe, in the USA most schools believed that the industry (ie: the 'building industry and the architectural profession) is big enough not to have to be too discerning on its graduate intake. Because of its scale almost everyone can find a job doing something. The author would suggest that if intending candidates had a greater awareness of the role for which they were training, or perhaps destined, the interviews would probably be different. However it is not possible at this stage to pursue the multiple aspects of interview models, actions and reactions. It will be more appropriate during the proposed field study to establish the validity or otherwise of the experiences gained and the systems used in the schools.

1:4:1 RESEARCH PROBLEMS

From the foregoing there are two aspects which need further analysis. They are of critical importance to the thesis. One point is the suggestion is that bad architecture results from inadequate designers. The second is the inference is that inadequate designers are the result of inadequate students being trained to be building designers. The research so far has suggested the following hypotheses which may assist in discovering why there seem to be a significant number of inadequate design students either passing through or dropping out of the schools of architecture.

PROBLEM ONE

Tutors who select students for design courses may not necessarily be selecting for design ability but may be seeking students who can successfully complete the course and;

PROBLEM TWO

When schools do actually interview candidates, due to the poorly structured and imprecise interviewing procedures, interviewing tutors are as likely as not to be victims of their own stereotypical views on what makes a successful designer, and therefore they may make subjective selections based on their own belief systems.

PROBLEM THREE

The schools select students according to their ability to comply with the institutions own academic agenda (ie. perhaps art or science based) rather than the candidates ability to design. This is done before interview or in schools where little interviewing is done
These three factors could negate against objectively seeking out design creative individuals. They search instead for individuals to fill places on the course, who can be taught or even moulded to complete the course on offer, this perpetuates the system. The above hypotheses need to be tested to establish their criticality to the fourth hypothesis. In that, if good designers have intuitive ability, then one of the reasons why much of the poor design of the built environment exists could be that individuals with the wrong abilities are being selected and taught. Therefore more care should be taken in design course selection processes to seek out individuals who may have an aptitude for design.
PART TWO

OVERVIEW OF HOW HISTORIANS, AUTHORS, CRITICS, ARCHITECTS AND OTHERS REPORT THE ARCHITECTURAL QUALITY IN DESIGN
2.1. DESIGN CREATIVITY AND THE BUILDING PROCESS

2.1.0 : INTRODUCTION

Section 2 of the research attempts to establish what architectural design and specifically good design is. This is done by referencing the writing of practising architect, architectural critics, writers and academics who are involved in the analysis of architecture. Indeed the difference between architecture and building is often refer to in many of the text, but how good design is recognised is not at all easy to establish. It is unclear whether is simply the result of step by step process or whether the designer needs an innate talent to do the task. If it should be the later what sort of qualities should the client look for in his design architect.

The second section is in three parts, the first discusses the myriad reductionist models which are representative of so much architectural analysis. The second takes a more historicist approach in trying to identify if in a long history of architecture there are many references to the methodology or anergies require for the creation of good design. Finally the third section looks to the architectural and professional design texts to discover if originality, creativity and innovation are a possible insight or key to understanding the inherent ability required to be a good designer.

2:1:1 INTRODUCTORY CONCEPTS

It is important to establish what design talent is. As a term it has been used in the text but what is it? Generally the word 'talent' is used to ascribe a propensity of the mind, an inclination or disposition of an individual to be successful in a subject. It also is associated with mental powers and cleverness. So what is design talent? Dacey (1989) allies innate talent (of any sort) to creativity in the performance of a task and Hudson (1974) states that gifted or talented children are generally the most creative. Hughes suggests that human creativity and talent are synonymous in the visual arts. The link between talent and creativity is noted by Braaten (1964), Abercrombie (1960), Garvin (1964) and Leary (1972). Although there has been no serious research into 'talent' as such, creativity has had a considerable research base for some time. In North America particularly in school and pre-university assessment tests, the terms creative and talent are frequently interspersed and substituted for each other. So what is creativity in the context of building design? Creativity is a multi-faceted, dynamic activity which has the following aspects and approaches to it.

Firstly there is the individual's creative ability. This person orientated approach is the most researched psychological area. In particular there are numerous tests which have been
developed to identify the degree of creativity pertaining to individuals. These will be identified later and their value examined. However, the person centered approach is also concerned with the individual's own sense of their own worth; their own sense of achievement and creativity. This is separate to and different from the reality of their achievement in social or cultural terms.

The second method of identifying creativity is an analysis of that which has come into being (or has been created). This is known as the product-orientated approach. How much has this product contributed to the well being or development of society? How has it changed ideas or attitudes? What level of originality does it display? Does it have what Hatfield (1948) has termed inventiveness? Or has it achieved an 'eminence' in its field within a recognised time span. Simon (1981, 1975) and Simonton (1988) have specifically engaged in modelling this form of creativity analysis which will be discussed later. There is also the history based approach which identifies both individuals and products in the context of human development on the planet. Art, science, technology, politics and music historians are too many and too diverse to specify any particular individual author for reference.

Then there is the 'process' approach to creativity. This is similar in psychological terms to connectionist school, Pylyshyn (1985), Fodor (1987) and Pinker and Mehler (1988), which will be dealt with in more details later (see p. 48). This process approach is basically the only method by which a dynamic activity can be analyzed. The basic model for this process spans between the genetic precepts of the individual through the cultural interchanges both of the designer and the responding public. These are seen in the context of time, the product’s utility to society and the historical connectionism of the whole. Of particular contrast to this process model is the concept of microgenetic theory, Smith and Carlsson (1985) and Draguns (1990).

The problem with creativity in a process approach is that, while a creative individual and product may not now be considered creative, at a later time or seen at the same time from a different perspective or in a different situation it may emerge as creative. Situationalism (Dacey 1992) is a major problem in creative analysis and therefore parameters for creative design ability need to be drawn and this will be discussed later. It is important to identify where design creativity corresponds to the general design and construction model.

In the following section various models are presented in order to identify the 'normally' perceived sequence for the design and construction of buildings which many authors deem necessary for the successful completion of projects. These product models are usually published in a reductionist style, listing all or as many elements as possible relating to the building or project to be attempted. Some of the 'total' models attempt to cover the whole process i.e. inception, design, technical detail, costing, tendering, site construction, client hand over and finally performance monitoring, and they can become cyclopean in scale. For example the RIBA Job Book (1990) is 162 pages long and, although it does refer to some minor psychological aspects it is basically a product model. It is also very important to note at this
stage that these models which have been developed in considerable detail by designers and builders, are not paralleled by the analysis of the process, an example is provided by the person orientated approach.

These models are recorded here to identify to the reader the complexities of the building process of which the Design Process is the primary element. They also show the screen of detail which often obscures any real search in the educational sphere for design 'talent'. With such complex models, design talent is often seen as just one element, although an important element of the whole building design curriculum.

2.1.2. : ARCHITECTURAL CONCEPT MODELS

Building Design, as well as ‘architecture’ has a fundamental basis to its study, and that is; (at its broadest, including psychological sense) human health and safety. It can be stated that in any design scheme the following influences are a necessity. (In this concept section the models are strategic rather than tactical, or detailed, which this research labels product models).

1. The architecture of the building, its aesthetic design, its internal environment and its effect on the external environment.

2. The safety of the building, not only structurally, but also the aspects of health and hygiene.

3. The ergonomic and organisational form of the building must reflect the social and cultural values of the community in order to integrate the building with both its users and the society around it.

The hierarchy of the arrangement of these practical objectives reflects the nature of this paper as the research is primarily concerned with design quality. Nevertheless items 1, 2 and 3 are interdependent, although from the point of view of society it is the health and safety objective which normally receives the most attention, particularly from the Government and Local Authority legislators. For this reason it is important to discuss the form and the scale of operations required in many of the models. The primary and most simple example is the RIBA model. It is common to many tasks, not only building design and the author feels that it needs no further expansion.

Brief -> Analysis -> Synthesis -> Communication.

This model is used throughout all the elements of the RIBA Plan of Work. The main Plan of Work is a robust and extensive model. It has thirteen sections nominated A to M and is reproduced overpage as Table 1. This model has been adopted internationally with only minor alterations. Insofar as the RIBA is the longest established professional architectural body it has
always been in the forefront of practice. The Plan of Work model is important because it identifies the total process or at least a simplified serialist model of it. The full Plan of Work extends to one hundred and sixty two (162) pages (RIBA 1990) and has full descriptions of the work involved at each stage. As can be seen from Table 1, which is a short synopsis, it is most extensive and is what Walter Gropius (1936) refers to as 'The Scope of Total Architecture'. The work stages below have the author's analysis adjacent to them, as they are the elements of the plan most relevant to this research.

RIBA Plan of Work

A. Inception  
Discovery of what is actually required in terms of function, usage and value.

B. Feasibility  
Establishing the viability of the foregoing proceedings and establishing limiting criteria.

C. Sketch Design  
Producing a flexible actual copy from the brief and the restraints.

D. Scheme Design  
The "final" scheme for analysis by all interested parties.

E. Production Drawings  
From this stage on the tasks become mechanistic if not bureaucratic. While stages F,G,H,J,K,L and M, have both divergent and convergent element involved in them, the majority are convergent.

An abstract is shown overpage providing more detail. See Table 1

The Plan of Work is a representation of the 'total project' from the initial client concept through to the occupation of the building. The main area of interest to this research are the first four sections shown above these are the design sections A to D. Yet these four sections are largely determined by the individuals working on the project.

This plan of work model, or parts of it, is reflected in most of the following product models investigated in this section. However while all these models attempt to be "a complete view" of what each author believes the nature of architecture to be, most are serialist in structure which by their very nature negate an holistic understanding. In the context of this research the following analysis is necessary in order to establish an acceptable universal model of the design process; in order that the importance of the aesthetic formulations of the design can be identified and abstracted. Perhaps the simplest model was that produced by Sir Henry Wooton (1630) when he paraphrased Vitruvius (AD70) by stating that architecture must have: (Diagram 3 on page 42 identifies Wootton model).
<table>
<thead>
<tr>
<th>Stage</th>
<th>Purpose of work and Decisions to be reached</th>
<th>Tasks to be done</th>
<th>People directly involved</th>
<th>Usual Terminology</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Inception</td>
<td>To prepare general outline of requirements and plan future action.</td>
<td>Set up client organisation for briefing. Consider requirements, appoint architect.</td>
<td>All client interests, architect.</td>
<td>Briefing</td>
</tr>
<tr>
<td>B. Feasibility</td>
<td>To provide the client with an appraisal and recommendation in order that he may determine the form in which the project is to proceed, ensuring that it is feasible, functionally, technically and financially.</td>
<td>Carry out studies of user requirements, site conditions, planning, design, and cost, etc., as necessary to reach decisions.</td>
<td>Clients’ representatives, architects, engineers, and QS according to nature of project.</td>
<td></td>
</tr>
<tr>
<td>C. Outline Proposals</td>
<td>To determine general approach to layout, design and construction in order to obtain authoritative approval of the client on the outline proposals and accompanying report.</td>
<td>Develop the brief further. Carry out studies on user requirements, technical problems, planning, design and costs, as necessary to reach decisions.</td>
<td>All client interests, architects, engineers, QS and specialists as required.</td>
<td>Sketch Plans</td>
</tr>
<tr>
<td>D. Scheme Design</td>
<td>To complete the brief and decide on particular proposals, including planning arrangement, appearance, constructional method, outline specification, and cost, and to obtain all approvals.</td>
<td>Final development of the brief, full design of the project by architect, preliminary design by engineers, preparation of cost plan and full explanatory report. Submission of proposals for all approvals.</td>
<td>All client interests, architects, engineers, QS and specialists and all statutory and other approving authorities.</td>
<td></td>
</tr>
<tr>
<td>E. Detail Design</td>
<td>To obtain final decision on every matter related to design, specification, construction and cost.</td>
<td>Full design of every part and component of the building by collaboration of all concerned. Complete cost checking of designs.</td>
<td>Architects, QS, engineers and specialists, contractor (if appointed).</td>
<td>Working Drawings</td>
</tr>
<tr>
<td>F. Production Information</td>
<td>To prepare production information and make final detailed decisions to carry out work.</td>
<td>Preparation of final production information i.e. drawings, schedules and specifications.</td>
<td>Architects, engineers and specialists, contractor (if appointed).</td>
<td></td>
</tr>
<tr>
<td>G. Bills of Quantities</td>
<td>To prepare and complete all information and arrangements for obtaining tender.</td>
<td>Preparation of Bills of Quantities and tender documents.</td>
<td>Architects, QS, contractor (if appointed).</td>
<td></td>
</tr>
<tr>
<td>J. Project Planning</td>
<td>To enable the contractor to programme the work in accordance with contract conditions, brief site inspectorate and make arrangements to commence work on site.</td>
<td>Action in accordance with The Management of Building Contracts* and Diagram 9</td>
<td>Contractor, sub-contractors.</td>
<td>Site Operations</td>
</tr>
<tr>
<td>K. Operations on Site</td>
<td>To follow plans through to practical completion of the building.</td>
<td>Action in accordance with The Management of Building Contracts* and Diagram 10</td>
<td>Architects, engineers, contractors, sub-contractors, QS, client.</td>
<td></td>
</tr>
<tr>
<td>L. Completion</td>
<td>To hand over the building to the client for occupation, remedy any defects, settle the final account, and complete all work in accordance with the contract.</td>
<td>Action in accordance with The Management of Building Contracts* and Diagram 11</td>
<td>Architects, engineers, contractor QS, client.</td>
<td></td>
</tr>
<tr>
<td>M. Feed-Back</td>
<td>To analyse the management, construction and performance of the project.</td>
<td>Analysis of job records, inspections of completed building, studies of building in use.</td>
<td>Architect, engineers, QS contractor, client.</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 RIBA Plan of Work.
Wooton's Model (continued)

Commodity: The spatial arrangement and the suitability for task.
Firmness: The building fabric, structural environmentally healthy and suitable ergonomics to fulfil the task.
Delight: That ephemeral aesthetic which produces joy from both internal and external aspect.

Diagram 3  Sir Henry Wooton's Model (1630)

He added that if any one of these three elements were missing, the building would certainly not be architecture. In our current pluralist society, it is often argued by individuals and groups that the "delight" factor is omitted. Certainly when most building designers work today, they are often more concerned to incorporate 'commodity' and 'firmness' because 'commodity' for the task for which the building is required is demanded and paid for by the client. McLaughlin (1962) identifies that buildings are never built for their own worth, but rather as a symbiotic box for the production of something be it a product, service or living environment, ie.
buildings are not sculptures. 'Firmness' is demanded by the whole of the building legislation, in the sense of structural, safety and health standards. It needs to be reiterated that the majority of buildings are not built for their own exclusive sake. For this reason designers often place the process for which the building is required at the forefront of their design hierarchy. This is acceptable if the 'delight' element is also considered and integrated into the solution.

Delight can often be an accidental by-product and is seldom specifically demanded by a client, yet many people fear that it should be fundamental to the building designer. It is the designer who can breathe the spark of like into buildings, and so create "delight". This phenomenon ie. the difference between ordinary building (stages A and B) and architecture (stages A, B and C) is what an architect/building designer must be capable of producing. The architectural historian Pevsner (1943) states that:

"Nearly everything that encloses space on a scale sufficient for a human being to move in, is a building; the term architecture applies only to buildings designed with a view to aesthetic appeal". Page 15

It follows therefore that their education must encompass this aesthetic element.

2.1.3 : ARCHITECTURAL PROCESS MODELS.

In consideration of the design product it is important to understand that one of the major influences on building form is the nature of the technology available with an awareness of the structural alternatives, the current and available materials and their usage. These technologies will vary not only between climatic zones, (ie. building design technology in Lapland is different from that in the Sahara) but they can determine distinctly different building envelopes and consequently their appearance. They can also dictate the plan form and sections. All these influences will shape the final problem solving matrix.

David Oakley's (1967) model suggest that there is a hierarchy of design criteria which leads the observer or the designer to develop "architecture" as distinct from building. Oakley terms it Architectural Intention and has arranged it as follows: (in decreasing order of importance).

1. Well and aptly built
2. Safe and Stable Building Fabric
3. People and Equipment protected Human Needs
4. Activity housed Cultural
5. Social Human Purposes
He further suggests that elements 1-4 should be determined by formal aesthetics and the final two elements are determined by the aesthetics of 'Emotion'. He also proposes that the building designer can: “step up and off at any level he chooses”, but he suggests “it is disputable whether architecture begins until level 4 is reached”. The author would agree that the essence of this model is valid but would argue that the six points are interdependent and not that it is the architect’s purpose to provide the aesthetics of their emotions regarding the project, integrated with the formal aesthetic and practical aspects in an interpretative role. This is what creative design ability is all about and begins to be part of the realm of microgenetics.

2.1.3.1. COMPUTERS AND PRODUCT MODELLING

John Weeks, (Personal Communication 1985) has stated that the computer had enhanced the design layouts for his most recent hospital schemes to the level where he had chosen the seventh computer generated scheme from a series of 9 Computer Aided Design (C.A.D.) schemes. Weeks noted that before the introduction of the computer he would never have achieved seven design options since it would have been impossible in terms of both time commitment and economic viability. CAD has eased the burden of the building designer in relation to their previous role of building planner, thus easing their responsibility in this area. However it is clear that the overseeing and the final decisions on planning in large schemes will remain within the architect’s domain for some considerable time. This is as it should be, as it is the sense of space, both the real and the imagined interaction of spaces which is the creative essence of the architects’ service. The grand state rooms and parlours of previous ages are a reminder of this. However the role has changed and the current design model, as mentioned before, has a greater requirement for the provision of the processes for which the building was developed. This, allied to the demand for cost restraint and control, inexorably means that the computer will be essential over the next few years to provide a large proportion of the planning, as distinct from the aesthetic element. At the 1983 conference of Computers in Architecture, Paul Nicholson stated:

"Computers can provide the tools for both quantitative and qualitative analysis. Moreover, they can be used at the early design stage where the decision made about a scheme are usually the most significant (see). Computer modelling allows the design team to set up a geometric model building using various input techniques; a three dimensional model can be viewed in two (2) dimensions. Architectural design must be an empirical skill as a studied skill since we only really learn about the problems by doing, testing analyzing and doing again. The computer provides such modelling and evaluation in quantitative terms can produce many more models in the same space of time as the average architect could produce one” (page 181)

Interestingly he also states:

"... that they (computers) are not a crutch to prop up an architect’s lack of creativity but is an economic aid to design”. (Page 185).
At the same conference David Compton noted:

"...that the use by qualified architects for computer aided draughting enables them as designers to take decisions which speed up the design process". (Page 78).

Many other speakers recounted similar practice opportunities but all were keen to state that you generally only got out what you put in, and that in aesthetic design it might be possible to develop a theory which suggests that the computer could work in similar and particular ways to that of the human brain. Garnham (1986) develops the idea that the brain and computers are parallel machines. He suggests that information is stored (memory, language, spatial interpretation, creativity etc.) as a series of associations or connections between "neuron like" elements. This approach is termed connectionism. Boden (1990) states that some of these models assume local information networks in a part of the brain, with other networks linking between different areas. 'Connectionists' refer to the linear symbolism of the SI and other cognitive models as being too straight jacketed. They would suggest that in the context of any research is psychology, it is important to recognize and to differentiate between both symbolic and subsymbolic cerebral activity. Clearly, the classical psychological cognitive model explains large elements of such differentiated activity, through the symbolic, that is to say defined cognitive models (eg. S.I. etc.) are extensive and are believed to have both substance and 'elegance'. Connectionist theory is still developing and it may be some years until such 'elegant' models are produced to explain the "holistic flexible" process of cerebral activity. As the term itself identifies, in the area of creativity any analysis must also use what are termed (paralleling Kaos theory) the unregistered or unexpected connections. This is what is termed a "spreading activation model" and this for example can relate to the neurophysiology; cognate and subliminal activities allied to sociocultural values prevalent at the time. Connectionist models are useful in the context of holistic operation and perhaps in the identification (in the negative sense) of those areas not otherwise accounted for, such as genius, mathematical, musical or artistic giftedness. However at the time of writing (1996) these are models only, and as Rollins (1989) notes, they will be for years to come (p92). This does allow this research at this moment of time to place computer aspects of significance of design giftedness to the periphery of the report.

2.1.4 PERSONALISED ARCHITECTURAL MODELS

In the context of this research it may be useful to establish what are the criteria or the recommended guidelines in use, which if adhered to it is hoped that good architectural design will result. This may also afford the opportunity to discover if there is evidence currently available relating to a designers design ability, creativity or giftedness in any of these models and if there is to distil from them how, why or what effects it may have.
The computer has been a major asset to the building designer in that it has relieved him of many repetitive and mundane tasks at which he has previously had to labour. However, because of the typical form of most models there is considerable danger of producing a fragmentation of the tasks of the design role. This move towards thematic specialisation is perhaps dangerous, as it could lead to a view of design as a series of separate tasks which, when taken sequentially, each sequence executed properly, will produce a good design. Foster (1987) states that this is not the case. It may produce a workable solution but the design quality may be poor, such a design list was produced by HRH Prince Charles with some ten elements.

The Prince of Wales Product Model

The Prince of Wales Model for successful design is:

1. **The Place:**
   "Don't rape the landscape". Take care of the land and be sensitive to its needs.

2. **Hierarchy**
   "If a building can't express itself how can we understand it". Buildings should be understood by everyone.

3. **Scale**
   "Less might be more; too much is not enough. Buildings should not dominate their colleagues, neither should they be dominated by them.

4. **Harmony**
   "Sing with the choir not against it". Buildings should compliment their surroundings not smother, destroy or denigrate them.

5. **Enclosure**
   Give us somewhere for the children to play and let the wind play somewhere else". Security and comfort are the necessity of building envelope.

6. **Materials**
   "Let where it be dictate what its made of".

7. **Decoration**
   "A bare outline won't do, give us the details". People enjoy the visual stimulation of interesting form, great or small

8. **Art**
   "Michelangelo accepted very few commissions for a freestanding abstract sculpture in the forecourt". Architecture is the mother of the arts and as such should embrace all other arts, naturally.

9. **Signs and lights**
   "Don't make rude signs in public places". Such objects should not dominate or be the only noticeable thing about a building.
10. **Community**

Let the people who will have to live with what you build guide your hand.

This rather fragmented model as presented by HRH Prince of Wales is very general in nature and is therefore somewhat simplistic. It fails totally to reflect the age of high technology. It appears to deal with some form of design appropriateness related to a small scale historic village model rather than the late 20th century.

Many of the points from this model hark back to Vitruvius and Palladio without any reference to eurhythmy or being design able. However their referencing to previous understood parameters could produce a "straight jacketing" for creative building design in terms of style and manner. Neither is the concept of commercial development covered, discussed or understood. This model provides a set of rules for design which the author believes would stifle innovation and inspirational design.

There are product models which will allow for greater flexibility and therefore provide for creativity. This research will identify some, though it should be stated that all models are open to interpretations and adjustments. Indeed they can also be misinterpreted. Oakley in his model appears to suggest that designers at least need a divergent approach to the task. He notes that in order to work through any model the aspirant designer must have certain abilities, these he believes to be:

1. The ability to comprehend the total problem context; architecture is "a phenomenon in a context".
2. The methodical ordering of design activity and decision taking; ie design work.
3. The ability to recognize a problem-structure, to handle ideas and concepts and to use design technology; design skill.
4. The ability to develop a creative imagination: being able to bring into being organising schemes in which spatial idea, building structure, aesthetic structure etc., be welded together into a unified space/form which embodies many levels of architectural intention.
5. The ability to realise a design: to know how a building is going to be made.

Point 4 is of importance, in that in the statement “developing a creative imagination” he is not suggesting that this can be done from scratch but rather that there is creative intelligence there to begin with. From all five points it is clear that he requires intelligent (organisational), divergent (high spatial conceptualisation) and creative (imagination) individuals.
Pye (1964) follows a similar tack. Like Oakley he suggests a process model rather than a prescriptive one. Pye suggests a much more divergent approach to problem solving. Pye suggests that the following process should be involved in producing an architectural product of worth.

1. **Context is established:** the design environment is analyzed and broad criteria of judgement laid down.

2. **The problem is recognised:** needs are established; a detailed design program is drawn up with clients or their representatives; necessary designed information is assembled and gaps in data filled through survey, investigation or inspired guesswork. Purpose in the building is clarified in relation to immediate use and future need and the activities it is to serve; the individual and his needs; the built environment as a whole; costs limits and building economy. Standard performance and detailed criteria are drawn up.

3. **Investigation and analysis:** the architect thinks "what he is doing", pursues various modes of thought in his attack upon the problem; identifies strategic issues of circulation, structure, use, etc., concerning which decisions (even if provisional) have to be taken if a space/form is to be conceived. Problems/data/means/economic limits/design technology merge into one stream of thought.

4. **Synthesis:** the architect's creative organization of the space/form after testing alternatives; the holistic marriage of plan, section, circulation and space/structure/form with higher intention.

5. **Evaluation, refinement and detail:** consistency in the design is ensured; detail reinforces total conception; criteria stemming from (1) and (2) above are met.

Indeed the Pye model attempts an holistic process model and his references to judgement synthesis and inspiration, though reflecting Oakley, do not directly call upon the architect to have design ability although his text presumes that it be the case.

Design models are not only developed for building design; in other fields of creative production there are almost an infinite variety of problems and problem contexts. To cover these multiple areas, product design engineering design commercial design etc. etc. other models have been developed; one such has been produced by Asimow (1962) as follows:

1. **Recognition** of a particular human need which has to be satisfied in a particular
context; social, cultural and economic.

2. **Diagnosis** corresponds to that particular combination of knowledge, investigation and creativeness that goes into developing the statement of the architectural problem and delineating its category: i.e. closed; one-off; open-ended or serial, and/or their combinations.

3. **Prescribing** corresponds to the preparation of the architectural strategy; part solving sub-problems within the main problem; the preparation of preliminary designs and their testing by criteria, and the offering to the client of the tactical plan for construct the proposed solution.

4. **Dispensing** involves the preparation of the final design and the super-intending of its erection.

5. **Assessment** means that the designer should study how his design functions in use (and is it being asked to perform functions it has not been designed to meet?). It is upon assessment that improvement in diagnosis and prescription depend.

Whilst illuminating in some respects, Asimow’s model is readily seen to be rigid and not easily adaptable to expressing in literary form the nature of the personal, instinctive design process searched for here. It is for this aspect of the designer as being a possibly instinctive, responsible creator that this thesis is searching.

Alexander, (1964) produces the proposition that building design is analytical in nature, and analysis generates problems requiring resolutions. He states that the solution may be a reflection of the inner self and the individual’s drives. The idea of creative building design being the resultant accumulation of many multifarious and diverse aspects is echoed by Collins (1970).

"Architectural thought is built upon ideas taken from many disciplines but there are some central ideas that can be described as being architectural and these revolve in the main around the themes of coherent organization of space for human activity and the meaning of that space and its enclosing forms for its users and for society as a whole. Such ideas that are current in our time tend to belong to one or other of the three strands that makes up the warp of architecture (commodity, firmness and delight - author's input). It is this aspect of delight which most often is suspect, and the delight of buildings is experienced by the massing of the building envelope and the internal spaces and manipulated form". (Page 172)

In the nature of this research such expositions are important as they provide an indication that the complexity of the possible models are as multifarious and diverse as the authors...
involved. Another interesting exposition of this is by Marcel Breuer: (1956)

"Space is not plastic, static, positive, projecting. It is hollow, negative, retiring. It is never complete and finite. It is in motion, connected to the next space and to the next and to the infinite space. It is materially defined by slab of masonry or wood or what have you, by structural frames, by dome or by sheet of glass. But defined only, not isolated".

"It may be given certain qualities by these defining elements depending upon whether they are of concrete or glass, or metal or brick, of this colour or that texture. And the quality of these defining elements is in turn, dictated by practical needs".

"At the rate at which we move our impressions are quicker, our impressions come in greater units than they ever did before: the scale has changed, we see in larger scale. And this is not true of architecture alone: it is true of our interpretation of history, it is true of our interpretation of the whole universe. A building that has fewer independent details will fit more easily into this find of space-continuity than a building of infinite individuality". (Page 27)

This exposition is a typical example of the many authors, both distinguished and pedestrian who have attempted to grasp and describe the experience of qualitative space and to describe the creative spatial interaction of form with the human experience. Breuer also indicates the divergency of the task and the designer interpretative role.

2.1.5 : DESIGN AS PROBLEM SOLVING

Many authors, including Landau (1965), Norberg-schulz (1963) and Balcombe (1964) have described a more basic process model. All have stated that the process of building design is one of problem solving. Not every architect adopts this initial approach (Roe 1985). According to Landau (1965):

"Some architects on taking a brief do not recognize the existence of a problem to be solved, but merely identify a building type that is wanted, ignoring the problem as such, they draw up a slightly amended version of a building already know to them, and offer a sketch to his client, yet others are not aware of a problem situation existing to which they have to bring anything. They collect facts, analyze, select a technological system, sort out the analyses and build this". (Page 82).
"Problems are solved within a framework of theory and tradition. These pattern the architects thinking in similar ways since both allow predictions to be made of the results of taking certain design decisions. In building, tradition represents the carrying out of constructional tasks within the framework of well proved precedent. Development and improvement takes place but not innovation. Tradition in architecture is something quite different. The tradition in architecture has been to solve the problem to the limits of the technological possibilities and theoretical knowledge. In the study of actual works these two traditions are inevitably seen to interlock and this causes confusion in interpretation and in reaction" (Page 86)

These authors suggest that much design is seen as a problem solving matrix as against the other concept of it as a "spontaneous outburst of creativity". Building design, when written about by many architects is seen as fundamentally different to fine art to which it is often allied, art being more spontaneous and passionate. However is the moment where the architect "sees" the conceptualised building in his mind and perhaps begins to sketch it out any different to that point when the fine artist or musician conceives of his or her masterwork, Rollins (1989) and Dacey (1990) believe not. What is different is the crafts and technologies which follow in order to execute the task. Building design is often described as essentially a response to a series of questions and problems, related to space circulation and usage. Yet as the previous authors have described, an analysis of elements part by part will not necessarily produce aesthetic buildings, often quite the contrary. The building designer must consider many other influences and demands before executing action. Smith and Carlsson (1985) suggest that the fine artist has no such parameters. His spontaneous creativity is only bounded by the strictures of his own resources, whereas the building designer creates within strict boundaries. That the architectural process is often described as a problem solving matrix; is agreed by many writers. This researcher would suggest that the building process is certainly a problem solving matrix but that the first four design stages are only problem solving in part.

Robert Wehrli (1986) describes the design process:

> Design may be thought of as a series of decisions each resolving early questions raised and instructing the designer in the making of future decisions".

Wehrli submits that the problem solving matrix is also a hierarchy of information gathering analysis and decision making. It is similar to the universal (or RIBA) model noted earlier and in some characteristics parallels the Department of Education and Sciences APU study on 'Design and Technology Activity' which is also prescriptive in nature.

Wehrli also notes that there is a considerable disparity between the weighting of importance between "early and later decisions in the process":

> "Decisions do not have the same importance throughout the design process. Instead early decisions tend to be far more crucial than later ones, because early
decisions control and shape those that follow. In other words early constraints place strict limitations on the scope of coverage that later constraints might have”.

"The cost of a wrong decision is quite high at the feasibility, architectural programming and schematic phases because the consideration are so far reaching.”  

(P33)

"In the later design phases, decisions are lesser in scope and have less potential for catastrophe.”  

(P40)

He further continues:

"Because of the implications of early decisions, it is important that the designer has clarity of vision and can obtain high quality information through research in the early feasibility, architectural programming and schematic design phases".  

(P41)

What does he mean “clarity of vision”? Like so many authors who allude to such concepts he provides no explanation for them but it is yet another example of an assumed understanding of the psychology involved.

A prominent researcher into the design process is Herbert Simon and in his opus 'The Sciences of the Artificial' (1981), he like Wehrli was concerned about the failure of design generally in the sciences and the arts (commerce) to conserve or usefully utilize resources. He developed several useful models. However it should also be noted that unlike many of the previously presented models Simon's are heavily weighted for cost, whether actual or via cost benefit analysis, which while certainly enabling a final product, tend to give little resource accounting for creativity. Indeed, much of Simon's work attempts to use mathematical models, for example, in administration taking production controls and applying them to a social situation possibly where conflicts of loyalties operate between groups. Statistics are useful as a basic modelling tool but are often clumsy and, according to Sudman and Bradburn(1983) can be wrongly used and interpreted when applied to areas such as 'aesthetics and ephemera. Simon's description of the "Design Task" is useful, as it engenders many of the establishments' views on the subject and his attempt at formalising the process has created a platform for considerable discourse in the subject.

However Simon recognises the separateness of design and rationalisation and begins to try and identify the complexity of the process. He notes that any or all of the information gathered has to be regarded as approximate, using that famous Simon term "Satisficing" rather than exacting, and using the engineer's analogy with "figures of merit" rather that specific minima and maxima for any situation. However Simon's approach to the full model could be flawed. It may be because Simon and many other modellers are observers of the process and the end product of the creative act, rather than actual innovators or
designers themselves. A shortened version of his models basic three principle foundations are:

(1) Design problems cannot be comprehensively stated.
(2) Design problems require subjective interpretation.
(3) Design problems tend to be organised hierarchically.

Roger Scruton (1979) observed:

"Contemporary architects often speak of 'design problems' and design solutions and in that notion of design is encapsulated as a rule, the attempt either to banish aesthetic considerations entirely or else to treat them simply as one among a set of problems to be solved either wholly or partially in the derivation of some ideal or optional design" (p78)

Drawing upon the review of the foregoing issues in modelling and building upon these frameworks, the author would suggest the sequences of the design process as follows:

1. Against a background of data concerning human beings (sociology, demography, etc.) and physical environment (climate geology and geography, etc.).

2. A particular design problem is stated in detail.

3. To this problem the architect brings a particular psycho-philosophical framework: a matrix of experiences, hopes and fears derived from genetic, personal, religious, cultural and economic "insights". Together these insights add up to a particular view of his place in the role of things and his or her creativity factors. In other words the designer bring his sense of 'self'.

4. From this "self", ideas, concepts and principles relating the architect, to his environment, and particularly to the built environment, are formulated related to their abilities, consciously and subconsciously.

5. From analysis comes synthesis and then critical evaluation. The synthesis includes the welding of the data of a particular design problem to personal psycho-social and cultural principles, environmental objectives and technological possibilities and to their integration and realization in the solution. Is may be clear that this synthesis is not totally conscious.

6. The overall design is then developed around these principles or schemes which then materialize as a building type a building system or a plan, the design quality being related to the individuals creativity quotient.

7. Within the overall design objective set by the individual, detailed proposals are prepared in the light of available resources to achieve the integration of people and environment; activity and economy at an efficient level which must include a personalised sense of aesthetics.

8. It is the understanding and absorption of the foregoing allied to how they are followed, that determines a work of architecture. How is a reflection of the inner life and capabilities of the individual designer. It is within his mind that rational, humanistic concerns and visual acuity have to blend, before they unify to produce aesthetic sympathy.
The above criteria suggests various rules or ideas to guide designers towards the end solution of producing well designed buildings. However it is the case that all the elements of all such models can still be abstracted into the person orientated approach two human aspects and these are:

1. The external factors. 2. The internal factors.

This mirrors Hertzberg's (1966). Adam and Abraham concept, (this is discussed more fully in the next section) and in the built environment these factors can produce the following:

The external factors:

A. The clients, their natures and characters, their building needs, the cities building needs and aesthetic impact, the process for resolving these sometimes conflicting elements.
B. The nature of the building and its location, the safety and protection afforded by the building. The ergonomics and working environments of the enclosure.
C. The understanding of how the physical material of the building works together, i.e. the structure, components and the finishes.
D. The total community reaction to the working building.

Secondly the 'internal' aspects of the designers approach.
E. The Designer, the calibre, integrity and outlook of the designer.
   The individuals interpretation of the brief through theory and tradition, their ability to organize ideas and solve problems, allied to an innate sense of 'buildability' and intellectual conceptualisation.

It is this final section E that must now be developed to investigate the possible alternatives of individual development. The absolute potential of an architect is naturally limited by their own inherited genetic makeup and their learned or cultural skills, the level to which these combine determine how the individual will aspire and perform. They probably also set the individuals own ceiling of abilities.

2.1.6 SHORT SUMMARY.

In this first section the multiple aspects of reductionist modelling have been exhibited. The design process was broken down into what the majority of authors believe is a recipe for the delivery of architecture (as distinct from building). None of those authors quoted, or for that matter read elsewhere seem not to need to explain how good design is achieved. It appears to be assumed that the model when used by an architect should be sufficient; the good or bad interpretation of it, is not mentioned. That design is seen as a problem solving
matrix is continually refer to, though the holistic concept of total design is never referenced. In all, this section proved unsatisfactory as reductionism even in the simplest form always fails to describe particular phenomena and in particular the creation of great architecture.

2.2.1 : WHAT IS CREATIVE DESIGN ANYWAY?

This is a particularly contentious issue particularly when related to aesthetics Broad opinion frequently has little rational structure or analysis, though it often has consensus. As in art, aesthetics is often only a matter of personal opinion. Few authors have successfully produced universal process evaluation models let alone an applauded single aspect project model. As we have already noted one who has tried is H.A. Simon though regrettably much of his analysis of design evaluation tends to be mechanistic in nature, i.e. related to the physical, the mechanical or to task 'appropriateness'. However his work in evaluation is worth recording as it does provide the basis of an approach.

Simon (1981), in his discussion on the science of design, describes the typical representation for this process as the "meansend" model. He sees it mainly as a problem solving matrix. His analysis and evaluation of the design model produced the following components.

1. Theory of evaluation: utility theory and statistical decision theory.
2. Computational methods.
   a) For choosing optimal alternatives such as linear programming, computations control theory dynamic programming
   b) Alogrothims and heuristics for choosing satisfactory alternatives.
3. The formal logic of design: and declarative logic.
5. Allocation of resources for search.
6. Theory of structure and design organization: hierarchic systems and weightings.
7. Representation of design problems.

The problem with the above and all the Simon models is that they require weighting for particular hierarchical successes. It is the essence of it, that in mechanistic situations or environments products either work or they do not, or they work with varying degrees of difficulty. Plan forms of buildings can be assessed in this manner, though without experience sections through buildings can be less easily assessed. The aesthetics of massing and elevational treatment is very difficult. Creativity is not usually thought to be mathematically exact nor can it be consistently created by scientific formulation, innovation or the 'shock of the new' may not have a scale or a formulae by which it can be recognised.
Particularly before 1939 the search for creativity was actively pursued, by the search for the "inventive". Researching these earlier investigators uncovered most of the ideas of the later management writers, Hatfield (1938) was referencing (without doing so) JB. Montmasson's earlier text (1927) which, Hatfield had translated in 1931, where Montmasson had suggested that:

"Invention is unavailable without the ease of access to the daily bread of life".

Hatfield’s invention environment model as disclosed in his chapter on the 'Practice of Invention' parallels Simon's context model. It is a useful speculation that creativity may be the aspect of a mind or thinking process which is continually searching for innovative or creative activities or solutions. Again incubation and enlightenment has some relevance here.

Another aspect of design creativity that is worth noting is 'lorality'; the human condition relating to the cultural “norms” instilled by living in a particular society It can ensure, or demand that many people recognize what is "right" and what is wrong. However it is never straightforward. Sorokin (1952) analyzed the social choices available to all of us and he determined that society offered three basic formulations.

1. Ideational - a God or other Deity centred society - (medieval Europe, Saudi Arabia.)
2. Sensate - A society based on materialism and consumption; (Manhattan, Hong Kong).
3. Idealistic - Society with a mixture of the first two probably biased one way or the other. (Nazi Germany, Leninist Russia).

Sorokin identifies that within any of the above social models everything is viewed from a particular viewpoint, art, religion, history everything even the weather! Creativity most certainly falls within the parameters of this cultural network. Sorokin does not recognize universally accepted truths, they are truths only for this or that sliver of time and as long as they have expediency for those cultures concerned. In the Sorokin model creativity and creative people can be identified as mercurial and often tangential to the culture they serve. Gardiner (1987) suggests it is also generally thought that architecture reflects its time and probably architectural creativity models have no universal use in determining what right or wrong in a particular time and place, i.e. each model needs adapting for its own time. In order to further the research into personal design creativity it is important to determine and understand what design is or may be, in order to establish where creativity fits in or if it does not.
2.2.2. DEFINITION OF DESIGN

What is design? 'Design' has been termed by Tony Bussan (1986) as a "trigger word". It can mean almost anything. It is polymorphic in nature and can be, and is, used in many contexts. It can therefore create considerable uncertainty across the communities where "design" is practised. In order to try to harmonise the concept of design in the various professions, Professor Bruce Archer (1979) at the Royal College of Art, endeavoured to analyze the phenomenon of design, he attempted to formulate a common language in the field. This definition has ten sections.

1. Design Technology: The study of the phenomena to be taken into account.

2. Design Praxiology: The study of design techniques, skills and judgement applied to a given area.

3. Design Language: The study of the vocabulary, syntax and media for recording, devising, assessing, and expressing design ideas in a given area.

4. Design Taxonomy: The study of the classification of design phenomena and aesthetic values.

5. Design Metrology: The study of the measurement of design phenomena with special emphasis on the means for ordering or comparing non qualifiable phenomena.

6. Design Axiology: The study of goodness or value in design phenomena with special regard to the relations between technical, economic, moral and aesthetic values.

7. Design Philosophy: The study of the language of discourse on moral principles in design.


9. Design History: The study of what is the case and how things came to be the way they are, in the design area.

10. Design Pedagogy: The study of the principles and practice of education in the design area.

Table 2. Archers Design Analysis

The above analysis provides a basis for this research. The primary interest areas and the most difficult to assess from the model are: Design Epistemology and Axiology, Secondary
areas are Design Metrology, Pedagogy Taxonomy and Praxiology and finally the tertiary subjects of Design History and Philosophy. The aphorism that "necessity is the mother of invention" indicates that man has always been in a situation where he has had to invent solutions to particular problems. This inventiveness is akin to a design task. Bruce Archer stated in 'Philosophy for Design':

"That there exists an under recognised but definable third area of human knowing additional to numeracy and literacy which we might colloquially call wroughting and wrighting. By wroughting what is meant is knowing how things are brought about and wrighting means knowing how to do it".

He further goes on to discuss how this "wroughting and wrighting" is an element of the instinctive inventiveness of mankind and the current usage of the known designer is the modern inheritor of these innate abilities.

It is interesting that Archer produced such a reductionist model of design, as it is the experience of many studio tutors that students do tend to design in particular modes. Some may design using technology as the prime mover, "the high-tech school". Others with historical referencing, the classicist school; others in the philosophical mode "alternative architecture" or as alternative technologists. Some students also portray a crypto fascist/Stalinist style. Then there are the "eclectics" who use any idea or element they feel like using, in order they believe, to enhance their design. It may also be possible that individuals, when they perceive or reflect buildings, are identifying their own specific, if subconscious, pleasing or antagonistic interest in the fabric before them. This supposition will be developed later in this paper.

2.2.3 ASSESSMENT MODELS

In the context of this research the need to review design models was necessary, if only to identify their limitations. Most of the models referred to in the section have been used consistently as guiding tools for would be designers to produce what their authors deem to be correct solutions for their particular design problem. None of them address the issue of concern to the author, which is that for any of the models really to work, according to Wooton, the designer must be able to instill a degree of "Delight". This is excluded from them all, the designers it is assumed are already talented.

It is Roe’s (1952) view that a key to the understanding of how the individual designer used the total process models in the design mode, is that it must be the designers ability to be
able to grasp the holistic nature of the model, and instinctively "burst forth" with the design. This can then be tailored to the legislative requirements for safety and health. Or as she notes, more appropriately, the designer hopes the legislation can be tailored to fit the building.

As Henry Wooton pointed out, all buildings which aspire to be architecture must have 'Commodity Firmness and Delight'. Most of the models covered in this section of the research can easily provide the Commodity and Firmness, that will produce a practical building. However for architecture there must be delight and it is the "Delight" factor that concerns this research and the search for those who can produce it.

Assessing Design

So how is creativity or creative achievement identified? Again creativity seems to fall into its separate packages, Personal, product, process, situationalist and historical. We have seen product models and their structures. The problem of regularising and quantifying creative achievement has always been in objective terms, very difficult to assess, Besemr and O'Quin (1986) produced a Creative Product Analysis Matrix (CPAM) the major components of this model are:

A. Novelty (newness of product, process materials, utility etc.)
B. Resolution (functionality, usefulness, safety etc.)
C. Synthesis (the cultural utility of the produce process etc.)

This tripartite division does not fit exactly with the designations made by Henry Wooton (1630) but it continues the tradition. Problems arise in establishing weightings for particular forms of creativity, if the requirement is technical rather than aesthetic creativity then definitions need to be made at an early stage. This research is concerned with design talent and its identification. Simonton, Barron (1988) and Dacey (1990) confirm that creativity is something that is mutually or generally agreed upon. Dacey's situationalism is of direct importance ie, time, product and process.

2.2.3.1 SHORT SUMMARY OF PART 2

From the foregoing it is the author's opinion that the most important creative element of design, i.e. the concept of the 'revelation' of the optimum solution is possibly produced during the synthesis stage of the process. If that is the case, it may be useful to discover what the area of psychology may have to offer by way of explanation for this phenomenon.
In the next section the research will begin with an exploration of the possible “heritability factors” and elements involved which may effect the inherited abilities of the individual followed by a review of the positions adopted by various relevant eminent psychologists and schools of psychology.

2.3 : AESTHETICS IN DELIGHT

2.3.1 : THE SEARCH FOR DELIGHT

In this research the author is trying to identify how design talent is recognised. Several product models that assume a complete product have been surveyed. A review of some methods of consensus and institutionalised methods of agreeing what good design or creativity may be were also researched. But does this produce creativity in the sense of fine architecture as distinct from buildings? Those models we have discussed are all in operation now and have been for many years. It may be worth examining the historical aspect of creativity in architectural design.

Design Methodology

It is therefore important at this stage to provide an analysis of the various modes of design methodology. This is concerned with the design/build product models, described earlier, where design was specified as being the first four elements of a twelve element operation. In the previous section 2.2.2, Archer’s (1979) model of design was presented. In the context of this research the phenomena of design, epistemology and axiology are important. They both refer to the phenomenon of ‘knowing’ that the process involvement or resultant product is right. They also suggest that its ‘rightness’ or ‘wrongness’ may be recognised instinctively. This is ‘knowing’ that a design is good or bad, weak or strong or of high or low quality. The active words are ‘phenomenon’ and ‘knowing’. According to Trettinger (1980) both terms seem to defy analysis.

"Design contains enquiry and a kind of knowing which do not lend themselves to conventional scientific or speculative enquiry". (P.8)

Speculation of a personalised nature is both abundant and, as in criticism, rampant, and always has been. However the author does agree that a scientific analysis of specific forms of intellectual aesthetic instinctivism (while being a difficult area to chart) must be capable
of an element of analysis. Therefore at this stage of the research it may be prudent to analyze some of the basic concepts involved, such as inventiveness, innovation and creativity.

It is now important to establish how an individual begins to design, and in what processes they involve themselves. While physically most designers begin with a blank piece of paper, how do they approach the problem?

2.3.2. : HIERARCHY OF QUALITY

Henek (1953) produced an elemental model which was expanded by Potter (1980). The model goes some way towards identifying the sort of individual who would use particular elements of it. The five points below are from Potter's (1980) text.

1. **Innovative Design** originality in design.

2. **Inspired and Desperate**: based on extending the limit of design in a way that creates interest and beauty.

3. **Rational Selection**: design follows function, dominant factors may be anything other than aesthetic design.

4. **Slow Evolution and Traditional** Design through custom and evolution i.e. Greek to Roman, from thatched cottage to modern house.

5. **Plagiarism**: direct or even indirect copy of someone else's ideas.

Innovative design is very rare, occurring (as per Galtons 1889 model) in perhaps one or two individuals per generation. True innovators in other fields are often referred to as geniuses. Depending on the time, the culture and the human response, such genius was first analyzed by Galton (1889) though considerably earlier the term was applied to Plato, Newton, and Einstein. These can be defined as individuals who produced a new form of thinking that changed the working of society irrevocably. Can innovation be scaled? It could be argued that an innovation is a one off entity and all innovations are of equal value. However could a value judgement be placed on the different contributions made by the invention of a bottle cork or of atomic energy. If it could, the model would be very complex and its weightings, mechanisms and the degree of flexibility needed would be as Dacey (1990) states, almost “chimerical”.
2.3.3: HISTORICAL REFERENCES TO DELIGHT.

As stated previously creativity or innovation in itself is certainly part of the process but it is not sufficient on its own to provide lustrous buildings. What is important is that the building be imbued with that most difficult of commodities, to define namely, 'delight'.

In this search for delight, one of the earliest writers, Vitruvious, a Roman architect, continually refers, in discussing buildings, to perfection and to the beauty of parts. He also produced a total model, a tome titled "Seven Books of Architecture", written he said, to ensure that clients and uncultivated architects can produce good architecture. He states that this can be done by following his book of rules to the letter. It is similar in nature, but of greater depth and detail, to many of the 'full' models which were identified in the earlier sections. In the third of his 'fundamental principals of architecture' he refers to Eurhythmy, or the "beauty and fitness in the adjustments of the members". He does not particularise how this is achieved other than to claim that all parts must correspond symmetrically. It is interesting that various modern dictionaries define Eurhythmy, (current usage spelling), as proportion, rhythm and harmony in the proportions of a building; or regularity of the pulse, rhythmic order or movement, graceful proportion and carriage of the body; or harmonious proportion in architecture and a system of rhythmical bodily movements especially with the aid of music. Vitruvius associates 'delight' in buildings with proportion, harmony and rhythm. In his analysis of the education of budding architects he demands that an individual has a very broad range of interests and achievements. He states that;

"Architects should have experienced and mastered the physical skills of building. He should be equipped with the knowledge of many branches of study and varied kinds of learning both theoretical and practical. He must have the intellectual capacity to learn. He must be able to sketch to illustrate his ideas, he must be practical in the skills of geometry to draw plans. He should be able to use square level and plumbline to survey. He must understand optics in order to draw light into buildings. He must have a wide knowledge of history in order to understand form and ornamentation. He must be aware of philosophy in order to be high minded and not self assuming, he should be just honest and not be avaricious. He should be familiar with music so that he may have knowledge of hamonical and mathematical theory. He must know structure, he must know acoustics in order to design theatres for music and drama of which he must be familiar" and also;

"He must have a knowledge of the study of medicine on account of the question of climates, all the healthiness and unhealthiness of sites. He must know the laws of property and state". (Page 18).

However he notes that,
"For in the midst of all this great variety of subjects an individual cannot attain to perfection in each, because it is scarcely in his power to take in and comprehend the general theories of them". (P.19)

Vitruvius, writing some 1900 years ago notes in his text that a much earlier Greek architect writer, Pytheos (353 BC approx.) had made the following observation:

"An architect ought to be able to accomplish much more in all the arts and sciences than the men who, by their own particular kind of work and the practice of it have brought each a single subject to the highest perfection. (Page 122).

He, (Vitruvius) then notes "but this is a point not realised!". The author would suggest that there do seem to be similar parallels today, in the sense that there are so many varied elements within a building that any one individual would probably have great difficulty in fully understanding every part of it. These are the earliest and the clearest pointers to the roles of architects being generalists and not specialists.

Leone Battista Alberti in his writing "De re Aedificatoria" (1485) when referring to the beauty of buildings considered the beauty to emanate from 'the harmony of parts' fitted together with 'just reflection' in such a way that nothing could be added, diminished or altered for the worse.

It is the terms 'just reflection' which the author believes refers to that instinctivism of creative ability. Extensive research has brought no further expansion to "just reflection"

Was Alberti referring to the buildings or as Scumozzi (1615) called it, to that, "universal sense of beauty recognised by most men". Alberti (1485) recorded that:

"It is the property and business of design to appoint to the edifice and all its parts their proper places, determinate number, just proportion and beautiful order". (Page 28)

Alberti, refers to the sameness of buildings through the use of classical rules, but made

"entirely separate through the thought and imagination contrived by an ingenious artist!".

Other than this need for the 'ingenious artist' no further analysis is offered. It does however suggest that something other than mediocrity or an indifferent artist is required in order to fulfil the design task. Alberti calls for something extra in a designer, although he offers no definition of it and no formula to recognize it. However again and again throughout design history it has been recognised by those recording or attempting to teach others that, some form of specific 'talent' ability, aptitude, ableness or what you will is
required in order that buildings are taken out of their 'sameness'. They may then be imbued with "delight" and become architecture rather than just buildings.

By the seventeenth century in Europe some critics writers have argued that a kind of rigor mortis had set into design. Frischer Von Erlac (1721), required any form of architectural form and its intellectual description to be restricted to what he labelled, "the linear and corpus of the classic forms which must be without any tensions brought about by timorous individuality or interpretation". He was, like so many of that period including Carlo Fontana (1634-1714), Guarini (1624-1683) and of course Borromini (1599-1667) historical classicists, whom Tafuri (1980) labels "solidly super historical"! In 1755 the classicist and critic Ernst Winckelmann in his book the 'Reflections on the Imitation of Greek Art', which was an analysis of classical design, referred to beauty as;

"resembling the most limpid water drawn from a pure source which is all the better for being tasteless". (Page 63).

Wincklemann was referring to the scientific purity of mathematical symmetry and composition that could be achieved by studiously following the rules of composition as laid down by the ancients. He states that there is no place for human temperament in design, which Wincklemann believed would generally follow fashion and therefore be hollow and without any substance. Winckelmann was paraphrasing several of the standard classical texts, including Vencenzo Scamozzi and Giacomo Vignola, who were renowned as being among the most rigid, most conservative and turgid of the Renaissance writers on classical form.

However Winckelmann was popular throughout Europe and was writing for a large dilettante audience who had wealth but were frequently with little artistic ability. His philosophy of rigid copy book design was eminently suitable for such people, and this concept of how to achieve beauty had held sway for hundreds of years in Europe. As Clark (1976) recognises, it wasn't until the "Romantic Rebellion" in the late eighteenth century, that Winckelmann and his precursors' concepts of classical purity or rigidity were challenged.

Wincklemann's inclusion in this section is of the utmost importance, not only because of his recording that designers should not have inspirational qualities or a glimmer of talent, but because he and others like him became responsible for the concept that art and design could be produced by formulae rather than by inspiration. Winckleman was writing at the time of what Clark (1976) refers to as "a universal almost sheeplike taste for turgid neoclassicism" when money and the salon were the culture of the social elite. He suggests that by going on the Grand Tour you were guaranteed to have developed the taste, if not the ability, of an artist or an architect.
In essence this view held the belief that by following the rule books the designer could hardly go wrong. Fortunately the rule books were generally excellent and the master schemes of the dilettante were thankfully interpreted and reinterpreted by the builder or a consultant draftsman in an attractive way. Many of these earlier draftsmen and their offspring went on to become famous society architects.

So was all the architecture generated during this period (1500-1790) decadent? One could argue a case that it was though often the interpretations would suggest not. Thankfully the copybooks themselves contained the seeds for great architecture. Though much was, according to Hughes (1980) “without any intrinsic value, this period was more about extrinsic value.”

The Romantic Rebellion ended this movement although it did not finish it permanently and it appears still to be around in one form or another. Possibly the Winckelmann philosophy still abroad today i.e. you do not need talent to join this design school, do not worry, we will teach you how! Russell, (1945), Reich, (1972), and Tribe, (1975), agreed (in differing spheres of influence) that it is directed conservatism that is the norm for most cultures. Breaking with that cultural stereotyping is the most difficult thing for an individual to undertake.

Hughes (1980) refers to the classicism of the previous five hundred years as likened to a room in a museum, an historical space that can be entered, viewed but a space that we are no longer a part of. His view is that the machine age saw the end of prescriptive design. As Schorske (1981) notes, the thinking of the rigid classicists was:-

"The philosophy of mechanical copying which produced shallow imagery and vulgar form, much beloved by governments and banks. Form which conveyed no risk, no energy and most of all, no humanity". (Page 39).

Hegel (1975), writing in 1817 suggested that the death of the existing form of classical art was inevitable because it had to make room for a higher form of knowledge; he writes:-

"It is the subjectivity of the artist, which with its feeling and insight with the right of its wit can rise to the mastery of the whole reality; it leaves nothing in its usual context and in the validity which it has for our usual way of looking at things". (p 87)

Hegel was decrying the normal prescriptive form of artistic tradition espoused by Von Erlach and Winckleman.
Viollet le Duc (1872) in attempting to differentiate between built forms, accepted that it is human imagination which is the "regulator". It is, he says, this "natural faculty" which enables the designer to 'see' that the farther the creations of his imaginations are removed from the reality of nature, the more necessary it becomes to give cohesion and harmonious form to the 'material combination', destined to make those reflections intelligible". This is the same view as held by Vitruvius. Le Duc is clear that bad design is that design which has not been executed under his rules. This points up the ego and power "in society" as exercised by such authors. The idea that a poor imagination had perhaps interpreted the rules wrongly, is discounted. However he does understand that it is the quality of the intellect which is the regulator of good design even when applying the extensive mathematical concepts, formulae and rules he sets down.

The German architect Gottfried Semper, (1875), in his writing on architectural analysis and appreciation, identifies that; it is a sense of beauty, or more importantly a "delight in beauty", aesthetic enjoyment, and artistic instinct that impels the individual to seek more than just shelter. He further states that it is humanity's sense of invention and capacity for toil that prove in greater or lesser degree the proof of the enterprise. By this declaration he is concluding that the greater the degrees of ability the individual has in both these areas, the greater will be the success in the design of the building. Conversely, the weaker the abilities and efforts, the less successful the design will be. He continues in an historical narrative which regularly makes reference to man's 'creative power' and the need for architects to be "men of the whole world". He then confuses matters by putting his text at the level of man's connections to the family, and equally importantly the state, and, finally, mankind. He was certainly a traditional German conservative, but he did recognize that "levels of invention" are important to deliver beauty! It is also interesting to note Semper's ideas on Eurhythmy. He like Winkleman, identifies them as a strict serialist model, which, by his analysis was closed to interpretation, there was only one Classicism.

Vitruvius was much less dogmatic on Eurhythmy and form, but perhaps Semper's text identifies some of the confusions that can arise from the changing meanings of language over the centuries. Semper's analysis of Eurhythmy is possibly viewed through the veil of the cultural, nationalistic, conservatism of the time.

John Ruskin in his 'Seven Lamps of Architecture', (1886) designates one lamp as "The lamp of beauty". In this chapter he says that all beauty "is founded on the laws of natural forms", and it is this "natural form" which is most readily recognised by mankind and can be most ordinarily seen all around us. He also proclaims that architecture delights in abstraction, and that proportion and abstraction are the two special marks of architecture.
Ruskin suggests that while some architects can be trained in rendering beauty, it does require more than just a book of rules. He continues:

"The man who has the eye and intellect will invent beautiful proportions (buildings) and cannot help it but he can no more tell us how to do it than Wordsworth could tell us how to write a sonnet". (P. 125).

This is the first reference that identifies the importance of the phenomenon of design, i.e. through aptitude which he terms as having "the eye" (also page 45). Ruskin, like nearly all the previously noted authors, also lays down a considerable dossier of rules for the less able. The first of his rules or principles required to produce beauty, is that proportion should be arranged in hierarchical form, i.e.

"Where proportion exists at all one member of the composition must be either larger than or in some way supreme over the rest", and that:

"Symmetry is not abstract and beauty can be achieved by Asymmetry in design. Elements may be thrown wild and loose and yet be highly architectural in their separate treatment".

Here, Ruskin appears to demand a form of natural 'anarchy' which he suggests can be organised into beauty by his ideas. In the context of this paper this is not particularly fruitful. The only contribution is his belief that the most beautiful buildings can only be delivered by people with "the eye" for design combined with intellect. Ruskin was one of the prime movers in redirecting architectural design away from an increasingly rigid, solid and decadent classicism prevailing at that time. He never defined 'the eye'.

Ruskin’s work is an example of a high profile architectural text revealing the need for some form of natural 'design capability'. Others more recent, William Clough Ellis (1934 ), Walter Gropius (1936 ), Frank Lloyd Wright (1940 ), Peter Smithson (196 ) and many others, in their analysis of their own aims in the production of buildings and in analyzing other architect’s work, all refer to their buildings special qualities of space, proportion, articulation, general gracefulness, elegance, fineness, or its forcefulness, aggressiveness and energy. All authors and critics assume that these qualities they are describing are therefore attributable to those particular designers. There are only a few of these high profile designers compared to the numbers of individuals in practice, and this also is an interesting aspect of the choice of the critic designer/writers concerned. Clearly modern writers are identifying these few designers in relation to their "Design capability". It appears to be presumed that such high profile architects and buildings were automatically endowed with that indefinable asset, design ability, talent or whatever term may be used.
2.3.3.1 SHORT SUMMARY-THIRD SECTION

In the third section and attempt was made to survey the historical references to the phenomenology of architecture. It was seem that Vetruvius called for an understanding of 'eurhythmny', Scumozzi for a 'sense of beauty', and Alberty for 'ingenuity'. LeDuc demanded the designer be able to “see”, Ruskin is more specific however, and requires a designer must have the 'eye'. Otherwise he suggest that a building may end up just an assembly of bits, rather than architecture. All these authors recognized that to be an architect the individual needed something more than just an ability to produce buildings; the individual needed something special to be able to create architecture. However none of these authors provided any guidelines to be able to identify such people, the research must therefore look to another aspects of the design field for ideas.

2.3.4 : DESIGN APTITUDE, THE INDIVIDUAL'S RESPONSES

What is design talent, the eye a sense of eurhythmny? Senior (1964) writes that it does not consist of being "good with one's hands", though it is useful to be able to draw free hand in an explanatory way, but Allen (1959) and Clayton (1978) suggest freehand drawing is far from essential, though what is essential however is invention and interest and also a questioning approach to how things are made. Richards, (1974), suggests, like Vitrivius, that an architect has no need to possess the skill of a plasterer, a bricklayer or a joiner. If he had then he would merely be a good plasterer, bricklayer or joiner. However he should have the insight to understand the technicalities of these trades, and he should attempt to know within the limited time scale available the properties of materials and the history of their use. But above all, the author would state that the building designer must possess the visual imagination to know how buildings and components will look when they are built.

One of England's greatest architects, Sir Edwin Lutyens, (1869-1944) in his analysis of the abilities required of prospective architects, was very clear in his advice on one of the essential prerequisites for a career in architecture. Robert Lutyens, (1948), records that Sir Edwin stated:

"In choosing a career it is necessary not only to decide whether it would suit you, equally important is the question whether you would suit the career. Indeed one has to face the fact that without the prerequisite aptitudes a training in architecture will be very arduous and even if you do manage by sheer hard work to pass all the examinations, frustrations and disappointment may come later because you lack the talents which make for success in architecture. Just as it is no good trying to be a ballet dancer if you are lame, so it is far better to know and face the facts about yourself before starting on other careers where though a little less obviously, the same rules apply". (Page 48).
Careful reading of this passage indicates that Lutyens firmly believed in the need for talent. Michael Pattrick (1961) ex-principal of the Architectural Association School of Architecture in London produced a similar description

"One would normally expect an architect to have a higher than average degree of observation and it would not be unreasonable to expect an intending student to know at least some buildings which he has admired and taken an interest in their construction. It is also obvious that the indefinable talent required is that which is sometimes called creative ability, and it is just as possible for people to be visually blind as far as architecture is concerned as it is for them to be tone deaf in music. What is quite certain is that absence of design ability must be treated as a sign that architecture is not the right career for the individual, together with the sense of observation there should be an indication that a student is thinking about how people live because there is a real need for architects to understand social habits and traditions. (Page 62)

Pattrick further characterised what he considers to be the three main aptitudes required by a prospective architect:-

(1) An above average degree of observational awareness;

(2) The indefinable talent of creative ability;

(3) An understanding of social habits and traditions. (p.117)

Yet again point (2) above remains indefinable, Pattrick was clearly able to assess and grade his students as they went through his college courses. Is it perhaps that creative ability can certainly be defined, but in so many ways that no single definition will result? Perhaps then it should have multiple definitions, from which could evolve a commonality which could begin to lay the foundations for an objective analysis of creative ability. Pattrick's three points are he says interdependent and are used instinctively in every decision an architect makes. Pattrick, like Lutyens, makes no attempt to identify which of the three elements has the strongest or weakest response. He has not presented a hierarchy of usage, therefore the author would assume that the points are indeed flexible, with varying commitments from each required, depending on the problem in hand at any particular time.

Taylor (1951) in his description of an architectural career suggests why individuals become architects.

(1) They had a desire to create;

(2) They are good at art;
Their fathers were architects or their fathers had a friend who was an architect who had an opening for a smart boy (p.8)

Taylor's note that they had a desire to create is important. However the author suggests that the desire to create is not necessarily synonymous with the ability to create. Taylor's reference to being good at art is typical of most approaches to the published traits required by architects. He offers no scale or sense related to the term "good" and Taylor assumes that no one who 'knows' would try to define 'art'. However like many observers he appears confused by the myriad of possible issues, and therefore ignores them.

How can society educate its designers to ensure that "delight" or beauty is consistently seen to be a component in any design task which is undertaken?

The sphere of artistic beauty and aesthetics is so multifaceted that it may prove, elusive as Roger Scruton (1979) writes:

"The concept of beauty (delight) is absorbed into a certain pattern of reasoning, whose terms are at once intellectual and visual, thus their specific definition will probably remain elusive." (Page 196).

This is the opinion of many authors, educationalists and architects due perhaps to the complexity of the model. However, as noted previously it is clear that measurement or, a rationalising of the quality of beauty or delight does take place in colleges of art and design and in schools of architecture. In that work placed before juries is selected generally because of its quality specific or general, it "has something". The point, that there is generally common recognition among the jurors of its quality, is the interesting characteristic of this process.

2.3.4.1 : DEFINITIONS

The author also believes that this 'Delight' maybe the product of some cognitive ability or giftedness on the part of the designer triggering a similar cognitive awareness in an observer, if so, this congruency is of direct relevance. The analysis of this ability or talent and reaction to it lies in the realms of cognitive psychology and possibly in the field of psychogenetics. But what actually is this ability to create "delight" can it be understood as a universal constant and is it related to creativity or being creative?
Before investigating the field of psychology for pointers, creativity as a product may be worth reviewing Barrow et. al. (1965), defined creativity quite simply as, "the ability to bring something new into existence" (P 3). He further identified three aspects of creativity; first, creative products, then creative processes and finally creative persons. The creative product could be painting, sculpture, music or of course, architecture. Jackson and Messick (1965) suggested a further definition, for a product to be considered creative. They stated it:

"must be both novel and appropriate to a given set of constraints. Each of these attributes is essential since a product which is novel but inappropriate may be bizarre and a product which is appropriate but not novel may be banal!" (P. 26)

This is not necessarily accurate, as the term "appropriateness" is too general and "time specific". It can be used however as a basis for further work in the assessment of the architectural product, i.e. in the area of architectural appreciation. Of more interest is the creative people who produce the product. Creative processes in the practical sense of the reductionist model may be relative to their time and use and can quickly become outdated and with hindsight be seen to be of small value.

Simonton, (1988) in his analysis of the design process suggests that creativity can be thought of in four possible parts. Firstly, there is procedure, which he suggests is 'Process'. This he describes as the area of cognitive analysis, searching for problem solving systems and also possibly for gestaltists seeking "insight". Secondly, there is 'Product' which he states should usually be original or adaptive, though he notes the difficulty is assessing the specific degree of originality or creativity involved. The author agrees with this problematic because of the extrinsic value codes involved in assessment, i.e. time, style, fashion, efficiency and of course aesthetics. Thirdly, Simonton terms 'Person', the area which he regards as belonging to the personality psychologists whose interests he suggests includes developing differential tables of individual's differences in creative intellectual abilities. Finally, he says that 'Persuasion', is highly important and this is the realm of the social psychologists. This is because the act or degree of creativity is interdependent with the inactivity or the reflection of the abilities and interests of others.

Simon's study of the design process recorded that when individuals are seen to be creative it is ultimately as a result of their own internal processes. Are they creative in the sense of an holistic process or serialist reductionist processes? There are problems here for, as Herbert Simon (1983) identifies, there has always been a form of 'romanticised creativity' for which he claims no empirical evidence exists or has ever been realistically established.
Romanticised creativity is, in everyday usage, characterised by general terminologies such as 'good judgement', 'good intuition', 'really inventive', 'the active right hand hemisphere of the brain', 'creative energy', 'emotional positiveness' etc. He also refers to these in his "Models of thought" (1979) and in his Sciences of the Artificial (1981) but does not expand on them to any useful degree.

Even in the romanticised form, certain terms used in, or substituting for creativity are worth recording and possibly analyzing. These include intuition, inventiveness, judgement, emotion, energy, self projecting, artistic and musical, all suggested elements of talent or creativity in part or in whole. However creativity, as an empirical discipline is also as onerous a subject to research as romanticised creativity is to constrain, by virtue of the breadth of its multiple possibilities.

2.3.5 : CREATIVITY IN RELATION TO PHILOSOPHICAL THOUGHT

Creativity as an area of research impinges on or is part of the mainstream of much philosophical and academic thought. For example, it is reflected in the work of developmental psychologists, anthropologists, philosophers, management scientists and of course armies of amateurs and dilettantes. Within each of these groups there are considerable numbers of interested subdivisions. For example under the heading of psychologists there are academic psychologists, behaviouralists, cognitive psychologists, human relations psychologists, occupational psychologists, neuro psychologists, and even psychoanalysts, who all define and appropriate the concept of creativity in their own terms.

Each of these interest groups and their subgroups have added to the theory of creativity in their own particular fields. However it does not end there, as each of these groups has its own particular methodology and its own philosophical platform. For example developmental psychologists are in two main groups, the cognitive structuralists and the symbolists. The cognitive structuralists are serialist and reductionist in nature, while the symbolists tend to be more eclectic. They perhaps pursue a holistic approach in their view of psychophilosophical or developmental/neuro-psychological models.

In the context of this research, philosophers theories often mirror those of theoretical psychologists. However the concept of reason as a tool for understanding creativity is of use as Stereleny (1991) notes. He suggests that where no rational scientific mathematical or historical models can be used then the use of philosophy can aid a possible solution. Many of the earlier philosophers were concerned with the reason for existence, what is the existence of the human race for? Starting with Plato's quest "what is knowledge" each
later generation of philosophers has attempted to develop a reasoned view of the human condition. However within the scope of this research it is the aspects of the individuals ability to be creative which is of most value. Kant (1788) refers to the earlier work of Liebnitz and Hume and their analysis of reason and their weakness in establishing what he termed "a priori" platforms for their ideas (he refers to them as "synthetic a priori"). In the area of (moral) beauty and the reasons for its existence, Kant expounds the need to discover its value through moral philosophy i.e. the individuals responses to given problems. This work was further developed by Schopenhauer (1852) and in his discussion of the "laws of appearance" he warns against the superficial analysis and acceptance of the form. He states there should be two forms of viewing.

1) The physical, to be viewed in the sense of "cause" i.e. the physicality of why it is there?

2) The metaphysical, the "will" of it being there i.e. the intelligence and primal will that motivates the individual. (P56)

It is this metaphysical aspect of the act of bringing something into existence which Schopenhauer explains creates the essential differences in the world. He uses the term "moral intention" in order to attempt classifications of the phenomena produced by creativity. He suggests that while the "physical", in all its forms i.e. need, form, allusion, image, usage etc can all in some way be made objective, the "metaphysical" may never have an explanation other than in "luminous moments". In this he agrees with Goethe (1806) when he refers to "a sensible mans sympathetic understanding of things beauteous". Goethe notes that such things, while often in need of explanation will forever be without explanation.

In the twentieth century pure philosophy has also contributed to the concept, by arguing that to create is "to bring something into being that is original and valuable". However this can be a childs finger painting or Einsteins Theory of Relativity. Both may be original, both may be valuable. The great arguments in philosophy (in the area of human creativity) orbit around this problem, discussing which is more important in pure philosophical terms, the childs or Einstein’s contribution.

Since the 1880's there has been an interest in the subject of creativity. In this pursuit many terms and definitions have been allocated to the concept. Galton (1896) termed it 'Natural Artistic Ability', Garnett (1919) found a factor he called "Cleverness". Montmasson (1931) referred to it as being 'developmentally imaginative' and Hatfield (1933) referred to it as "inventiveness". It was J.P. Guilford in the late 1930s, forties and early fifties who corralled and directed all interested parties into the now accepted area of "creativity". The
modern concept of creativity draws on all this earlier work and as a result appears multi-
facetted.

Sternberg (1988) stated that ‘creativity, like food, has many natures’. He also writes that

“It is now recognised that the ability to distinguish between consequential and trivial questions is an important characteristic of creative achievers” (p62)

Sternberg believes that creativity is intelligence based and that intelligence is the ability to adapt to the environment to oneself. Moreover he states that most creative human processes in life are governed by intelligence and wisdom though creativity “is nearer to intelligence than wisdom” (p112). Most importantly for this research he continues that the strength of the type of ability that an individual has, i.e. that which is basic to the area of their creative achievement will be directly proportional to their production. McGinn (1991) in his discourse on reasoning believes that in the design process. Creativity can be reduced in simple terms, as follows:

A man observes some external event or process and arrives at some conclusion or prediction expressed in words or numbers that mean or refer to or describe some external event or process which comes to pass if the man’s reasoning was correct. (P174)

He further prescribes the reasoning process;

1) Translation of external process into words, numbers or other symbols
2) Arrival at other symbols
3) Retranslation of these symbols into external processes (as in building a bridge to a design).

He further notes that one point is clear. This process of reasoning he says produces a final result similar to that which may have been reached by causing the actual physical process (i.e. constructing a building haphazardly and measuring its strength and seeing what happens). It is important to understand the flexibility and versatility of mental prediction in order to produce creativity.

Craiks (1967) view that strong externalism of symbolic and other forms presupposes realism and therefore projectivism (can include creative design) Ochse (1990) notes that the area of productive creativity cannot be divorced from skill. He suggests that while skill is not synonymous with creativity it is an important vehicle for it. He also records that:
To think that creative ability develops through learning could be in error, one should not think that ‘learning to be creative’ or ‘learning to think creatively’ leads to individuals being creative. When considering how to promote creativity, designers of creativity programmes philosophical or psychological theorists believe that creativity is considered to be antithetical to reproducing learned material. There is much to suggest in the findings relating to the intelligence of eminent creators that creativity depends on crystallized intelligence in some specific area. And it is likely that the development of the necessary crystallized intelligence is initiated by intellectual stimulation and independent intellectual activity in the home. Further developments of the original skill may be attributed to emulation of appropriate models, self-instruction and education. (P113)

Ochse believes that the relationship between creative achievement and psychopathology is also axiomatic stating that there is little doubt that many highly creative individuals suffer from mental distress and often exhibit bizarre behaviour. He suggests that this link is often ignored in any assessment of creative people due to social pressures. Indeed later he suggests that ‘creativity results from psychopathology’. Roe (1953) Lichentein (1971) and Richards (1981) saw the combination of anxiety and ability as a “productive neurosis”. These authors explain that creative individuals may be less likely than others to be negatively affected by their pathology, because they are able to find an outlet for their inner tensions in creative activity, because pathology fuels their creativity. Humphry (1992) agrees, his researches suggests that certain manic syndromes create appositions of equal and opposite magnitudes. All realities are in the ownership of the owner who determines their validities. These are understood via sensations ‘these are personalised drives, needs, satisfactions or they can be negative. He says that all reactions, be it to music, art, theatre, politics or whatever are based on the following five sensations:

1) sensations characteristically belong to the subject
2) sensations are characteristically tied to a location in bodily space
3) sensations are characteristically modality specific
4) sensations are characteristically present-tense entities
5) sensations are self characterising in respect of properties 1 to 4 (p117/21)

He suggests that the individual will experience life through self interpretation of these sensations. Of interest is the concept of ‘modality’ in relationship to experience. This Humphrey suggests is in regard to the inherited factors of each individual i.e. spatial, literary, mathematical and specific modalities will be required. It is these sensate traits that this research is seeking. Marr (1982) argues that these modalities are indeed occurring in ‘Modular Brain Theory’ and like Fodor (1988) he agrees that many of these autonomous ‘elaborately structured neural systems’ are innately specified (most of the proof of this phenomenon is in the languages modality or module and can be traced to most other senate
areas). This evidence of human intellectual sensate ability is used as a foundation for the development of modern philosophical reasoning.

It can be seen that in any philosophical analysis of creativity the ultimate function is to view the individual and their unique reasoning systems in a search for time and context. The current work in philosophy often parallels and overlaps the work of theoretical psychologists.

2.3.5.1. CONCLUSION

Conventional models on how to design and historical references to the need for something special in a designer both fail to provide specific sign posting as to how individuals with design ability could be recognized. In the review of other aspects of design terms such as attitude, design talent, and creative ability were all referred to. Indeed the fields of innovation and philosophy were useful in opening up the concept of design. As the profession itself and its many adherents have never attempted to define what design creativity in the individual may be, just having accepted the phenomenon without critical definition, the author believes that it may be more beneficial in order to progress the research to turn to the field of Psychology to explore the cognitive aspects of design creativity.
SECTION THREE

THE PSYCHOLOGICAL ASPECTS OF DESIGN ABILITY.
3.1 : CEREBRAL ACTIVITY, A KEY TO THE CREATIVE PERSONALITY?

3.1.0 : INTRODUCTION

In the first two sections of this research, the author attempted to draw together the ideas and concepts derived by those closely involved in the practice of architecture and others with diverse interests in the development of architectural criticism, theory and the sociocultural implications of building design. This next section will now investigate design ability through an analysis of the areas of psychometrics and psychology.

The section will begin with a review of the physicality of the brain and its implications for design ability. The historic development of inherited abilities will be researched as will the relevant aspects of genetics. This will include genograms, separated twins, savants, giftedness and some of the debates surrounding the impact of culture on the individuals genetic makeup. It will pursue the processes involved in imaging, divergent / convergent thinking and the various models which attempt to allocate or map the numerous ability traits which make up cognitive psychology.

The research will then look to specific aspects of cognitive psychology to see if they can aid in identifying prospective spatial / building designers. This includes the fields of motivation, design cognition, Mackinnons and others research on architects and their abilities. A listing and analysis of any relevant personality traits which may bare on design ability and then a review of the availability of psychometric tests for quantifying the traits will be presented. The author will report on the problems of assessing the validity or otherwise of such tests. It is hoped that this area of study will present more fertile ground for objective analysis of design ability.

3.1.1. THE PHYSICAL BRAIN.

The human brain is the most complex organism in existence and like the psychological aspects of personality” the physical nature of the brain is being researched by many individuals and groups from many disciplines. One of the problems of discussing the brain is that it can never be fully described. It is multidimensional and can be viewed from so many aspects that many studies fail by omission.

However one aspect of the brain that needs discussion is situational functioning. This is the concept of brain specialism zones. For example when an individual is talking the linguistic
centres of the brain are working, and producing beta waves. When the spatial and mathematical centres are not in use, they are either idling or are dormant. These relaxed areas produce alpha patterns of brain wave. These, Kohen-Raz and Reuven (1977) suggest are a key to the holistic brain operation. They also state that inter-connectedness, specialisation, iteration and situationality are four other key characteristics that begin to explain the working of the brain, this terminology will be developed later in the context of cognitive psychology.

One of the elements of the working brain which uses all the four factors is memory and at this point it may be useful to develop the concept of memory as it will also be developed later and in particular, in relation to image generation. Greyson (1961) notes that no memory, once installed, is ever irretrievably lost. Hayes (1981), suggests there are phases in the act of remembering things.

(A) Encoding the information (memory) when needed.
(B) Storing it.
(C) Retrieving the information (memory) when needed.

Pavlov (1963), also developed a theory of memory in the context of conditioned reflexes. He argues that conditioning involves learning. It could also involve a conscious effort to learn and he suggests that conditioned reflexes are built from memories. He also believed and it is now generally agreed that the main reservoir of memory is the cerebral cortex. In creative design this must be important as Walkup (1967) identifies much creativity as actuated by 'developmental memory' i.e. memory working actively in a multidimensional role, testing past failures and analyzing past successes.

As was recorded earlier in the research, design is engendered as part of a problem solving matrix. In order that questions can be answered; memory is needed. In order that the proper questions can be generated about the problem, memory must be used. If as Ochse (1990) notes, 90% of all memory is unconscious, what mechanism is necessary to retrieve it. The id and ego may have particular blocking mechanisms towards 'damaging' memories. McGinn (1991) further suggests that the biological function of the mental state also constrains its content, so that mental content models can become strong, overlaying a 'real' understanding of what thought (including memory) actually is. Indeed Sterelny (1991), states that the key to understanding memory probably lies outside cognitive psychology and is more likely to be found in neurobiology. Humphrey (1992) agrees, though he suggests that all the aspects of 'mind' research should one day come together to solve the greatest riddle before mankind.

Diagram 4, overpage shows the general Brain Model.
Lashley (1950) stated that an actual physical (mechanical) structuring of the brain could be part of the memory process. He developed a model of brain organization in two activities centres or parts. These were:

1. **Mass Action:**
   I.E. the brain works holistically 'en mass'. If a small amount of brain tissue is removed the brain can cope; but if a lot is removed deficits will occur and;

2. **Equipotentiality:**
   Which means that all parts of the brain are created equal at least a far as learning and memory are concerned. No one part of the brain seems more important than any other. (P. 460).

Lashly's findings and percentages given for brain loss (as will be seen from the next section) appear partially obvious and his other discussions on right and left side loss are
relevant here. The case of an individual who lost 30% of his brain in the Falklands campaign and yet appears to carry on a normal life suggests 'Lashley's' limits may need expanding. It is important however to note that Lashley failed to locate any trace of memory in some specific cerebral locations or zones. Nor is it not now thought that any actual physical restructuring either short or long term takes place in the brain during the process of memory retrieval or storage.

3.1.2: HEMISPHERIC HOLARITY

Of more specific interest to design creativity or talent, is Gardiner's (1982), major study of the cerebral hemispheres. He discovered what happened to artists following major brain damage. He notes that most concern and observable research has dealt with the left hemisphere (or the dominant hemisphere) rather than the right (or non-dominant) hemisphere. He states, and is supported by Bass (1986), that the physiology of the brain has been mapped i.e. visual and tactile skills are distributed to both hemispheres and their workings i.e. body control, left brain over right body and right brain over left body (or visa versa, i.e. left over left in some individuals). Higher reasoning powers are located to the left along with language, (but also in part to the right) and music and non-language processing probably to the right. This is supported by Eysenck (1979), Gardiner records the subsequent activity of artists with variously right or left brain damage, and finds that while they may have lost some abilities (i.e. become aphasic) many have indeed improved their potentiality for creative art. As unlikely as this may appear, many such cases have been recorded by psychologists, neuro-psychologists and art critics. Could it be that within the "holism" of the cerebrum surviving traits from one or other side of the brain "escape" or restructure themselves with the same trait on the opposite side of the brain? Hebb (1949), also notes that when substantial masses of an adult's cortex is removed it does not necessarily appreciably lower the IQ though he also states that the same cannot be said for an infant's brain. When parts of it are damaged the later adult can subsequently be severely retarded. This must nullify in part Debbits (1981) concept of 'brain tracing' (ie similar to Lashleys work, where they suggested that the brain actually restructures itself continuously during the thinking process thus leaving faint traces of this activity).

Ahsen, (1985), also records the phenomenon of hemispheric asymmetries and the holistic aspect of the damaged brain with the aspect of interhemispheric transfer, but he suggests in his discourse on hemispheric damage and difference that:

"Hemispheric asymmetry represents the principle of predominance (not exclusion) and indicates a further attribute of complimentary reliance dedicated to the unitary functioning of the brain". (P. 88).
It must be noted that in 1996 arguments are still raging as to the workings of the brain but it is important to take account of this holistic phenomenon.

Diagram 5: Lateral Dominance

The "holistic" aspect of the brain and its apparent ability to 'overcompensate' in some functional faculties, following the loss of others, is fascinating. Most individuals are right handed and therefore are dominated by the left lateral hemisphere. Left handers tend to be dominated by the right hemisphere. Ambidextrous individuals are still not completely understood. However Bass (1986) and Dacey (1989) argue that being ambidextrous is the result of communication variance between both hemispheres, believed to be at the junction of the two halves of the brain. The analysis and location of what are termed "dichotomania" in the cerebellum is well developed, though Dacey suggests that:

"Although there is some evidence for each of the dichotomies, most may be more the result imaginative guesses of creative theorists than of hard research" (P. 62).

While there is truth in this, the credibility given to the location of the various 'dichotomies' is practiced regularly by neuro-surgeons and is referred to by Bass as being 'beyond guessing'.

3.1.3 : HEMISPHERIC FUNCTIONS

Springer and Deutsch (1981) in their analysis of the working of "hemisphericality" produced a table identifying the location of the various human attributes with their mental dichotomies (see overpage, Table 3).
### MENTAL DICHOTOMIES

<table>
<thead>
<tr>
<th>Left Hemisphere</th>
<th>Right Hemisphere</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual</td>
<td>Intuition</td>
</tr>
<tr>
<td>Convergent</td>
<td>Divergent</td>
</tr>
<tr>
<td>Intellect</td>
<td>Sensuous, emotional</td>
</tr>
<tr>
<td>Imaginative</td>
<td>Deductive</td>
</tr>
<tr>
<td>Rational</td>
<td>Metaphoric, intuitive</td>
</tr>
<tr>
<td>Horizontal</td>
<td>Vertical</td>
</tr>
<tr>
<td>Discrete</td>
<td>Continuous</td>
</tr>
<tr>
<td>Concrete</td>
<td>Abstract</td>
</tr>
<tr>
<td>Realistic</td>
<td>Impulsive</td>
</tr>
<tr>
<td>Directed</td>
<td>Free</td>
</tr>
<tr>
<td>Differential</td>
<td>Existential</td>
</tr>
<tr>
<td>Sequential</td>
<td>Multiple</td>
</tr>
<tr>
<td>Historical</td>
<td>Timeless</td>
</tr>
<tr>
<td>Analytical</td>
<td>Synthetic, holistic</td>
</tr>
<tr>
<td>Explicit</td>
<td>Implicit, tacit</td>
</tr>
<tr>
<td>Objective</td>
<td>Subjective</td>
</tr>
<tr>
<td>Successive</td>
<td>Simultaneous</td>
</tr>
</tbody>
</table>

Table 3 - Springer and Deutsch. (Page no. 186)

This table of mental dichotomies could lead one automatically to the conclusion that it is the right hemisphere which would dominate every aspect of creativity and thus lefthanded people who are right brain dominated would be the most creative. This simplistic statement may be more of a key to design talent than it immediately suggests.

However, creativity itself is a problematic as it obviously has multiple, possibly myriad applications and implications in descriptive terms. Hermann (1981) offers the following portrayal of how hemisphericity in relation to the 'holistic' working of the brain functions. He suggests:

"If you think through a creative process consisting of interest, preparation, incubation, illumination, verification, and exploitation, then it becomes clear that the process itself has left-brained, right-brained and whole-brained phases to it. If you started with interest being the first stage, then I would speculate that would be whole-brained. Preparation is clearly left-brained. That means doing the rigorous
task of defining a problem and specifying it in its essence. Incubation, on the other hand, is clearly right-brained. It involves getting away from the problem and engaging in an activity that permits the effortless, natural processes of the right brain to mull over the complexities of the problem, so as to permit the mind to come up with new combinations that could lead to a solution. The illustration stage is where this kind of "Aha" can occur, which produces one or more possible ideas or potential solutions. The verification stage, then, is the critical left-brained analysis of the idea or potential solution against the specifications of the problem. The final stage could be called "exploitation", which is the putting to use or applying the solution which emerges from the previous stages. Exploitation is probably whole-brained". (P.13).

The question could then arise of what percentage of each aspect of Hermann's observation dominates in creative thinking? Dennet (1981) believes that to a great degree this activity /decision heirarchy will be the product of the individuals genetico-socio cultural matrix.

3 1.4: DYSLEXIA AND LEFTHANDEDNESS

Of interest to this research is one of what Dacy (1990) refers to as one of the eidetics of design and art schools; that dyslexia and/or left-handedness may be a key to design creativity. The other concept is that dyslexics are also, to some degree 'design able'. For example an internationally famous architect (Richard Rogers) is a self-proclaimed dyslexic (1984). Wise (1987) also identifies other famous designers as dyslexic including Vanburgh, Scott, Macintosh and Jacobsen. This has had its effects in schools of architecture where often dyslexia is looked upon less unfavourably (see the field study for further details) than in other academic areas. However, the writer can record that in the eight instances over eleven years 1979-1990 where design students, (with which the author was involved) who obtained distinctions in design, none were left-handed nor dyslexic. The writer would also record that of the dyslexic students whose work (3 No) he knows, none were outstanding, though it would be true to state that in comparison to their written academic work the dyslexic students obtained much higher marks for their design (spatial) projects. However this small sample is probably of little value in relation to the volume of published evidence which suggests the contrary. Many recorded "geniuses", for example Michelangelo, Leonardo da Vinci and Thomas Eddison were left-handed, regretably it is not recorded whether other geniuses were also left or perhaps right handed.

Shein (1973), records that:

"In one school of Architecture 30% of the students were left-handers and in another school of art 50% were left-handers". (P.47)

Dacey (1989) was interested in ‘handedness’ and states that:
"In perhaps the first study, to look at the relationship between handedness and actual achievement, is the research by my colleagues and me. This research found that compared with the national average of 10% left-handed, 20% of the most creative were left handed. This is not a definitive answer but it offers some evidence in favour of the theory linking left-handedness and creativity". (P. 74).

He continues;

"There was a time when left handed children were forced to be right handed, left handedness was considered sinister. This practice may well have suppressed creativity. Lefthanders are disproportionately represented among the creative. For example half the students in one architectural school are left handed as are 65% of students in a major art school. (P. 224).

The author feels that considerably more work needs to be done before such a theory could be accepted. After all what is left-handeness and how does it come about? Williams (1963), Bass and Luria (1973) argue that in some cases genetic inheritance is possibly the cause, especially when it occurs in several generations of a family. In other cases, Dacey and Luria (1989) suggest that it may come about as result of minimal brain damage to the left hemisphere, probably during pregnancy or the birth process. Because of this damage, the person comes to rely more heavily than usual on the right side of the brain for language as well as for other functions.

Twins appear to be a special case of this. Only about 10% of the general population are left-handed (Luria 1973, Dacey 1989). Twins, however, are left-handed 25% of the time. This is true for both monozygotic (identical, single-egg) and dizygotic (fraternal, two-egg) twins. Minimal brain damage has been given as one reason: Stott (1983) records that some mothers of twins have smaller than average pelvises, and so twins are squeezed together in birth, as well as in the womb and are more likely to suffer slight brain lesions. Another theory argues that in monozygotic twins, there is a mirror-imaging effect in which each twin has opposite features from the other. However, dizygotic twins also have 25% left-handedness so this aspect of mirror imaging may not be useful. Lauria states that the location of speech centres and the exact locations of dichotomies in the cerebellum in left-handers is more complex than with right-handers.

However the differences show consistency and can thus be traced. For example, as Sterelney (1991), notes; when surgeons are about to perform brain surgery, they sometimes preface it with tests of laterality using a ‘sodium amytal procedure’. This chemical is capable of anaesthetizing one hemisphere at a time, so the doctor can determine where speech and other functions are centralized. For right-handers, speech is nearly always left-brained, and for more than half of left-handers, this is also the case. Thus the early presumption that all left-handed people are right dominant may not be true. For other
mental functions, the situation becomes even more complicated. In fact, researchers must be cautious even about how they determine such an apparently obvious trait as handedness because so many individuals who write with their left hand are really ambidextrous. Only direct observation is reliable.

A further complication, but also a factor that may shed light on this question, is provided by Levy and Reid (1976). They believed that the way people write may be as important in terms of laterality as the hand they use whether individuals invert their hands when writing (they appear to be writing upside down (this is sometimes called "hooked" writing). Levy and Reid found that inversion is even more related to brain dominance than handedness. Nevertheless, like the other predictors, right or left handedness is certainly not perfect or even agreed. It is unlikely to prove to be a dominating factor in detecting design talent, though it may have an informal impact.

3.1.4.1 Dyslexia

In the context of left-handedness being the possible result of minor brain damage it may be useful to identify various other forms of 'Agnosia'. Guilford (1953), records the problematics which occur with agnosia. Apart from dyslexia which is probably the most commonly recorded agnosia he also identifies apperceptive and associational visual agnosia. The former relates to distortions of visual objects and the latter to the recognition of familiar objects. There are also pictorial agnosia, colour agnosia and object agnosia which could all affect an architect's design ability. However, directly related to building design creativity is the existence of spatial agnosia which Guilford notes to be:

"disorientation and lack of appreciation of relationships between objects and space errors in the location of two or more objects is common. There is difficulty in avoiding objects and in counting them either by touching or looking". (P. 371).

This is important in relation to the search for creative spatial design ability! It suggests that those with spatial agnosia would probably not make good or even passable designers.

There are other agnosias not relevant to this research which will therefore not be recorded here. As was mentioned previously dyslexia has a 'creative' aspect to it, or at least it is perceived to have. Alexia is word blindness and dyslexia is both letter and word blindness. Both agnosias vary by degree and certainly alexia is often identified with brain lesions "from the occipital to the frontal lobes". So why do dyslexics often appear creative? Ahsen (1987), notes:
Dyslexic children are often characteristically very gifted and sensitive, are acutely aware of the environment and of conflict in the environment. As has been affirmed in the literature, the dyslexic child has a more finely tuned ability for manipulation and imaginative distractions". (P. 85).

Corballis & Beale (1976) state that 'dyslexics are figuratively' pulled apart by dipole hemispheres whose laterality is in confusion with neither one side or other having dominance. This leads to the individual adjusting his own psycho-metric values to a scale within which he or she can survive. This lack of hemispheric symbolic emphasis may lead to specific weakness in particular skill fluencies. Deficiencies in literal and verbal fluencies are among the primary abilities to be identified because of the structure of most education systems. However due to the holarity of the working unitary brain; such deficiencies are probably identified and then an overcompensation occurs in one or possibly more different areas of the brain; such as increased 'spatial or mathematical fluency'. Dyslexia comes in many forms, generally in early life and it can be diagnosed. Bee (1984) states that, it can disappear with proper teaching, though Rowe (1987) believes, the individual continues, as part of their overall survival strategy to retain large parts of the earlier 'overcompensated' fluency.

Dyslexia is also an interesting area in terms of those actual designers who are or who have been dyslexic to some extent. This again is part of Howe's (1989) artistic creativity research. Although, as Corballis (1976) et al reported that dyslexic children have their two cerebral hemispheres figuratively pulled apart by conflict, Dacey (1986) remarks that this can be "represented imagistically in a fascinating way". Apparently such individuals can live in a world of paradoxes. They perceive their lives as oppositional both optically and emotionally. Because of these conflicts, dyslexics are unable to compose identities for themselves as ordinary people would, because their two cerebral hemispheres are constantly sparking with each other. To protect themselves from this struggle, a dyslexic's activities are often represented as unorthodox, either hyper-active or passive. It can also be remedied by specific reference to various interaction and therapeutic programmes.

In terms of particular human characteristics, high creatives have often been held as psychologically defective, in particular manic depressives. The work of Goertzel and Goertzel (1962) in their analysis of 400 eminent people found specific forms of neurotic behaviour and beliefs probably based on the fact that many of those surveyed had troubled and deprived childhoods. Hudson (1966) suggests similar reasoning. However other authors have found no correlation between creativity and psychological disorder. In particular Richards (1981) subjected many of the previous studies to scrutiny and allied to her own work ultimately determined that due to the vast complexity of creativity and the
failure of many of the researchers having no common agreed definition of creativity, and using less than scientific methods of analysing psychological defects, much of their conclusions were thus weakened. It is therefore believed that generally while some emotional (or affective) disorders exist, Izzard, Kagen and Zajone (1984), suggest that repression of certain affective disorders in childhood can lead to their overdevelopment later thus producing specific profiles in an individual, i.e. violent, humble etc. And Reason and Canter (1974) in their short study of some (15) American literati interestingly discovered mental disorders moving towards and linked to schizophrenia. However the scale of their study fails produce real evidence that this may be a key to creative writing or creativity.

3.2.0 : GENETICS, HERITABILITY OF CREATIVITY

3.2.1 : Historical Development

Is design talent and the ability to be creative inherited? Heritability has been a subject of debate, observation and interest for a considerable time. Hippocrates (120BC) notes that maladies in children and young men could also be noted in their parents and grandparents. Lucretius (50BC) also wrote on the obvious physical aspects of genetic inheritance.

"It often happens that the children may appear like a grandfather and reproduce the looks of a great grandfather because the parents often conceal (in their bodies) many primordia mingled in many ways, which fathers hand on to fathers received from their stock; from these brings forth forms with varying lot and reproduces the countenance, the voice, the hair of their ancestors". (P. 74)

Lucretius discriminated between mind and spirit (though in odd physical locations!). The mind he noted, keeps the body under 'lock and key' and his discussion of the operation of the body and the 'holistic' aspect of the spirit he provides a sort of structure of intellect or SI model simply through his analytical observations. Lucretius criticises earlier work in this area by 'Democritus' and draws on work from Epicurus and Anaxagoras. Thus over two thousand years ago there was debate and probably disparate schools of thought on the inheritance of family traits. Later, the Roman writer Linnaeus added to the analysis of peoples; however his report appears mainly to be a physical attribution and the transfer of physicality over generations gained through observation. It was another seventeen hundred years before a real analysis of genetic inheritance is recorded. Most earlier authors were anthropologists or physicians. Prominent among them was J.F. Blumenback (1790), who began the study of inheritance particularly by race, and attested to the genetic intelligence of races. Considerable numbers of researchers followed. These included Gobineau, Pouchet and Carl Vogt. Vogt's analysis of what was later to be termed perfect/imperfect blending led directly to the concept of separate race succession and the resultant hereditary traits. However at this time Darwin published his first volume of "The Origin of Species" (1859)
which had a profound effect not only on anthropological research and science but on the
general population. Darwin's analysis of the development and 'struggle' of nature started a
vast movement of research into heritability and its effect on the genetic propensities of
living organisms.

3.2.2 : GENETIC INTELLIGENCE

The debate on genetic intelligence probably begins with Galton in the late nineteenth
century and almost finished in 1945 with Auschwitz and Alfred Rosenberg's execution as a
war criminal. Rosenberg, author of "The Myth of the Twentieth Century" (1938) was Nazi
Germany's chief political /racial philosopher and one of the main protagonists of Nazi
"scientific" race theory and all that led from that concept. Following the Second World
War, the genetic aspects of humanity was not considered to be an acceptable social or
political issue for any research. However by 1960 with Jensen and later Eysenck the
physiological aspects or component of people began to assert its relevance to psychology
and thus started a second stage. In 1996 it is still a risky area for any researcher to examine
publicly and therefore much psychological research often still omits the genetic aspects of
personal interpretation of tests and other data. Although giftedness is now gaining an
acceptability which will be discussed. However the political forces ranging against any
genetic illumination are just too powerful. The current branches of research which includes
a genetic component is generally referred to physiopsychology and in the sphere of
sociology, biosociology.

Probably the earliest writer on hereditary value was Francis Galton, who, after producing
several primers on the subject he wrote the notable text "Hereditary Genius" (1892). This
text was certainly one of the foundation stones of psychology. However, not only is it
clear that he believed God to be an Englishman but his racist and sexist remarks, (which
were possibly the order of the day in high Victorian culture) appear incredibly simplistic if
not to say naive. He classified men (the author uses the word advisedly) into seven
intelligence ability groups or classes, 'A' being the lowest order and 'G' being the highest.
He also attempted to identify this distribution of intellect across the population. Later
writers such as Eysenck, Jensen, Vernon and Taylor regard this distribution order as
acceptable. However Galton had a further classification of individual which he designated
as X, which he stated would possibly occur say once in every million humans. Unless
considerable numbers of such individuals have been lost for whatever reason it is probably
more accurate to suggest that X types appear once in every one hundred million, spread
over generations. X types would be individuals like Newton or Einstein etc, but possibly a
further designation of XX or even XXX for the classification of such luminaries.
Alternative it could be that such luminaries are much more widespread than we know and
that for cultural and other reasons they never find a platform from which to develop. While
certainly Galton believed strongly in hereditance it is interesting to note that his whole
posture was male orientated, indeed his analysis of the mothers of illustrious men led him
to pursue the idea that the female line of continuity was diluting genius. He notes that
where the line did not continue in the same strength it was probably because grade G men
often had grade C and D wives. He appeared not to identify the possibility that it could all
have been the other way round. That G women had married inferior 'A' type men, or if he
did recognise it, he failed to publish the details.

3.2.2.1 Genograms

So far the terms genetic and hereditary have been used and for this research they must be
differentiated; as they are different. Genetic coding is inherited, but considerable work in
medical, clinical analysis in particular related to hereditary diseases and their predictability
have produced important differences between inheritance groups. McGoldrick and Gerson
(1985) in their analysis of genograms clearly identify the specificity of particular disease
predictors. Some are direct straight through from doner to all offspring, others miss a
generation and yet others miss a generation but will develop only in the male or depending
on the malady only in the female. In others it may only be in the first born while all other
descendants show no symptoms whatever. Ernst and Angst (1983) state that in other
physical dyscrasia it may be totally unpredictable; turning up three or four generations later
in either male or female offspring, not necessarily first born, even if the last recorded
family member had been say a first born male. In medical diagnosis "multigenerational
mapping" is necessary in order to establish any form of predictability. Brandt (1980)
agrees with the analysis of physical heredity being useful stating that it is thought that the
systematic view of coincidences in hereditary disease analysis can range from 70% to
100% predictability depending on the physical disorder in question, and the degree of
accuracy in identifying the biological parents of the child.

However predicting psychological disorder, ability, attitude, and personality from
ogenographs, it is thought that successful prognosis is very much limited. Bowen (1978) in
his analysis of genograms attempting psychological profiling in family therapy stated that
as a 'quasi projective technique' it was less efficient than guessing. It is clear that the
complexity of the model of the individual relating to previous family physical,
psychological and sociological history in relationship to the individuals current physical,
cultural, psychological and sociological awareness is so diverse that modelling is almost
impossible. It is also clear from the work of Bowen and Stolorow (1979) and Lieberman
(1979) that the predictability of psychological family inheritance is such that suggesting that
an artist may produce artistic offspring or that music, mathematics or linguistic abilities can be predicted from generation to generation is almost impossible. Lieberman councils that guessing is an equally good predictor. However Findlay and Lumsden (1988) suggest that the reasons for the poor level of predictability are as follows.

1. Only eminent men and their offspring take enough interest in their success to record or trace their family abilities.

2. Generally average people seldom analyse their own abilities and seldom recognise the abilities of their forebears and may only identify their descendants capabilities when obvious or some other self recognition factor.

3. There is also the problem of the 'Rashomon effect' (i.e. the different perspective individuals have on the same event). At a family level any agreement on each persons strengths and weaknesses, is never scientifically analysed.

4. Family memory is usually very short (particularly in developed countries). Family dynamics are such that as McGoldrick notes the "Family Information Net" can be flawed through lack of any real information about the family members even one generation back. (Lack of knowledge, adoption, death, lack of interest etc.). (P.7-11)

It would therefore appear that in any search for a natural designer the possibility of identifying them via the abilities of their forebears is at best limited to direct observation, or failing that, guesswork. However, it may be that a key or guide of design ability could be elsewhere in the 'nature' side of the debate either genetic or hereditary.

3.2.2.2. Genes And Cultural Transfare

It is perhaps important to view the background to the genetic controversy and to try to abstract from it relevant material to this research and to the 'production of delight' ability of the individual. Burt & Howard (1956) in their analysis of 'Primary Factors' used factor analysis in the context of gene analysis in their polygene theory which they termed multifactorial theory. However as Baker (1974) notes "It is now out of the question that a factor in the psychological sense could be determined by a single gene". (P. 455). although Howard and Fisher (1952), identified that pairs of allelomorphic genes, when present together would have an intermediate effect. They confirmed Yules (1906) earlier findings that in the case of perfect blending and an intermediate effect, in the absence of
modification by different environments, the coefficient of correlation between the characteristic of an individual and those of his parent, grand parent and great grandparent would be 1/2, 1/4, and 1/8. However this form of 'perfect blending' is dependent on there being no assortative (out of tribe) mating, or as Baker notes no systematic or regular interference from environmental effects (mineral, vitamin etc. deficiencies). It is also interesting that Yule's original mathematical formulations were adopted in full in the "Reuchburger Gesetz". (Gesetz zum Schutze des Deutsches Blutes und der Deutschen Ehre). These were the German Nazi Nuremburg Race Laws of November 1935. Where one Jewish great grandparent did not produce a German but a "Mishling" 2nd grade and having one great grandparent of Jewish origin apparently allowed the descendant to be a German. However to have one German parent and one Jewish parent was a deadly position to be in. This perfect blending does tie up with current genetic theory. The 'morphological' aspect of DNA replication is explained in terms of the ability of a double helix, two strands of uniquely matched 'sites' to separate and link up with an exactly similar new one which is a distinct functional component. Hangeland (1984), argues that this then works as a result of "orderly summation". The question then arises as to the conditions required for orderly summation. Eysenck's (1979) work in multivariate genetic analysis vis a vis socio-economic status (SES) produced an interesting result in that like Baker (1974) he contributes a degeneration of predicted genetic performance, to a low or lowering socio economic SES but he states:

"It is well established, of course, that most aspects of personality normal and abnormal have a substantial genetic component". (P. 167).

Arthur Jensen's work (1969) on analysis of IQ levels and their development in school children was one of the first post war texts on population genetics. His argument is that efforts to raise children's IQ's of particular races have failed not because attempts have been incompetent through bad teaching skills or under financing, but because IQ's cannot be raised, because they are under the control of a genetic code. His work has been assiduously attacked and researched and indeed parts of it has been found lacking. However, does the analogy extend to students without design ability being tutored in design? Would such students ever be able to design, no matter how much tutor input they had? It is also noted from a general survey of researchers in heritability that all from Galton through to Baker (1974) tend to support Jensen. Nevertheless raciologists as distinct from 'racists' or 'ignoracists' have often come to blows on what is the "truth" of the matter. As Hudson (1974) observes

"cutting through the sticky mess of egalitarian sentiment which such social issues are surrounded "is in the current climate, very difficult". (P. 92)
3.2.2.3. Design Ability - An Inherited Trait?

Perhaps it is appropriate to discuss inheritance in the context of this research and explore the nature/nurture controversy. The following points present possible positions and situations in the context of promoting a designer.

**On the side of nature**

1. Design creativity is a cognate trait and the designer only needs signposting.

2. If design is an inherited psychological trait and is in the genes it requires a series of cultural conditions and inputs in order to crystalise (in the individual) what has always been there.

3. The designer is born but does not know it. Their natural flair needs to be teased out by good teaching.

4. The designer is born, but will never discover it, due to intellectual, and cultural blockages and the lack of society's interest in helping to discover it.

5. If the designer is born, at what point is their talent identifiable and is it then recognised, nurtured and developed or not recognised and the ability subjugated and dissipated.

Or conversely could it be that:

**On the side of nurture**

1. The designer is not born, but due to early nurturing and developing inputs and later design teaching is able to design adequately.

2. There is no such thing as a "designer", anyone can design eventually even a computer.

3. Aesthetic appreciation is a rule governed activity like other rule systems it can be acquired, though not necessarily by everyone equally.
The intermediate position suggests that the individual's abilities are the result of what we are (genetically) and our experience (reinforcement). All psychologists agree with this, though there is considerable argument about which element and what proportion of each is more important, Jensen (1972) writes:

"Any observable characteristic, physical or behavioural is a 'phenotype' the very existence of which depends upon both genetic and environmental conditions. The legitimate question is not whether the characteristic is due to heredity or environment, but what proportion is attributable to genotypic variation and what proportion is attributable to non genetic or environmental variation? (p. 115)."

Kamine (1975), states that what we most depend on our neural and endocrine make-up for what we are (i.e. the totality of our central and autonomic nervous systems).

3.3.1 : HEREDITABILITY AND MONOZYGOTIC TWINS

Considerable work has been done in the analysis of the endocrine matrix in relation to the intellectual and physical development and the basis of this work is monozygotic (MZ) or identical twins and in particular, those who were separated at birth and later united. When their degree of similarity is measured, it is usually found that (dizygotic (DZ) twins - non identical twins) are genetically no more alike than ordinary siblings. However MZ studies in reference to cultural differences increasing or decreasing IQ level were according to Kamin (1981), and Stott (1983) inconclusive. However both agreed that environmental enrichment did, in the case of the twins study increase intelligence, though Kamin does not identify whether the genetic aspect that the MZ twin with the lower intelligence could probably have had their intelligence developed to the same level with an equal environmental input. Kamin doesn't address the concept of "genetic optimality". Eysenck (1979) is clear in his own exposition that MZ twins (reared apart) show no differences relating to cultural development. He calls on considerable researches to support his genetic model. It is also interesting that with all researchers in this area, the jump is always made from MZ, DZ studies to the concept of 'Heritability' and relating this in turn to tribal strains, although the logic of this is not always clearly explained. Stott (1983) notes that this type of model is very difficult to analyse in the singular and continues:

"the complexity of successive gene and gene environment interactions with the possibility that any one of them can set the individuals development on a new course in which a different array of genes becomes effective with different environment will forever nullify attempts to calculate of heredity and environment by a mathematical model". (P. 49).

Current work by psychologists aided by the clinical genographers may in the future add to the picture. We have also earlier seen other authors refer to 'the eye', the touch, etc. This tries to imply some type of natural ability which appears inherent in a particular individual.
3.3.1 GIFTEDNESS

Indeed it is the gaps in the theory which inevitably lead to the conclusion that the "physical" material of the brain and by extension its DNA is important. In the section of this research which identified the "holarity" of the brain and the aspects of hemispherical asymmetry that gene-gene chemico neuro activity is very important. Also, there is 'Turning Syndrome', Turner's Syndrome (T.S.) defect is related to chromosome deficiency. Hudson (1974) records that normal persons have 46 chromosomes, while persons with T.S. have 45. This can produce some unusual physical defects such as a lack of physical growth. He also notes:

"Their peculiar deficiency in spatial perceptual ability is sometimes so severe as to be popularly characterised as space form blindness". (P. 115).

In the context of pursuing the cognitive abilities of a designer, persons with Turner's Syndrome (T.S.) can certainly not be building designers. This does identify a specific DNA characteristic which unfortunately, in this case is negative when related to the search for architectural designers. Although T.S. is rare, it is an obvious genetic aberration with physical manifestations (the 45 chromosomes can be counted under the microscope), Hudson (1974) also reports such maladies have generally been reported in convergers as distinct to divergers. (Convergence and divergence in cognitive psychology will be discussed later).

3.3.2: THE SAVANT SYNDROME

Clearly having intelligence is important in overlapping, i.e. using, expressing and developing personal traits including creativity, but in recent studies Clair (1990) clearly expressed the belief that "Savants" (individuals who are normally considered to be intellectually 'sub normal' with very low IQ scores), can express the highest levels of apparently creative activity. One in particular, Steven Wiltshire (1989), while being autistic is capable of producing highly acclaimed architectural perspectives full of incredible detail, often drawn from memory. Clair also refers to Niel O'Connor who Clair states has half the IQ of a 'normal' person. O'Connor hears a tune and immediately translates it to the piano and occasionally elaborates the theme. However we again need to identify what can be considered to be "creativity" rather than repetition of creative form.

Treffert (1989) in his explanation of the savant syndrome describes the phenomenon of eidetic imagery which he believes to be the key to savants. The average person has an image decay time of approximately 8 seconds, and during that time it needs constant
reinforcement, i.e. thinking about it. A savant can have a decay time of up to 40 seconds without reinforcement. He also says that eidetic imagery is also present on a persistent basis in some form of brain damage. Lefthanders he suggests have a higher proportion of eidetic imagery than right handers. The term eidetic imagery does not only relate to art or pictures it can also be accounted for the savant "calender counters", (i.e. those individuals who can give an exact day - Monday, Tuesday etc., for any week in any year, fifty thousand years into the future or past). Selfe (1983) also accepts that eidetic imagery is generally the result of some form of brain damage, before, during or after birth. He refers to the holistic nature of the brain and its left / right positionality. He suggests that severely mentally handicapped people are often missing major components of the cerebral sphere, resulting in severe backwardness, being dumb, deaf, blind, spatially disorientated, and with severe autisms either singly or in combinations.He states that in certain circumstances some of these individuals can generate eidetic imagery as a form of holistic overcompensation. Treffert states that it is uncertain what the mechanisms are that generate this eidetic phenomena.

Treffert suggests it can be "the pathology of superiority", i.e. compensatory growth of the right brain, via damage to other parts of the brain; or secondly the development of powerful "habit memory" due to a weakness or flaw in other cognitive areas; or thirdly; it is due to constant repetition and practice. He also notes:

"However in the prodigious savant, access to the rules of music or rules of mathematics, for example is so extensive that some ancestral (inherited) memory must "exist to account for that access. Such memory, in these individuals is inherited separately from general intelligence". (P. 222).

This astounding statement may perhaps another key to this research. Brain patterning experiments with savants identify that mathematical, sculptural, painting or music savants appear to have their specialisms distinctly separate within the brain.

It may be that eidetic imagery is important in the context of building design talent, the ability of an individual to hold an image for longer than usual is obviously useful in terms of altering form before producing it on paper. The research will return to mental imagery later; as it probably has an importance to the intellectual design process.

All authors recognise the importance of DNA coding which preordained aptitudes, but that may be inherited memory is not generally accepted. Furthermore it is thought that such inherited aptitudes could adequately cover anything perchance omitted from endocrines and neural makeup, such as for example physical strength. It will also dominate any vocational preference traits and abilities, which could include "design talent".
The independence of these traits or abilities is quite remarkable. Indicating that while interdependence of all these various powers is the norm in the average person, each aptitude is possible of being greatly expanded (as holistic compensation) by the loss of other aptitudes. This points again to the aspect that spatial and artistic abilities are probably "stand alone" traits that in some individuals are more highly developed than in others.

These studies have also opened the debate on intelligence and the need for applied intelligence for the development of art, music etc. It is clear that in the repetitive sense great intelligence is not required. However, for example for music to develop, for the individual to be inventive, to be able to create innovation, musical ability must be allied to intelligence, and this observation applies equally to any creative activity.

In the context of this research into architectural creativity the same seems to hold true. The individual must be gifted having innate artistic and spatial ability together with a high degree of intelligence in order to be able to use progressively these inborn, intuitive, and instinctive qualities.

Bass (1986) in his studies in Neuropsychobiology and developmental psychobiology is also in the 'naturist' camp. His belief that the preordained DNA codings have provided a specific receptacle. This author agrees and suggests for example if it has the capacity of a gallon, through blockages and dents, and being short measured, often contains less.

In summation, in the debate between the influences of nurture and nature, Burt's (1966) classic study of intelligence of twins reared together and apart confirmed the earlier findings of Newman, Freeman and Holzinger (1937) and Shields (1962). Later Inel-Nielsen (1978), further confirmed this work stating that between 68% and 77% of an individual's character can be identified as hereditability. Although Burt's findings were discredited in the late 70's, they are now seen as having some value both in methodology and conclusions, early studies by Erlenmeyer, Kimling and Jarvik (1963) and Martin (1975) have all identified heritability of approximately 79% and what Eysenck terms "common environment effect" of at most 20%. Innate ability would therefore appear to be important in the individual's ability to accomplish particular tasks.

This research has not identified any physical or specific neural mapping, DNA construction, endocrine or neuropsychosurgery hand or textbooks which have as yet discovered the actual atom, molecule or cluster which is responsible for creativity. The author considers that the genetic arguments of heredity possibly assisting in creativity and thus having a propensity for specific development may have benefits which have not been successfully explained by environmental and cultural conditioning.
3.4.0. SPATIAL IMAGERY AND ARCHITECTURAL DESIGN

Of specific relevance to this research is the ability of individuals to be able to spatially image both the interiors and exteriors of their buildings, before they actually render them on paper. This ability is referred to by McClaughlin (1962), Oakley, (1970) Kneller (1965) Scruton (1989) and so many others, architects, critics, journalists, its usage is commonplace. However, it is generally anecdotal rather than factual or in a quantifiable manner.

Vandenberg (1968) concluded that there are at least three of the Primary Mental Abilities (number, space, and word fluency) which can all be quantitated (by using standard tests (see tests section)) independently and all have significant hereditary components. Pavlov (1963) notes that spatial ability is one of the 'unconditioned instincts' which Ahsen (1984) then notes is obvious. He states that it is:

"Irrefutable in the face of the elementary laboratory fact that spaciality of a visual image is not a product of conditioning and that chunking (elementary semantic imaging) is genetic and is widespread in organic structures". (P. 45).

He continues:

"The spatial attributes of visual images such as left-right, and up down, are inherent in the image and are not assembled through experience". (P. 45).

Vernon (1961) and Kohler (1960) attributed much of the brain's spatial ability to genetic traits. Jensen, Schockley (1972) and Bass (1974), in their analysis of the spatial values and its measurement suggest that inherited spatial ability may be as high as 80% which Schockley also mentions in his paper on monozygotic twins.

It appears that the Primary Mental Abilities (PMA) are all inherited in one form or other, Dacey suggests that most individuals inherit the PMA's in equal part, Vandenberg (1987) suggests a scale of one hundred for each PMA, and suggests that the form of the average human being could be as follows:

Number 100 Spatial 100 Verbal 100 Word Fluency 100

Vandenberg and Hudson (1978) suggest that possibly those with high spatial abilities may lack strength in other areas in compensation. Such an example could be (after Vandenberg):

Number 20 Spatial 150 Verbal 100 Word Fluency 130

McKinnon's (1962) work identifies most 'successful' architects as having low numeracy factors but having high spatial factors, (McKinnon will be discussed fully later). This
tendency to balance high and low factors in order to stabilize the cerebral processes also fits into the holistic aspect of the brain and clearly provides the basis for models for the search for the most apt psychological profile for the "building designer". The position of inheritance of spatial abilities may challenge the view, that spatial design can be taught to anyone. Using the models above clearly those with a score of twenty out of a normal one hundred in spatial ability could be taught, as could those with a score of ninety out of one hundred, but perhaps those with higher spatial abilities (and higher scores), would need less teaching and produce better buildings. Perhaps individuals with high spatial ability should be sought for architectural design courses.

In the earlier sections of the research it was noted that terms like 'innate ability' and having the 'eye' for design had a certain currency. In this section it has been recounted that specific abilities are, for whatever reason, inherent in individuals. The giftedness programs in America certainly believe that some individuals have higher than average abilities in some subject areas than others. Whether this is inherited or due to some form of clinical aberration is uncertain.

3.4.1 Other Aspects Of Creative Development

Family life is deemed important (i.e. that the genetic quart pot does not end up with only half a pint in it). Taylor (1964), and Goertzel (1978), argue that parents of creative children refrain from imposing rules on them. Dacey (1989) found that:

"With creative children their parents averaged less than one specific rule, such as the number of study hours, bed times or sexual activity for their children's behaviour. The group of twenty families with no highly creative members averaged six rules. (p.193).

Torrance (1979) and Wicker (1985) also recorded that one of the aspects that is universal to most families that produce creative offspring is a "sense of humour" which inevitably was also an important element of their offsprings character. These families also rated a high IQ as of no particular importance whereas in families where high academic striving was seen as essential, few of the offspring were ever noted for their creativity.

Dacey (1989), also noted that homes which were full of variety and of no particular type - i.e. consistently truly modernist or solidly victorian also appeared to produce more creative individuals, though interestingly he does note that in his study:-

"Most of the families were middle or upper middle class: It is difficult to find successfully creative persons who are poor!" (P. 196).
"We model ourselves on the parent who punishes us. Male undergraduates with characteristically female patterns of mental ability, high verbal, low mathematical, often reported that their fathers were often away from home for long periods; and they had been punished exclusively by their mothers. Young men low verbal and high numerical is associated with punishment exclusively by the father again results fit the identification hypothesis. The pattern of ability here described as 'female' is strongly associated with English sixth forms and universities with specialisation in the arts. (p.35).

This identification hypothesis was also recognised by P.E. Vernon (1965), Bee (1989), Berger (1973) and of course it was clearly identified by Freud (1905) in his Oedipus conflict and its subsequent crisis and development.

From the aspect of this research if the identification hypothesis is correct (though Bee (1989) suggests that it is still a matter of debate) and that a 'femaleness' is indicative of an artistic or perhaps the author would suggest a better description would be a less linear thinking process which would indicate a more divergent approach, are we therefore to seek out female dominated individuals? It also raises the more open question if as the evidence suggests there is a natural polarity of the sexes, why is there not a great historical catalogue of creative women? Is culture that repressive?

Another aspect of the 'high creative' individual is noted by Rank (1965), who notes that:

"The more highly creative adolescents were more likely to have a larger number of collections and these collections were unusual for their age, such as campaign pins and models of prehistoric birds", (p.69).

This is an interesting aspect to creativity because it would also appear superficially to be contradictory. Collectors and their collections would appear to be convergent in nature. Although Taylor and Ellison (1964) in their 'Biographical Creativity Predictor Inventory' also recorded interests in miscellaneous collections as part of their three hundred element 'livewood' inventory. Collecting as a creative indicator is not satisfactorily explained by any of the authors who have quoted it, other than it is recorded as part of the researched character pertaining to "creatives".

3.5.1: PSYCHOLOGY OF THINKING SYSTEMS

In order to pursue an indication of where design talent may be, it is worth identifying some of the traditional models in cognitive theory relating to our earlier models in the research.

Thurstone argued that in cognitive creativity it did not matter whether society regarded an idea as novel, unique or creative, what was important was that the thinker believed it to be novel (1952). He stated that the idea might be artistic, mechanical or theoretical.
even be administrative if it solves an organisational problem. Thurstone also stated that the creative thinker reaches the solution by "sudden closure". This is interesting as it certainly complies with Wallaces' (1926) model of the creative thinking process, which was:

1. **Preparation.** In the preparation stage of problem solving, the solver has recognized that a problem exists, and some preliminary attempts at understanding and solving the problem have been made.

2. **Incubation.** If the preliminary attempts fail, the solver may then put the problem aside for a while. At least on a conscious level, the thinker is no longer working on the task. However, at some unconscious level, work proceeds.

3. **Illumination.** Illumination refers to the famous flash of insight that ends the unconscious work and brings the answer to the surface of consciousness. This is similar to Thurstone's 'sudden closure' scenario.

4. **Verification.** The verification stage refers to the confirmation of the insight. Generally, this stage is the least complicated and is usually nothing more than a simple checking to make sure that the insight worked.

below, identifies Darkes diagram

Diagram 6 - Dark's (1978), Partial Map Of The Design Process. (p. 332).
These stages cannot be considered as discrete entities but will as suggested by Taylor (1964) and Amabile (1983), overlap. However the Wallace (1926) model has come under criticism from several authors. Ghiselin (1952) in his work on the 'incubation' effect noted that those in his survey after returning to the problem after an incubation period were in fact no further on.

But that was probably because Ghiselin's approach to problem gestation was time limited. In the gestaltist form the illumination factor need not necessarily be sequential. Illumination may be instantaneous following incubation or it could possibly be days, weeks, months or even years later! From the author's own experience of the architectural problem matrix model, illumination often arrives hours or even days later. Of course hindsight is the most often recorded period of illumination.

Thus the writer would note that from his own experiences and observations in design schools that in the design decision matrix, Wallace appears accurate but perhaps his findings are particularly relevant to the visual / spatial model, rather than to a mathematical or literary one.

3.5.2. : GUILFORD AND THE S.I. MODEL

Parallel with this work J.P. Guilford was developing his "structure of intellect theory" (or SI Theory). A particular aspect of Guilford's researches has been to identify creativity. Guilford started his work as early as 1934. The main personality factors Guilford(1974) distinguished in creativity, and therefore important to architectural design are as follows. The letters prefixing the various factors are those recognition symbols as used throughout the Guilford SI model.

G. General activity: Energetic, rapid-moving, rapid-working person, who likes action and may sometimes be impulsive.

A. Ascendance: The person who upholds his rights and defends himself in face to face contacts; who does not mind being conspicuous, in fact may enjoy it; who through social initiative gravitates to positions of leadership; who is not fearful of social contact; who is not inclined to keep his thoughts to himself. There is little to indicate that "submission" accurately describes the negative pole, as was formerly believed.
M. Masculinity vs. femininity: Has masculine interests, vocational and avocational; not emotionally excitable or expressive; not easily aroused to fear or disgust; somewhat lacking in sympathy.

I. Confidence vs inferiority feelings: Feels accepted by others, confident, and adequate; socially poised; satisfied with his lot; not self-centred.

N. Calmness, composure vs. nervousness: Calm and relaxed rather than nervous and jumpy; not restless, easily fatigued, or irritated; can concentrate on the matter at hand.

S. Sociability: Likes social activity and contacts, formal or informal; likes positions of social leadership; has social poise, not shy, bashful, or seclusive.

T. Reflectiveness: Given to meditative and reflective thinking; dreamer, philosophically inclined; has curiosity about and questioning attitude toward behaviour of self and others.

D. Depression: Emotionally and physically depressed rather than cheerful; given to worry, anxiety and keep.

C. Emotionality: Emotions easily aroused and perseverating, yet shallow and childish; daydreamer. (Not identical with Factor C).

R. Restraint vs rhathyemia: Self restrained and self controlled; serious minded rather than happy-go-lucky; not cheerfully irresponsible.

O. Objectivity: Takes an objective, realistic view of things; alert to his environment and can forget himself; not beset with suspicions.

Ag. Agreeable: Low-scoring individual is easily aroused to hostility; resists control by others; has contempt for others; and may be aroused to aggressive action. High-scoring person is friendly and compliant.

Co Co-operativeness, tolerance: Low-scoring person is given to critical fault-finding generally; has little confidence or trust in others; while high scoring tends to assist creativity

These criteria should assist if used as part of any assessment model
3.5.3.: DIVERGENT PRODUCTION IN THE S.I. MODEL

Figural Ability As An S.I. Model, Figure Factor:

Figural Ability is important in the field of design talent and creativity as it is the ability particularly manifested in the visual field. It relates to perceptual experience in making, recognising and producing variable images from similar sources. Also known as the "elaboration-ability" factor. It is generally identified in terms of lines, shapes, colours, textures, gradations, fenestration, etc. It is deemed not only to be confined to spatial form. In the auditory form it could be rhythms, (also applicable to visual form) melodies and various vocal sounds. There are also other forms such as, tactile (sense of touch, sensation and other types of stimuli and imagery) and kinaesthetic (movements, both perceived and experienced i.e. intellectual or physical (muscular or neuro system orientated).

S.I. Model Semantic Factors

One concept refers to semantic ability as the basic ability to make generalisations beyond the primary observations (stimulus) received is generally thought to be level 2 activity (as per Spearman's aspect of personality). The formal system for this semantic ability is the 'network model'. It is the retrieval system of the network model which is of interest to the designer. Many semantic memory models have been constructed and indeed in the area of educational psychology this core subject is continuously under study and development. Much of the research is and has been reductionist in nature or gestalt by formulation. The author's own view that within the 'necessarily' holistic workings of retrieval and conscious thought, the work of Colins and Loftus (1975) probably best explains the process's workings in the network, see diagram 7 below. They suggest networks of interlinking modes of familiar elements and their derivative 'spreading activation model' which leads on to larger more complex gathering systems, for complex problem solving.

S.I. Model - Behavioural Factors

These factors can be defined as information essentially non verbal, involved in human interactions where there is awareness of attentions, intentions, perceptions, thoughts, desires, feelings, moods, emotions and actions, both intrinsic and extrinsic. Within the context of divergent production clearly memory, focussing and breadth of experiences and receptivity to them is of importance, i.e. both quality and quantity. The more the better for divergent production.

In the end divergent production or divergent thinking is, as Getzel's (1975) notes, the kind of thinking that goes off in different directions. Such thinking is less restricted by given facts; it permits changes in direction, in problem solving, and leads to a diversity of solutions or products which the previous sections identified as the process of design and the designers main activity.

S.I. Model - Symbolic Factors

Symbol elaboration, spatial linguistic figural and mathematical recognition and analysis levels can be measured with varying degrees of success. It is usually factors such as numbers, syllables, words (as structures, not necessarily as specific meanings) and all kinds of "code" material which are referred to under this heading. Such codes have no "natural" meanings but are specific to the individuals mental make up. These are generally referred to as 'cognitive codes'. It is believed that a cognitive code "is created by the nervous system which encodes the cognitive reception of information". The quality of the coded information is dependant on the considered importance of the input. It can be reduced or elaborated. The author suggests this encoding quality must relate to the motivational factors involved. If the event that is being witnessed is considered relatively unimportant then it will be 'reduced' in coding. On the other hand should it be deemed of critical importance then the code may well be 'elaborated'. The greater the elaboration then the easier the recall and vice versa. Shortened codes may well be lost in the memory for ever. These codes and their recall depend on various aspects of pattern again relating to motivation/"attention focussing" and how they are processed. For the building designer this factor is very important as images retained must be the formulations for future design focussing. They can be processed either 'automatically' - i.e. without conscious effort or in a 'controlled' manner - i.e. those processes that require attention and sustained effort in order to understand them. This could explain why why so many individual architects have their own recognisable styles?
Matlin (1983), suggests two main types of cognitive codes; the 'declarative' which refers to factual information of a somewhat static nature, who's organization is often apparent and which is usually describable and the other 'procedural' which refers to codes or knowledge underlying skilful actions and its nature tends to be dynamic. It is difficult to describe both verbally and literally it is best described by showing (i.e. driving a car or playing a musical instrument).

Guilford then arranged a further series of subdivisions of the factors level of classification which he termed "content". This refers to the specific area of operation where mental processes are involved. However it may be more useful to this research to go directly to his main work on creativity.

Guilford, in his "Structure of Intellect" identifies that he clearly allocates creative thinking in what he classifies as divergent production; (as distinct from convergent production). He suggests that reviving items of information from memory storage in order to meet certain objectives (arts, sciences or sociocultural) is the basis for psychological production either divergent or convergent. (P. 138). However, in his earlier work "Creativity" (1950), Guilford identified two aspects of intellect, the first is the "aptitude for creative thinking" and the second is "non-aptitude traits related to creativity". The way in which creative thinking was factored will be discussed in what follows.

3.5.4. : APTITUDES TO CREATIVE THINKING

Primary to this is what is termed "Fluency", i.e. the ability to reason and execute judgement, positively or negatively about particular problems. The factors are as follows:

**Word Fluency / Number Fluency:**

Appears to be associated in arts and science creativity when identified with divergent symbolic unit recognition.

**Associational Fluency:**

Relating to language alternatives and development high scoring which can be time related (as can all testing), identifies high scoring ability.

**Expressional Fluency:**

Set in the DMS (semantic) factor. It identifies (again through written or mathematical) aspects of creativity and divergence through whatever medium (and written etc.).
Ideational Fluency:

The ability to produce ideas to fulfil certain requirements in limited time, sheer quantity is important.

Originality Factor:

Creativity should contain some form of originality if all the standard definitions are to be adhered to. This is also generally measured as quantity against time.

Other Factors:

Spontaneous flexibility, adaptive flexibility, elaboration ability, unusualness, remote association capacity and redefinition dexterity.

These are among many components of the aptitude factors relating to divergent ability. Most of these factors which are associated colloquially with artists and designers and are self explanatory by their titles. Higher scores and where appropriate shorter times are seen as providing a greater degree of divergent ability and hence as we will see, creativity.

3.6.1.: CATTELL AND KLEIN'S FACTOR THEORY

In the search for designers can we recognize these creative factors in the personalities of individuals. Cattell and Kline (1977), in their scientific analysis of personality and motivation, (developed from Cattell's much earlier work), produced a series of traits (factors) related to data, real life ratings through observations, Q data based on questionnaires, self report inventories and T data based on objective tests. Depending on the analysis in hand they identified the main aspects of personality. These were:

(A) Abnormal Factors - generally negative;
(B) Higher Order Factors - consisting of 3 parts;
   Second Order Factors - introversion vs extroversion;
   Third Order Factors - antisocial vs social;
   Fourth Order Factors - adjustment / morality.

They further organised a table of traits which appear to be a series of opposites. Where creativity is referred to, it is in what they call the "desurgency versus surgency trait".
Trait F - Desurgency  Surgency
(Sober, taciturn, serious) (Happy, go-lucky, enthusiastic).

They suggest that the 'desurgent' person has been made so by his or her experiences. This is why there is a steady decrease in surgency scores with age, and it accounts for the correlations of steady work habits, achievement and creativity, with the negative pole - desurgency. This surgency they group with second order factors, which the include under the heading of independence.

Independence - Surgency, dominance, adventurous, unconcerned, suspicious.

Creativity is further identified in the QZ trait group which at the top end of the scale is distinguished as characterising individuals who are self sufficient, resourceful, and prefer their own decisions. There are also: second order "Exvia", (extroversion) facts which need to be taken into account, Cattell states:

"This trait seems important in creativity and it is high in occupations such as research scientists, creative writers and artists but low in nuns, nurses, cooks and footballers. Newton and Copernicus were high on QZ, while Marilyn Monroe, was "low". (P. 117).

There is also the 'J Factor' or, Coasstenia, expressed as individualistic, internally restrained and reflective, also referred to as the 'Hamlet factor'. Creativity, they consider is the product of the independent individual, and the characteristics of the independent, are as in the list below. They suggest some recognisable independence traits are: EH, FLM and QZ.

| E | Assertive | H | Venturesome | M | Imaginative |
|   | Aggressive |   | Uninhibited |   | Bohemian     |
|   | Competitive|   | Socially Bold|   | Abscent Minded|
| F | Happy-go-lucky | L | Suspicious | QZ | Self sufficient |
|   | Enthusiastic, jovial |   | Hard to fool |   | Resourceful Prefers own Decisions |

Their creativity traits M and QZ are within their independence factor. It will be interesting to see later in section 4 of the thesis whether this research could be helpful in design schools selection procedures or to establish if it is actually known about.
Creative Problem Solving

Cattell's inventory was first produced in 1939 and fits very well into McKinnons (1972) work, and his creativity / creative problem solver personality model which will be reviewed later. Guilford records that problem solving begins with some energiser. It can be intrinsic or extrinsic. It can also be conscious or unconscious and that initial response is then firstly filtered in order to identify if physical reaction is required or not. The diagram (diagram 8 overpage) has five (5) "exits". These represent analysis, rejection or acceptance of information. The exits work for designers in the following way:

Exit 1:

Represents avoidance of the problem. This first filter when activated probably means that the designer isn't even aware of the energiser. However, if it is passed through Exit 1 a search for answers starts.

Exit 2:

Where no decision is made because the problem may not be pressing or is not worth further consideration, thought subconsciously. Generation of solutions begins (the term solutions, i.e. plural).

Exit 3:

The point where Guilford suggests that "most" people give up. They accept the answer that appears to suffice because problem solving is viewed as an onerous task. For the designer trying to finalise a large project it often represents an arduous malaise that demands tenacity and sticking power. For those involved in creative problem solving they now seek what Medrick (1964) terms, 'a higher quality solution'.

Exit 4:

Associations', which may produce as Leary terms, a creative blocked situation, where a slightly improved conclusion is reached. The designer may well drop out with this improved version. However, they may well, within these 'higher quality associations' receive "insights" which allow them to go beyond Exit 4.

Exit 5:

This is the point of production of new solutions to / for the original problem.
It is clear that Guilford's model owes a lot to the early Gestalist process model shown earlier but it is also true that its fundamental form was the springboard for considerable numbers of other creative decision making models which followed. Indeed in several of these later models only the nomenclature has changed probably to protect copyright.

Guilford's discussions on creativity suggested that 'real' creativity is an amalgam of convergent and divergent factors. The convergent factor is the aspect of thinking which leads to a single correct solution determined by the given factors. Guilford states that convergent production is in the area of logical deduction or at least the area of compelling inferences. "Convergent production is the prevailing function when the input information is sufficient to determine a unique answer". Convergent production is seperated( or reduced) into the other factors; within specific subgroups of convergent activity, however, identical factors and subgroups are also to be found under divergent production. A problem with convergent production is, that while it can solve problems the process must select the proper problem-solving paradigm, and because of its very nature it may be unable to determine radical alternatives and make creative choices. This is because of "functional fixity". This is when learned patterns tend to become permanent and the "only way to do it", or worse the "only way to see it" imprints. This could explain the lemming-like need for many architects (possibly natural convergers) to follow styles.

Diagram 8: Guilford's Problem Solving Model (1966), (P. 132).
it", or worse the "only way to see it" imprints. This could explain the lemming-like need for many architects (possibly natural convergers) to follow styles.

3.6.2. : HUDSON'S DIVERGERS AND CONVERGERS

Hudsons work (1966) on defining divergence and convergence is well documented. Hudson refined Getzel's and Jackson's work. For example adding one further category, between a divergent and convergent ie divergent, 'those in between' and convergent. His work went on to define the attributes of each group. For example convergers exhibit more rapid eye movements; have less dream recall, were more sadistic and more apt to accept stereotypes, etc. He further suggests that the distribution of types in society is as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme divergers</td>
<td>10%</td>
</tr>
<tr>
<td>Moderate divergers</td>
<td>20%</td>
</tr>
<tr>
<td>All rounders</td>
<td>40%</td>
</tr>
<tr>
<td>Moderate convergers</td>
<td>20%</td>
</tr>
<tr>
<td>Extreme convergers</td>
<td>10%</td>
</tr>
</tbody>
</table>

Noting also that any of the categories were measures of bias, 'not of level of ability', he also formulated that "high creatives" (as distinct from high IQ) tend to be divergers and in his later publication, Frames of Mind, (1968), he further develops the point that convergers will:-

"plump for those routes through the academic system, mathematics, physical science, classics, in which the weight of the accepted authority is greatest while divergers will elect those subjects where the pressure is least. What is alluring to the converger (and repugnant to the diverger) about the exact discipline is their exactitude". (P.78)

He further states

"Convergers" are intolerant of ambiguity in intellectual matters. While divergers positively seek it out. In their choice of a life's work, convergers are drawn towards careers which hold the promise of crystalline exactitude and the ultimate exclusion of doubt, while for divergers, it is not only the emotional connotation of the arts that render them so attractive but also their empiricism",

(P. 67)

Building design, and indeed the even more technocratic aspect of building production is by no possible stretch of the imagination a "crystalline exactitude". At best it verges on the mechanistic and at worst, is anarchic, as Andrews (1985) notes. Coping with this form of organization would, according to the texts require extremely flexible thinking. The general consensus of most of the writers in the creativity/intelligence field, is that divergence is the
trait most appropriate to creativity and design. There is one important caveat however. Dickey (1974) makes the observation:

"The normal person does not engage solely in one kind of thought, but varies the degree of directional (con. or divergent) control he exercises. Here is another distinction between art and design. The designer must consciously direct his thought process towards a particular end, although he may deliberately use undirected thought at times. The artist however, is quite able to follow the natural direction of his mind or to control and change direction of his thinking". (P. 12)

Dickey may be correct to an extent. It is again clear that he is also considering the extended role beyond the pure "talent" stage. An artist, no matter who or what they are or what they are doing, generally always has motivations and end goals, much in the way a designer will have, i.e: landscape or a portrait, or any figurative study for that matter will automatically create parameters for the artist. In the abstract, the artist has motivations, and critics and perhaps even a market to - at worst - "satisfy". It is the authors view that it is this initial "spark" in design or art that is similar; this creative urge to produce a new product be it on canvas or in bricks and mortar. Is it perhaps that Dickey has a romantic preconception of what art is?

From the foregoing, is it possible to begin to identify some pointers that may identify an architect? Should they be largely divergent with elements of convergence? Shein (1972), noted that architectural design is based on an engineering (convergent) component and design a (divergent) component. Though he offered no precise definition. The author would suggest that an attempt must be made to at least move towards an understanding of the interactive processes.

3.7.1: IMAGERY AS A COGNITIVE DESIGN TOOL

How important is imagery and in particular spatial imagery to creative design. If we refer to earlier authors, such as Ruskin (1886) referring to the designer needing to have "the eye", to Alberti's (1450) requirement for imagination contrived by an ingenious artist and Le Duc's (1872) requirement that designers have the natural facility that enables them to "see" the farther creations of their imagination, the question naturally arises as to how a high level of imagery and recall help? can it be usefully identified as a possible measure for future predictability of design acumen?.
In the earlier section on savants and eidetic/imagery, the ability to image is of particular interest to this research, as is the aspect of image on memory, its manufacture and recall. For generations it has been said that "a picture is worth a thousand words". Today this is more fully understood. Images seem to have special power attaching to them. In the media a long story can be told about a hideous event but a picture has more impact. It is often seen, not as a representation of what happened. The picture is actually viewed as the event itself. It is a "viewed stimulus event." Ahsen (1985), refers to neural psychical imagery as:

"a virtual store house of possibilities, imitation, ideas, concepts, fantasies, incarnations, composites of judgements, preferences, ideals, propaganda and for many the imagery of TV has become the new God. In brief, the picture is a magical operation, an insideoutside phenomenon in which external capabilities and internal sensibilities are homogenised". (p.222).

The design decision complex invariably uses imagery as part, of its solution production process. Indeed Rogers (1987) Schwartz (1985) and Gardiner (1985) all state it is essential to any form of design process and internal dialogue. Neisser (1976) states that imagery is a major element to memory and recall. He suggests that "close to" imagery was quickly described but that images he described as being "far" were more slowly described. He draws the analogy with ordinary vision. This must relate to the creative building designers ability to reproduce or invent imagery in the creation/invention of their buildings. It can also be related to the ebb and flow in design fashion, i.e. if you can see it around, you tend to mimic, refreshing "close to" imagery is easier than 'far' imagery. Do designers have or need strong imaging qualities and fast recall image delivery systems? For this research it is important that the process of neural imaging is discussed and its value assessed in the context of design creativity.

Oakley (1970), Ahsen (1985) and Lawson (1990) suggest that the manipulation of this imagery is of importance to the architect. Schwartz (1985), who believes that imagery remains in the brain a great deal longer than words, (as distinct from the savant syndrome) both are interlinked but the image often triggers words while words do not always (to the same percentage) trigger images. For example, the complexity of perception and imaging is well seen in gestaltist terms. Images will have their own properties but those need not be the same as the perceptual qualities of their objects. For example it is argued that a picture of a square blue box need not itself be square or blue, the blue 'squareness' is, instead a part of its content. This abstract approach to conceptual form is congruent with holistic conceptual design.

Richardson (1969) explains his imaging research in four parts. He proposed that mental imagery refers to:-
1. All those quasi-sensory or quasi-perceptual experiences - of which;
2. We are self-consciously aware - and which;
3. Exist in the absence of those stimulus conditions that are known to produce their genuine sensory or perceptual counterparts - and which;
4. May be expected to have different consequences from their sensory or perceptual counterparts.

Fodor (1987) in his review of cerebral imagery notes that the definitions which refer to 'sensory' aspects of memory and imagery are apt to be confusing because the anatomical psychological aspects of sensory or sensation are not resolved and indeed its use as a metaphor is generally unscientific and therefore capable of misinterpretation. Ahsen is strident in his requirement that unconscious sensory-perceptual effects must also be included in any model.

Rollins (1991) and Aschsen note that there is the problem as to the interpretation of images, in determining their types and how to describe the relations between their various displays and their descriptions. Fodor (1987) states that pictorial representation on its own is not sufficient for determinate, let alone creative thought. Iconic systems allow for too many alternatives to be derived. Therefore the iconography must be set within a referential system probably literal or linguistic. Fodor suggests that the image rather than the description may be used for perceptual categorisation. He also states that the capacity for imaging is not literally a component within the linguistic formulae of interpreting value. This is possibly born out by 'Savants' (see the earlier section) and by some Downs Syndrome people, who may still be capable of producing what is often considered to be fine 'art', even though these same individuals are often incapable of linguistic expression. This aspect of imaging being a 'separateness' possibly like 'creativity' could be important in assessing an individual's capacity for design.

3.7.2. MEMORY IMAGE MATRIX AND DESIGNERS.

The memory image matrix needs investigation in the aspect of imaging in memory operation. This is because the whole of design research and creativity in the visual arts is so orientated towards imagery both physical and cerebral. The brain receiving such images storing them and then retrieving them, not necessarily in the whole form but perhaps adapted, or even in parts. These parts could range from ninety percent of the image down to very small elements say even one percent of the image. So what is an image? Like Neisser, Steinman (1987) reasons that: Images have two major components:-
(1) The surface representation - this is the quasi pictorial entity in active memory that is accompanied by the experience of having an image;

(2) The deep representation - this is the information in long term memory from which the surface image is derived.

Of interest to this research is the deep representation because of its direct effect on the individuals capacity to originate designer images. This is where Tye (1993) begins to draw the 'descriptivist' argument between 'picturing and imaging'. He suggests that most imaging is indeterminate by nature (i.e. the image does not hold all the detailed information that a photograph might). He also states that (following Neisser's model), some images require more time to formulate than others. Picturing however suggests recalled, detailed form, which may be the savants methodology. Arguments continue as to which may be the brain's method of producing images. Kosslyn's (1987) approach to image determinism is picture orientated, he refers to 'function pictures'. For example there is no physical dimension in distance in a mental picture (i.e. the brain does not actually image a proportional height for a mountain, it is not literal but functionally it suggests the mountain is higher than other imaged points.

Kosslyn (1980) earlier described how limited 'image space' is available for imaging and that it takes place with a "kind of short term memory" area which he calls the 'visual buffer' and like Guilford's "gates of memory" there are a series of sifts and barriers which contain and memorise image priority. It is the visual buffer which to a certain extent controls the rate scale and ability to regenerate subsequent imaging. The imaging is processed also by the 'minds eye' which Kosslyn describes as:

"...An interface with the conceptual system and serves to classify portions of the spatial image in terms of semantic categories. Obviously the 'minds eye' corresponds to a set of procedures that serve as an interface between spatial images and more abstract discursive es and so on) and the output of these procedures serves as the input to a semantic classification mechanism. (P.6).

Pylyshyn (1985) states that deep representations stored in long term memory fade over time and that the minds eye working in terms of "Gestalt wholes" selectively retains as yet undefined hierarchies of representations. The mechanism for accessing then retaining spatial imagery is fairly limited. Designers who as students and probably in their own lifestyles have viewed tens of thousands of images of buildings and their details have a vast catalogue to draw on or do they? For example, the eye has only a limited visual extent. Thus images cannot be too large or they will not fit the medium of the imaging system. Because the eyes subblend only, limited arc images are most sharply defined near the centre of the medium in which they occur and become more degraded toward the periphery.
Importantly McCarthy (1993) states that individuals have differing capacities for degradation limits. Possibly therefore a building designer should be able (due to the scale of the final product) to retain a large extent of the central image in a non degraded condition i.e. they can retain the image for some time, this is also suggested in Rowe's (1987) work. This ability assists in storage and retrieval, in particular with regard to the 'fade' characteristic of much imagery. It is also important in terms of the 'visual buffer'. Representations within the visual buffer are transient, requiring effort to maintain. That is, as soon as an image is generated it begins to fade; if images are constructed by placing parts sequentially, only so much material can be placed before the initially activated portions fade away. Thus as Kosslyn notes

"The visual buffer has a limited capacity defined by the rate at which material in it fades and the rate at which new material can be inserted (or old material 'refreshed')". (P141).

This is important because as was noted earlier the larger and more complex the image the more time will be needed to regenerate it. Kosslyn continues:

"The more complex the image the more time is required to see portions of it. If images fade with time, then when an image has more parts it becomes increasingly less likely that an image can be maintained at once". (P.141).

Clearly in "refreshing" large complex images - specifically the elevations of Gothic Cathedrals, interiors of Rococo chapels, office buildings in Manhattan and soon then a capacity to be able to quickly regenerate, or refresh such images is important particularly for building designers. Such individuals will certainly benefit from this spatial imaging matrix ability. The 'savant' Stephen Wiltshire clearly has the capacity to look at a large group of buildings, for a few seconds and then several hours later he has the ability to regenerate it fairly accurately. He can effectively retrieve the sense of the scheme he saw both in scale - horizontal and vertical, values and details - (i.e. locations of doors, windows, stone details etc. etc.). It has also been recorded that he was able to generate similar images several days later in completely different locations. Clearly his "formatting" ability is considerable, (that is his underlying literal encoding capacity) and his "accessibility" to it is not blocked or limited by the 'visual buffer'. Figure 9 represents Kosslyn's core theory model of imaging and figure 10 represents how surface images (representatives) may be generated from deep representations. Pylyshyn (1988) produces a similar model though suggesting that such linear programs are limited in value due to the fact that empiricism is flawed by its statistical dependence, which he states does not allow for a proper matrixed cognitive model. He believes that "connectionism" is appropriate, i.e. "the adding on of viable elements to a model, not necessarily in a linear manner in order to begin to understand the complexities involved."
Diagram 9 Kosslyn's Visual Buffer (page 350)

Diagram 10 Kosslyn's Surface Imaging from Deep Representations (page 45)
At this juncture the research returns to the concepts involved in design modelling. As was recorded previously there are several styles of model and to some extent they are in competition with each other, the system of working represented by the model generally represents a belief/style philosophy or system. However here for ease of access to the theory this research will use the conventional model below.

1. Schematic designs are proposed and developed to various levels of specificity.
2. One of these is chosen for design development.
3. The design is accepted, and working drawings are prepared to permit construction or manufacture. (Much detail design may also be deferred to this stage.)

Conceptually, this sequence demands from the designer a microcosm of all those capabilities of judgement, estimation, problem structuring, value assignment, and choice that describe human life as a whole. So, throughout this melange of activities, there are ample opportunities for refinements along the route whereby a design idea becomes a designed form.

It is this particular mental transduction - that of goals, requirements, constraints, and preferences to physical form - that most concerns investigators. How is it accomplished? What sort of information aids the designer, and in which format is it easiest to assimilate?

Many studies have been done that either retrospectively or "in situ" examine this aspect of the design process. The results are intriguing but still incomplete.

Eastman (1968), produced one of the earlier experimental studies of design activity, and found that, surprisingly enough, the physical aspects of the proposed designs generated the perceived constraints. However he had expected the constraints to generate the partial forms (what he called design units), much as in the earlier reported Simon model on engineering/scientific ideas generation.

Darke (1978), in her analysis of architectural design procedures identified what she termed a "primary generator", this led to the development of the process formulae below.

Generator - Conjecture - Analysis.

The primary generator is an almost holistic attempt to generate a solution. She suggests that architects indeed "picture" a solution then, through conjecture - generate further adapted
applications of the original image. This suggests specific imaging retention abilities above the norm.

3.7.4. : IMAGERY - AN INDEPENDENT COMPONENT

What actually is imaging in design and how dimensional is it? Darke's research on architectural design processing found no cases where requirements were analyzed in detail first. Instead, the whole concept was originated, formed apparently based on subjective values rather than explicit logical considerations.

This is important, not only as an issue of process but also as an indicator of imaging power. It was also noted in Wallache's model that illumination gestation periods could be long or short, following incubation period. Also the scale of imaging generally fades depending on size. Yet clearly here the author would suggest that Darke is arguing for large scale 'illuminations' with good retention capabilities. Is this the key to good design ability? This appears most certainly to be a divergent rather than convergent ability.

In a study of six English architectural firms, Wareh & Murta (1979) again found that principal ideas of the built form were conceived first, (using major imaging abilities) then checked against major constraints and utilized to refine an understanding of the constraints. The initial imaged form proposal did not change substantially during design development. This seems to echo Lawson's (1971) earlier laboratory results that showed architectural students worked within a narrower range of solutions than is thought generally necessary. They too had created all the images of the solution, before understanding if the solution image would work.

Rowe (1987), also records this type of idea formulation noting that the primary generator or principle idea often appears to dominate the total process. Again this suggests strong neural imaging ability. She notes that the:

"Tenacity with which designers will cling to major design ideas and themes in the face of what at time might seem insurmountable odds".

Lawson (1990), states that:

"Often these very ideas themselves create difficulties which may be organisational or technical, so it seems on the face of it odd that they are not rejected more readily". (P.35).
This is probably explained by Fodor's model and in the individual this imaging capacity is much stronger and less referenced to other cognitive matrixes than previously believed.

It seems that an architect first 'closes' a problem by hypothesizing a spatial imaged form. Then, she or he searches it for constraints to match it against an intuitive understanding of the problem. But the problem has been mentally encoded in terms of the form itself, not in terms of what the form must do to "work". To designers, problems are not encoded and "closed" in terms of a set of distinct performance parameters or constraints as engineering problems are reported to be.

3.7.5. : IMAGING, AESTHETICS AND PSYCHOLOGY

Pylyshyn (1981), agrees with other researchers about the autonomy of imaging - similar to the aspect of creativities relationship to intelligence. For example he states that the brain actuation is clearly important in the connection of cerebral aesthetics. The concept of what is art or what is psycho physiological in terms of the effect of receiving, examining, valuing or creating "art" (in its broadest sense) must be assayed. It is thought by Dickey (1974) and Gardner (1982), that art images are clearly not mechanical inputs from outside but structured presentations according to the individual and to internal sensitivities and sensibilities. The received image of this artist's representation is not simply copied, but probably created in the receiver's mind, in as Ahsen puts it a "complicated way through explorative neural activity". The author would note that interest, motivation etc. have a positive or neutral 'fixative' effect.

Gear (1989) suggests that art is best understood by using the APM-A model (Attention Perception Memory Arousal). This interactive model is viewed in the context of human experience, behaviour and dynamics of mind (i.e. intelligence, the individual's cognitive style, creativity, personality and motivation). She also requires that these aspects are viewed related to notions of normality and abnormality and ultimately to all the aspects of consciousness and unconsciousness. She suggests that the development of such a model may allow for greater insight and predictability in art perception. What is of interest to this thesis is her view that art is generally at once sensual, arousing and spontaneous. Is this a suitable description for architecture. Should all buildings impart these feelings?

Is there a model like Wooton's that perhaps two of the three achieve art in architecture. Should architecture be regarded as "The Mother of the Arts". The questions are endless and it is possibly better not to speculate along these lines. It is important to note that both Gear and Berlyne (1971) call upon the artist to have strong spatial abilities. Berlyne notes that aesthetics is dominated by an ability to both memory recall and 'spatialising' ability.
Imaging and the capacity of individuals to be able to do so appear to be related to the ability to design. Regrettably from the point of view of this research, Gestaltist, behaviourists, cognitivists, introspectionists et al each have a specific view of perception and imaging.

Vision cannot be explained merely by the properties of the observed object but is dependent on what goes on in the brain. Rollins' comments:

"The problem is that picture perception cannot be explained just by an account of the formal organization of the picture. Depth cues are notoriously ambiguous. The same set of cues can represent a variety of object configurations or scene arrangements. Evidence suggests that an unconscious inferential process is needed to see configurations as representing spatial relations". (P. 101).

Or the imagery that exists within the brain is as Ryle describes:

"Roughly imaging occurs but images are not seen. I do have tunes running in my head but no tunes are being heard when I have them running there. True, a person picturing his nursery is in a certain way like that person seeing his nursery but the similarity does not consist of his really looking at a real likeness of his nursery but in his really seeming to see his nursery himself, when he is not really seeing it. He is not being a spectator of a resemblance of his nursery but he is resembling a spectator of his nursery!". (120)

The abstract multidimensional quality of imagery is notable but of course visual observation has prominence over observation by the other senses, with most people visual imagination is stronger than auditory, tactile, kinaesthetic, olfactory and gustatory imagination. Indeed Wittgenstein (1953), thought language was a medium for representing mental imaging. For example he noted that words like "not" and "and" and "or" and "if", the so called logical constants were not part of mental imaging. He thought that these logical constants were just ways of linking images together but that they themselves are not part of any picture. Importantly Wittgenstein deemed pictures to be autonomous, textured and whole. Arnheim (1968), suggests that in this search for art and what or how it effects or interacts with the psyche, he insists that art exists only as psychological experience; and that the forces which generate that experience are a gestalt of "the highest degree". (P. 197). The psychological forces that determine artistic form operate essentially in the perceptual process of vision and the area of motivation and personality; which are of course perpetually interacting Arnheim (1974) maintains that although the brain's visual imaging system is always attempting to simplify its received pictures what in fact saves the human
being from bland horizons is that imaging is an open system rather than a closed one. The inflow of external energisers constantly upsets and delays the striving towards final image. It is the clarification of visual forms and their organisation into integrated patterns as well as the attribution of such forms to suitable objects that leads probably to a developed general intelligence. Could it be, that clarification of integrated images and patterns may be part of a recognition platform requisite for a creative designer?

3.8.1.: DETERMINING COGNATE AESTHETIC ABILITY

Other researchers have prescribed certain expressionism in art i.e. the use of colours, forms, patterns etc. are, or can be a helpful aid to the personality and probable abilities of individuals. This may be useful as an aid in building a general "picture of the "designer type" when allied to much of the cognitive work in divergence and creativity.

Alschuler and Hattwick (1947), analysed a large number of designs done by nursery school children and compared them statistically with what was known about the children themselves. They assert that children who prefer warm colour show "warmer" relationships to other people while cold colours go with more controlled behaviour. The practice of overlaying one colour with another is found in highly repressed children. Children who use heavy strokes and squares, rectangles or verticals are more assertive than self centred children who like circles in their pictures. Iochim (1976), suggests this form of "isomorphic" behaviour can be related to older children and pre-college students (18 year olds in the USA). Her work in Chicago schools also indicated that 'visual literacy' is important in the analysis of perception, 'belief' and 'in action' viewing and interpretation. She also noted that the perceptual decoding was dependent on the strength of the stimulus provided. Powerful colours in large symbolic or iconoclastic forms led quickly to interpretations and memory retention which then aided image recall. This of course is similar to the findings previously recorded of Guilford and his memory retention gate model, (Diagram 14) and Pylyshyn's deep representations model.

Khatena (1976) very forcefully argues that an individual's creative ability is very much linked to the role of imagery. Indeed both imagination and creativity are the result of visualisation. Truffinger (1980) agrees that it is an important component as does Hermann (1990). However, Hermann expands the model:-

"Images don't have to be fully visual, they can be experienced non visually, felt kinesthetically, somehow the mind provides us with a sense of image without necessarily providing a fully detailed image which then dominates any creative preoccupation at that time". (P. 276).
Within cerebral imaging is spatial ability, which Ahsen (1984) notes is:

"The single most intriguing property of imagery and the property that appears to
distinguish it from other forms of deliberate rational thought is that it has a certain
intrinsic autonomy". (P. 43)

However this autonomy is not specifically insular, it exists within an intellectual matrix
which Amabile (1990) states is itself dynamic in character and therefore constantly
influencing the imaging capacity. This influencing is described as cognitive penetrability.
Cognitive penetrability is important i.e. the response to the knowledge or belief system, so
producing changes in foundations thus changing the stability of a concept or undermining
the process of defining process 'equivalence' thus rendering useless - or practically so,
partial analysis of activities or convictions. This is of particular importance to building
design where long held beliefs about design methodology or stylistic longevity can be
destroyed or altered almost instantaneously.

Architectural students are often prone to what Rollins (1989), refers to as a "view-
attrition image" (VAI). He states that the usefulness of employing such a meta image is
that it allows the imager to picture the form his perceptual and visual memory judgements
take. Having that access provides him or her with the information they need to try to
integrate his perceptual judgements with his system of beliefs, desires and so on. Unfortunately this attribution image when used by weaker less imaginative students lends
simply as a copy of what exists. It may be that the degree of impregnation of the VAI will
indeed be part of the basis for rationalising the individuals degree of originality from
innovative designer to plagiarist. Could it be that the greater the memory recall the lesser
the ability to be innovative in design and visa versa? Can those individuals with weak
memories (for example, some types of Dyslexia with cognitive dissonance responding to
peripheral imaging) be more creative or inventive than those who have high memory
retention and recall attributes? The suggestion being that such recall abilities act as
blockages to instinctive creativity. Does it also indicate a more mechanistic mind? The
author would doubt it but there are arguments to support this view.

What then is the role of imaging in design. Clearly the arguments continue as to picturing
and imaging with no universally agreed process dominating current thinking. However it
is important to note the numbers of authors who attribute strong spatial abilities, memory
and imaging as necessary attributes for artists and designers. Therefore it is important in
any selection process that these abilities are sought in those making application to design
courses.
What motivates or drives individuals to believe that they should become architects? It is essential to understand some of the motivational aspects of the individual's thought processes in order to establish criteria for recognising whether some of the motivations displayed by those choosing building design as a career are in the realms of reality or imagination.

Motivation is a complex area of research and it is therefore important to differentiate the specific area of interest to this thesis. Areas such as deprivation theory, fear, determinants, anxiety, aggression and extinction stimuli while obviously relevant to an individual's performance are however too great a base to realistically investigate here. In order to keep to reasonable parameters for this research the writer concludes that the most relevant form of motivation is achievement motivation.

McClelland (1953) in his development of the subject discriminates between 'hope of success' and its opposite 'fear of failure', its measurement by the thematic apperception test (TAT) is still recognised as a basic tool. Adler (1927), proposed a basic human drive "the upward striving for superiority". Roe (1952) in her study of eminent scientists wrote that "driving absorption in their work" characterised them all. In relation to this research, is this high motivation or is it convergent myopia? All authors researched so far state it is the former.

From McClelland's nomenclature and scaling is it possible to determine the level of motivation involved, related to the degree of achievement? The problem has always been in assessing the level of achievement received by the individual attaining it. In identifying tasks one individual may be "over the moon" about his achievement while another individual completing the same task may feel a limited sense of achievement. How are any meaningful, let alone objective scores or tables discerned in this form of problem analysis? It is indeed the major problem in relation to creativity and its open ended aspect. The nebulousness of its contents leads to such possible diversities of scoring that often the achieved value is relevant only, for that test group, in that location, at that moment in time. This also has the 'knock on' effect of promoting the opinion that low reliability on scoring must lead to low predictability in their usage. Yet constant usage and improvement should lead to better tests and higher effective scores for predictability. However because of the foregoing, tests have fallen out of fashion; almost the perfect "Catch 22" situation.
Maslow's (1959) work in organisational and human management identifies some of the motivational drive factors in his 'hierarchy of needs'. He notes that a need satisfied no longer motivates and that second order ergs, (needs not goals) are soon substituted by others when they become, in Hertzberg's (1966) terms 'satisfied'. The dissatisficers are the equivalent of Cattell's orthogonal factors. McClelland (1962) produced a similar hierarchy which the author has arranged below.

A Comparison of Basic Motivational Categories Proposed by Maslow, McClelland and Herzberg

<table>
<thead>
<tr>
<th>MASLOW CATEGORIES</th>
<th>HERZBERG FACTORS</th>
<th>McCLELLAND NEEDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Hierarchy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Physiological needs</td>
<td>Working conditions</td>
<td></td>
</tr>
<tr>
<td>2. Safety needs (material)</td>
<td>Salary &amp; benefits</td>
<td>Power</td>
</tr>
<tr>
<td>3. Safety needs (interpersonal)</td>
<td>Supervision</td>
<td></td>
</tr>
<tr>
<td>3. Affiliation, love, social needs</td>
<td>Fellow workers</td>
<td>Affiliation</td>
</tr>
<tr>
<td>4. Self-esteem needs (feedback from others)</td>
<td>Recognition</td>
<td></td>
</tr>
<tr>
<td>5. Self-esteem needs (self confirming activities)</td>
<td>Advancement</td>
<td>Achievement</td>
</tr>
<tr>
<td>5. Self-actualization</td>
<td>Job Challenge</td>
<td></td>
</tr>
</tbody>
</table>

Maslow's second order needs require hard work, application, discipline, etc. However it is the aspect of self-actualization that is important to this thesis. Can creativity only be activated when the hierarchy is achieved? McClelland and Herzberg would agree. The author has doubts. Surely hunger or other deprivations engender instinctive urges to obviate that complaint. Some of these responses may well come under the heading of being creative. The traditional garret in which the struggling artist tries to paint has many international examples.

3.9.2: MOTIVATION AS INCENTIVE

Atkinson (1957), considered motivation or motive arousal as a multiplicative function of achievement motive. He divided it into three interdependent categories which appear at
once pragmatic slightly prosaic but not unfamiliar to architects and students (Gardener 1987)

1. The strength of the achievement motive,
2. The probability of success, and
3. The incentive value of success.

Factors 2 and 3 are seen as directly intensely proportional to each other. This also presents the risk analysis aspect of motivation, leading to expectancy theory and aspiration theory.

Amabile (1983) however disagrees with point 3 (above), on Atkinson's scale. She argues that extrinsic values such as material reward or social approval act against creativity. She states that the creator must be driven by his/her own internal drives, what Rogers (1954) refers to as the "internal locus of evaluation", (P. 54). This confirms the "strength of character and independence, ergs and sentiments, (Cattell (1963) & Torrance (1970)). Where Atkinson brought the theory forward, was by the introduction of the individual difference parameter which showed that temporary arousal on a number of drives such as sex or hunger produced changes in TAT scores. This function fluctuation is interesting as; it might be possible for it to be manipulated in order to increase motivation. Regrettably manipulation using fear is probably the best understood (Ref Nazi concentration camps and work productivity Hoess (1946) Verba (1948)), and also probably greed.

3.9.2.1 CATTELL AND KLEIN'S ERGS AND SENTIMENTS

cattell, while developing his own factorial analysis of personality produced several lucid papers on the structure of motivation which has been developed considerably by researchers. Cattell's (1957/68/71/75/77 et al) factor analysis of motivation is reluctant here. Primary to his researches was the aspect of motivation as a conditioned pattern, i.e. "a manipulated pattern of reinforcement" (1976) which he quickly disparages, pursuing a 'more complex cognitive and emotional' factor. Cattell outlines three basic aspects of motivated behaviour.

1. Spontaneous attention to specific things as against other things.
2. There appears to be a characteristic emotion specific to the drive and its action.
3. There appears to be an impulse to a course of action which has a particular goal as its end.
Kline (1975) suggests that interest is better used in the context of inferred behaviour. He also notes that its measure in the social context is bounded by many cultural social and personal precepts. He continues:

"Interest refers to the enjoyment and voluntary performance of activities, and thus the underlying dimensions are unlikely to be specific. Therefore that as explanatory concept it is quite useless". (P.131/32).

Cattell initially isolated five factors of motivation and later he and Child (1975) added a further two elements. These were all designated with Greek alphabetical titles. These motivation 'primaries' yielded 'second stratum factors' which have the complexion of being either integrated or 'unintegrated'. These layers of motivation are seen to be related to what Cattell called the 'dynamic lattice'. This lattice is constructed from the many aspects of motivational behaviour. It is a series paths establishing goals and sub goals. Goals are often products of multiple subgoals, either conscious or subconscious.

The summation of these chains and drives is the final level of this goal achievement, which Cattell names an "Erg". It is also clear that goals and sub-goals may not be consistent, or in fact that the subgoals may be multifaceted and be parts of other goals. Diagram (11) shows part of such a dynamic lattice from Cattell (1977) P. 177. The 'erg' is defined by Cattell (1977) as:

"an innate reactive tendency, the behaviours of which are directed towards and cease at a particular consummatory goal activity". (P. 179).

He likens 'ergs' to 'drive' and suggests that clusters of 'ergs' become "sentiments" being effected partly by instinctive emotional and consummatory factors. Sentiments he defines as:

"Dynamic structures visible as common reaction patterns to persons, objects or social institutions and upon which all people seem to have some degree of endowment". (P. 179).

Sentiments he suggests show up in the dynamic lattice as intermediate subgoals between initial attitudes and final goals. Which ergs do building designers use, do they determine a designers final product as discussed earlier by Oakley (1967)? The author would suggest they do.

Overpage is Table 5, reproduced from Cattell and Kline (1977), showing the main areas of activity of 'Ergs' and 'Sentiments'.

127
Motivation: Towards the Objective Measurements Of The Components

Hypothesized List of Human Ergs

<table>
<thead>
<tr>
<th>Goal title</th>
<th>Emotion</th>
<th>Status of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food-seeking</td>
<td>Hunger</td>
<td></td>
</tr>
<tr>
<td>Mating</td>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Gregariousness</td>
<td>Loneliness</td>
<td></td>
</tr>
<tr>
<td>Parental</td>
<td>Pity</td>
<td></td>
</tr>
<tr>
<td>Exploration</td>
<td>Curiosity</td>
<td>Replicated factor; measurement battery exists</td>
</tr>
<tr>
<td>Escape to security</td>
<td>Fear</td>
<td></td>
</tr>
<tr>
<td>Self-assertion</td>
<td>Pride</td>
<td></td>
</tr>
<tr>
<td>Narcistic sex</td>
<td>Sensuousness</td>
<td></td>
</tr>
<tr>
<td>Pugnacity</td>
<td>Anger</td>
<td></td>
</tr>
<tr>
<td>Acquisitiveness</td>
<td>Greed</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Goal title</th>
<th>Emotion</th>
<th>Status of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appeal</td>
<td>Despair</td>
<td>Factor, but of certain independence</td>
</tr>
<tr>
<td>Rest-seeking</td>
<td>Sleepiness</td>
<td></td>
</tr>
<tr>
<td>Constructiveness</td>
<td>Creativity</td>
<td></td>
</tr>
<tr>
<td>Self-abaseme</td>
<td>Humility</td>
<td></td>
</tr>
<tr>
<td>Disgust</td>
<td>Disgust</td>
<td>Factor absent for lack of markers</td>
</tr>
<tr>
<td>Laughter</td>
<td>Amusement</td>
<td></td>
</tr>
</tbody>
</table>

Hypothesized List of Human Sentiments

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Profession</td>
<td>S15 Theoretical-logical. Thinking, precision</td>
</tr>
<tr>
<td>S2</td>
<td>Parental family, home</td>
<td>S16 Philosophical-historical.</td>
</tr>
<tr>
<td>S3</td>
<td>Wife, sweetheart</td>
<td>Language, civics, social-cultural, esthetic rather than economic</td>
</tr>
<tr>
<td>S4</td>
<td>The self-sentiment. Physical and psychological self</td>
<td>S17 Patriotic-political</td>
</tr>
<tr>
<td>S5</td>
<td>Superego</td>
<td>S18 Sedentary-social games. Diversion, play club and pub sociability; cards</td>
</tr>
<tr>
<td>S6</td>
<td>Religion. This has emphasis on doctrine and practice, one high social and low esthetic values</td>
<td>S19 Travel-geography. Possibly Guilford's autism here</td>
</tr>
<tr>
<td>S7</td>
<td>Sports and fitness. Games, physical activity, hunting, military activity</td>
<td>S20 Education-school attachment</td>
</tr>
<tr>
<td>S8</td>
<td>Mechanical interests</td>
<td>S21 Physical-home-decoration-furnishing</td>
</tr>
<tr>
<td>S9</td>
<td>Scientific interests. High theoretical, low political;</td>
<td>S22 Household-cooking</td>
</tr>
</tbody>
</table>

continued over page,
The dynamic lattice is a useful model, and some of its ergs and sentiments appear directly related to architectural student selection procedures, though its "super complexity" can be noted within particular factors. Cattell and Child in demonstrating the lattice relating to sex, identified that it is almost impossible to represent; as the numbers of ergs and sentiments are so great. What is also of importance is the drive or dynamic trait involved, i.e. the drives for sex from a sex starved prisoner of natural disposition compared to those of another, say, after bromide treatment and 'a cold shower', are considerably different as between, quick and impulsive to sluggish and bored. Therefore any dynamic factor must be so broad and also be capable of coping with so many different ergs and sentiments that the dynamic trait must as Cattell says be "temperamental". The number of stimuli involved in 'sparking or damping' the dynamics of motivation are indeed too great to attempt to cover here. Though it appears to the writer that Abraham Maslow's work in organisational and human management identifies some of the drive factors in his 'Hierarchy of Needs'.

Another aspect of the human character must now be addressed, human 'temperament or disposition. It was noted that Cattell used the term before in the context of trying to explain the almost inexplicable crossings, usings and triggerings of ergs and sentiments. However temperament is probably locked in the individual's genetic code. Temperament generally is related to the "Orectic" aspects of personality, i.e. that aspect of personality that expresses impulsiveness, appetite, desire, emotion etc. In most management texts four 'types' are referred to; these are sanguine, melancholic, choleric and phlegmatic temperaments. In the generally accepted vernacular usage, these headings provide a form of key to the dynamism or energy of the particular individual. Cattell and Kline (1977) suggest that motivational and personality factors are independent (P. 194) though adding that in a "few" cases there are subsequent overlaps. The author feels that temperament is better measured in Ergs rather than delineating it into rigid sections. However it is interesting to speculate what temperament or ergs should a building designer display.

J.L. Holland (1966), defined six forms of motivational type, these are:

1. The Realistic Type;
2. The Intellectual Type;
3. The Social Type;
4. The Conventional Type;
5. The Enterprising Type;
6. The Artistic Type.

Holland considered that these interest types also identified motivations, though erg and sentiment values were not clearly allocated in the tests. That certain values can be identified is useful. Klein (1975) describes Holland's tests for the human types as:

"Most suitable in terms of empirical research. They have more psychological meaning, can predict changes in motivation and long term motivational goals to some extent" (P.143)

Any analysis of an individual's motivational drives becomes complex, again because of the nature of the subject and it may be that any of the "Freudian selves" predominate, i.e. ego, superego, or even the 'id' (i.e. extrinsic, intrinsic and facinorous self).

3.9.2.2 : RELEVANCE TO THE RESEARCH

When the career or occupation of architect and building designer are constantly referred to as vocational, then what sort of motivation and type of individual is required to execute the role becomes important. To the extent that the word vocation has a series of 'trigger'
aspects to it such as; dedicated, calling, metier, forte, preordained etc, then clearly it is a career that requires more care in its choice by the individual practising it, than say as a postman or fast food waiter.

Roe (1987), states that the drive or the motivation to create obliges competing drives to assume subsidiary roles, thereby inducing a distinctive motivational profile. Simonton (1988) agrees, and suggests that creative personalities prefer time for reflection and thus they tend avoid interpersonal contact, social affairs, administrative responsibilities and political activities. Another important and relevant aspect to Simonton's (1984) work was that of productivity and motivation. High motivation usually results in high productivity. Barren (1969) agrees, stating that "voluminous" productivity is the rule of highly motivated, creative, or original thinking individuals. Holland (1966) also offers this opinion as does Rogers (1954).

The researcher noted that Cattell (1963), found that both historical and contemporary scientists tended to be schizothymic (i.e. withdrawn and internally preoccupied) and desurgent (i.e. introspective, restrained, brooding and solemn). Simonton (1988), gives two reasons for how he thinks creativity can be an introverted activity:

Firstly;
"That social interaction and activity necessarily inhibit creativity. To the extent that the presence of others implies the possibility of evaluation, this interference effect would therefore be heightened all the more".

Secondly;
"Creative people must retain an "internal locus of evaluation". Recognition of the need to spurn extrinsic pressures towards conforming to social expectations may be partly responsible for the insistence on independence often displayed by creative people". (p. 405).

The author has included these views, because of their often perceived contrary position vis a vis artistic creativity, yet it is concurrent with the SI model and the need for specific relative quantities of divergent ability ( no matter how small or large). For example, many artists appear to be the opposite, from Michelangelo (1475-1564) through to Salvador Dali (1904-1988)a great many have been excellent self-publicists demanding and generally obtaining centre stage positioning, often dramatic, controversial and regularly garish in their lifestyles. Others of course have had desurgent natures. Van Gough (1853-1890) is the prime example. There were many others but Steele (1987) states that the flamboyant, or eccentric, unconventional or uncommon character tends to dominate any personality profiling study of any artistic careers.
Kenneth Clark (1976) records that the lives of many artists, and in particular Millet and Constable, began as shy retiring somewhat introspective youths. However once they had achieved recognition as painters of renown their characters also changed, ranging from being great teachers to martinetis. Clark also notes that others such as Goya, Gericault, Blake and Ingre were adventurous, tough and demanding of recognition from the earliest noted observations. Giorgio Vasari (1550) in his 'Lives of the Artists' recorded the precociousness of all the Renaissance artists architects and sculptors. Botticelli, Donatello, Bellini, Masaccio, Giotto etc. Of the twenty artists which Vasari described in varying degrees of motivational detail, all without exception were gregarious, aspiring, assertive, regularly audacious, avaricious and ardently forceful. Interestingly he records that Giotto and Uccello ended up "solitary, eccentric, melancholic and poor. He notes that like Giotto, "Uccello was endowed by nature with a discriminating and subtle mind, but he was later motivated only in exploring certain difficult or rather impossible problems of perspective. He continues that, though fanciful and attractive, this hindered him so much when he came to paint figures, that the older he grew the worse he did them". Indeed Uccello seems to have been a bit of a hermit, who constructed his paintings with almost mathematical precision.

The variability and non-specificity of the profiles accentuated by Vasari in some ways parallel Roe's 1951 study of physical scientists. At a simplistic level the writer would draw a parallel with Hudson's observations in "contrary imaginations" where he records in detail the attributes, abilities and character of 'divergent' and 'convergent' school children, the parallel with Uccello and possibly Giotto being convergers seems to be more than a possibility. Clearly, most creative artists require convergency as part of their character if only to be able to execute their creative ideas. However, it is also after the case that once the creative 'genius' of the artist is recognised, such artists then employ assistants in order that they can spend more time generating ideas. The "great creator" in general begins the work the assistant works it up and then the 'master' completes the work. Also from any selection of artists chosen from history, Hatfield (1948) records that there is a high proportion of suicides or untimely deaths from such groups as compared to others. Vasari and Clark also identify that many of the artists and "high creatives" have indeed been manic depressives. Clark further suggests - that manic depression is one of the personality indictors that may indicate high creativity. This concurs with Shapiro (1965), Hudson (1967) and Sedgwick (1982). The author would suggest that it may in some instances be a relevant indicator but the complexity of mental processing is such that the efficacy of such a statement must be cautioned until considerably more work is done in this area.
3.9.3.: CULTURE BLOCKERS

This idea was formulated, introduced by Leary (1964), in his text "Widening experiences in creativity". These models draw upon the total creative model. Leary suggests that any analysis of creativity must be multidimensional. He suggests creativity can be "direct fresh" or it can be reproductive, i.e. within the interpretative framework of what has already been learned. The writer would suggest that reproductive creativity can be dangerous in the context of design schools, because the student may see only what he has been taught to see. The two diagrams which Leary produced to illustrate his model are shown over page. The elegance of the theory and the simple rendition of the drawings has, suggests Taylor (1988) considerable merit. Prince (1970) is not as generous, he suggests that the models lack any sort of critical time factor, but are otherwise useful. In Leary's model he reproduces these two main concepts of creativity but develops two further aspects of them, the four categories are:

Creative Creator: (New experience presented in novel performances - the innovator).
Creative Blocked: (New direct experience expressed in conventional modes).
Reproductive Creator: (No direct experiences, but craft skills in producing new combinations of old symbols).
Reproductive Blocked: No novel experiences, no direct experiences - the cannon fodder of society).

Leary's Culture Blockers. The two diagrams below and overpage identify the models developed to analyse the individual's possible creative abilities related to cultural parameters and pressures.

Diagram 12 Learies
Culture Blockers
Diagram 13 Leary’s Culture Blockers.

He then allocates what he considers the distribution of these categories through American society. These are Creative Creative, 1% maximum and only found in what he terms "a golden age"; Creative blocked, probably around 12%, the same for Reproductive creative and finally Reproductive blocked, which he allocates 75% of Americans. This distribution of creativity very much mirrors Galton's work. The second model is sociological and parallels Hertzberg's and Etzionis' work on managerial personnel. Leary notes that the individuals within each group probably have a scale and the group below represents the opposite ends of such a creativity scale.

Creative Creator individuals are:

A. Truly Creative Giant recognised by his own age and then ages to come.
B. The mad creative genius, the undiscovered far out crackpot creator who is recognised by later generations as a creative giant.

Creative Blocked are:

A. Solid, reliable person with "deep streak".
B. Psychotic (religious) crank, eccentric who uses conventional forms for expressing mystical convictions.

Reproductive Creator

A. Bold imitator who wins game recognitions but whose fame crumbles as fads or performances crumble.
B. Reliable nihilist, insensitive, unsuccessful innovator whose shock value changes to morbid curiosity as fads or performances crumble.

Reproductive Blocked

A. Competent, responsible, reliable worker.
B. Unimaginative, incompetent hack.

A = Top of scale. B = Bottom of scale.

Leary's work is of interest though it is something of a blunt instrument. Though this work is insightful, how can it be used in schools of design as a tool for selectivity. Taylor and Ellison's (1983) biological inventory, may be useful in seeking out creative characteristics rather than creative thinking as a first process. Assessing intellectual and creative thinking components can come later but again, the test and components and subcomponents are complex to manage and access.

Again one of the problems of identifying 'creative designers' is the inherent social indices of fashion, style, trend, fad, vogue, tastes, chic urbanity assumed culture, sophistication and any other term that presents a "temporariness" to design. Within the context of these 'fads' probably the most promising designer that schools should identify would certainly be Leary's "Reproductive Creator" type.

3.9.4: MACKINNON'S CREATIVE ARCHITECTS

Leary's analysis leads directly on to one of the earlier studies of architects' abilities and attitudes which was by MacKinnon (1962). His study of "The personality correlates of creativity", is a study of American architects. MacKinnon interviewed and tested some 40 architects at his Berkeley campus. These architects were the result of asking American university 'Professors' of architecture (all from the same University of California School of Architecture), to nominate their own 40 most creative architects. This generated just 68 names. However this could place the study in question, as MacKinnon did little to
differentiate between the professors. The fact that they were all from the same "senior common room" was an error. His later samplings were more diverse though his original core sample of forty did provide the foundation for his work.

His work is important for this research as it identifies the problems of analysis. MacKinnon bases all his research on the opinion of architects. The old 'adage' that placing Dracula in charge of the 'blood bank' is not necessarily the best way to go about things. Architects are notoriously partisan. Style debates regularly draw blood and have for centuries. For example recently, the debate between post modern stylists and high-techists has had no middle ground. It is likely that at a particular given moment in time, a post modernist could see no value in any high tech design, terming it a pile of 'oil refinery' junk.

Likewise a high-techist generally describes post modernist work as the product of a "Child's building block banality". How could one account for the creativity of the other if they cannot begin to understand what either is trying to achieve. Similar situations rise in art between figurativists and abstractionists. It is often noted in architectural competitions, that if the judges can be identified then the character of the final design can be arranged to appeal to them. That is why in many competitions the identity of the judges is kept confidential.

MacKinnon, as part of this research, using the Gough California Psychological Inventory (1957) generates an interesting inventory of adjectives to describe an architect. The first seven are in hierarchical order: - Responsible, capable, cooperative, reasonable 'wide interests', sincere, serious. It is interesting that the Gough test presents no creative terms in the primary group i.e. artistic, imaginative, enterprising, individualistic, energetic. This may be because MacKinnon had gone out to "creative architects". He was therefore not seeking to define what creativity was, but in what form of personality it could probably be found. MacKinnon determined from his tests that the type of personality profile that high creative architects had was as follows. Dominant, social achievers who are poised, spontaneous and self-confident in personal and social interaction, though possibly not of an especially social or participative temperament.

They should be intelligent, outspoken, sharp-witted, demanding, aggressive and selfish. Of course they should also be persuasive, verbally fluent and both self-confident and self-assured. They must be relatively uninhibited in expressing their worries and complaints. This individual must be relatively free from conventional restraints and inhibitions, not prepossessed by his own impression of others and probably be capable of great independence and autonomy and ready to recognise self views that are unusual and
unconventional. They are also strongly motivated to achieve their own goals particularly in a non-conformist format. Though it is identified that their efficiency and steadiness is not particularly different to other careers. Finally, they must be definitely more psychologically minded, more flexible and possessed of more femininity of interest than others.

MacKinnon's research does provide a shortlist of adjectives which he suggested may be typical of the creative architect and are as follows:

"Aggressive, dominant, self-confident, not especially sociable, self-centred, persuasive, (cynical), (my parenthesis) relatively uninhibited and independent".

It is interesting that this panoply of criteria strangely mirrors Vitruvius writing since two thousand years earlier.

While all this may certainly be applicable to successful 'big name architects' in terms of their character and psychometric profile, it is certainly also the case in the personality profiles of many other career groups, i.e. politicians, advertising executives, newspaper editors, film directors, orchestral conductors, motor racing drivers, athletes, etc, etc. What MacKinnon has identified is a particular type of individual who can cut his way through society and become successful, he did not define success, which might be measured as financial, critical, power based, scale of operational terms in achieving national or international recognition etc. Neither did MacKinnon attempt to define what good design was in the context of his architect, he was more concerned with success which he may have assumed indicated good design. This may be explained as an outcome of the fact that he was interviewing architects who had already been nominated by other architects as being high creative.

MacKinnon has been criticised by Broadbent (1988) as being too nice to architects. Many texts chronicling the lives of great architects - Vasari (1550), Gloag (1963), Richards (1974), Blake (1976), all hold accounts of how selfish, bad tempered, conceited and arrogant many of them were. It is not a point as to whether design schools should be looking for such individuals.

3.9.5: PEAK PERIODS FOR COGNITIVE CREATIVITY?

It is important also in terms of architectural talent to establish whether there are there points in the average human life span that are potentially more creative than others; granted that the product of that creativity will take different forms, or can we take it for granted? For
example a young child building sandcastles, be compared with the architect Frank Lloyd Wright producing one of his finest buildings at the age of 89? Is the level of creative achievement equal in both instances. As socio-cultural intelligence grows so does the individual's application of his creativity. The question is, does the individual's intrinsic level and ability to be creative change? Does it, as Torrance (1979) suggests increase or decrease? Or does it remain constant and all that changes is the individual's efficiency and effectiveness in using their creative capacity. Literature has documented the seven ages of man. The best known version is recorded by Shakespeare in his play "As You Like It" where he observed.

"All the world's a stage. And all the man and woman merely players. They have their exits and their entrances. And one man in his time plays many parts:-

Infant  His acts being seven ages. At first the infant Mewling and puking in the nurses arms  
Schoolboy  And then the whining schoolboy, with his shining morning face creeping like a snail unwillingly to school  
Lover  And then the lover sighing like a furnace, with a woeful ballad Made to his mistresses eyebrow.  
Soldier  Then a soldier, Full of strange oaths and bearded like a pard  
Justice  And then the justicen fair round belly and good capon linedWith eyes severe and beard formal cutFull of wise saws and modern instances  
Retirement  The sixth age shiftsInto the lean and slippered pantaloonWith spectacles on nose and pouch on sideHis youthful hose well saved a world too wide  
Senility  Last scene of all that ends this strange eventful historyls second childishness and mere oblivion.Sans teeth, sans eyes, sans tastes, sans everything.

This elemental model has been referred to in general terms throughout history and in the area of developmental psychology each element in part has been much further amplified as this research has annotated in an earlier section. However the question does remain, given a 'design potential' through genetics, at what point if any does it reach maximum capability. Or does it ebb and flow, peaking and troughing, related to the moon or diet and assuming the individual has had the proper environment in which creativity can exist The writer purposely omits the words develop, flower, blossom in this context, as the
question still remains to be answered. In short is being 'design able' a natural phenomenon of constant power, its strengths and weaknesses only being related to the prevailing pressures of 'culture blockers'.

Dacey (1989) has further developed Gowan's (1972) work and believes that there are certain peak periods in life during which creative ability can be cultivated most effectively. His research suggests peak periods during which creativity may be cultivated. These are:

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However, the dichotomy which arises in much analysis and statistical evidence which is presented as a result of research into architects and their creativity is of course the whole issue of the environmental impact on the individual. How has their training affected their measured responses? What is important however, is to differentiate between the work on creativity identified and measured before exposure to an architectural course and creativity as measured either during such a course or after a course in the case of the practising architect. This important distinction was noted by Ferguson (1987) who claims that, "factor ability is itself formed through a process of transfer". This very much reflects the author's experience; having been trained over a number of years to a particular process it becomes difficult to define problems or provide answers in anything but those terms.

In Guilford's SI model creativity was identified as a basically divergent activity. However he also recognised that all creative activity as distinct (authors note), from creativity involves convergent activity. Again Guilford's "commonwealth" of intellectual abilities is the foundation for many of the subsequent researchers and authors in the rest of this section. The author believes that the individual brain like the individual fingerprint is unique. Each brain certainly has similarities with others, so many indeed that to differentiate at the physical level appears difficult except for defects, etc. However despite the contra indication of mass movements and mass histeria etc. it seems that at DNA and cognitive levels each has its own singularity. It is clear that cultural determination can sublimate individual intellectual responses to such a level that superficially, computer analogies and mechanistic serialisation of culture can be perceived as truths and realities.
self-evident for the betterment and progress of mankind. However while the author still recognises the currently impenetrable holistic aspects of the brain; creativity is one element of that holistic energy. Its description and analysis is always by way of reductionist methodology.

Torrance in "The Blazing Drive" (1987), lays out his ideas on what creativity may be. He suggests that there is no specific definition for creativity. To an extent this author agrees. Torrance notes that most approaches are either process, cultural, or environmentalist. (Clearly there is some overlapping and interdependence between these groups). He states that for creativity to exist or for something to be creative it can probably only be labelled as such by others. This author does not agree, and this is of course the environmentalist's problem - that is, that it cannot exist unless it can be referenced to other similar experiences or examples. The majority of people are creative in their own quiet way without recognising it in themselves or having it recognised by others.

It is important to return to the researches in the separate aspects of creativity that have created the platform of knowledge from which to move forward.

3.10.1.: CREATIVITY - PRACTICAL CONTEXT

Earlier in the text nomenclature such as inventiveness was used before the cognitive term 'creative' was fully developed. However it is important to understand that creativity is a trigger word meaning many things to many people. Is creativity and inventiveness the same? Are 'illumination' and discovery the same? Is an invention the result of creativity? The following may provide guidance:-

(1) Qualified intellectual activity should have preceded the invention.
(2) The idea should clearly overcome special difficulties.
(3) The amount of experimentation carried on before the achievement of the novelty is considered relevant.
(4) A history of failure is also considered relevant.
(5) The product should be useful and should provide a stride forward.
(6) A product is deemed particularly creative if persons engaged in that branch of activity had shown prior scepticism about the likelihood of the inventors line of inquiry.
(7) The product should fulfil a previously unfulfilled desire.

These parameters are for a 'patents' lawyer attempting to establish a 'sole' right to the invention and for future patent's clerks to be able to recognise 'a priori' rights to a specific invention. However whether they should be taken as an effective model of inventive
creativity is dubious. The model does call for specific convergent processes as do previously quoted authors on creativity. However, it should also be noted that there have also been a series of inventions which while not spontaneous neither were they the result of particularly harrowing years of painstaking research.

One is also at this point driven to the need to differentiate between an 'invention' and a 'discovery' as both are occasionally taken to be synonymous. Are the models for both identical or if not how do they differ? Dictionaries define the two variously as:

**Discovery:** To disclose or expose to view anything covered up or previously unseen; to reveal etc.

**Invention:** The action of devising, contriving or making up; fabrication; in art and literary composition; the devising of an idea, subject or method of treatment by exercise of the intellect or imagination.

Clearly the model for both must be very flexible with commonalities and overlapping of specific activities. Nonetheless, this research would suggest that there is a difference between them. To the author creativity is more akin to invention, though there are also elements of creativity in discovery the author would suggest that they are in inverse proportion to each other.

 Obviously the proportion for inventiveness depending on the individual could be 40% discovery and 60% invention and visa versa. The U.S. Patents rules would appear to be more associated to the discovery rather than the inventive model. Within the context of this thesis inventiveness is more appropriate than discovery. Clients demand design solutions from their designers in short time - not after considered research, practice and testing. Designers as identified by their own professional associations (RIBA, AIA) models owe only a little to their designer ability - related to their fee model, (see previous sections). However inventiveness needs to be investigated as part creativity according to the author's original definitions relating to design creativity.

Guilford, Getzels and Jackson and Hudson, the early writers on creativity and intelligence determined that creativity was essentially a divergent process. However, any analysis of creativity and the thinking processes immediately involves the researcher and has been recorded before in the realms of Gestalt and behaviour - of psychology, philosophy, mysticism and phenomenology et al. So how do we recognise creativity? To most authors in the field, the process of creativity is seen as just that. It begins with a problem, deals with the synthesis and develops an answer; that is certainly the creative process, however
this process is just an application of the creative mind. Generally the term creativity has been unnecessarily restricted by attaching it so closely to some tangible product. Creativity is a heuristic process. Each individual will exist with the context of his own life and experience model and these various attributes when in liaison with the innate creativity factor and the individual's own dynamisms will result in the "creativity response" to situations and problems.

Broadly, the process is currently analysed to be the sum to two general trends, cognitive orientation and personological approach. Cognitive orientation relates to analysis determined by convergent or divergent thinking and their relative proportions, while the personological approach deals with creativity as a construct in general, personality theory which, according to MacKinnon, is probably best proved in the humanistic tradition. The following is a minor selection of the literature which will be broadly expanded in the next stage of research.

Divergence seems to relate to creativity and is part of the SI model. As so many facets of the SI model have been examined and tested; we must now look to the availability of tests which provide an indication of an individual's creativity or creative potential, as both are usually distinctly different. Hudson (1980) noted that in the area of creativity the following 'maxims' applied.

1. The conventional intelligence test is outdated.
2. In place of the conventional intelligence test we now have tests for creativity.
3. That despite the existence of creativity tests the factors which determine an individual's creativeness are personal not intellectual.
4. That originality in all spheres is associated with the same personal type - The diverger.
5. That convergence is a form of neurotic defence while divergence is not, divergence leads to all the good things in life, personal as well as professional, convergence achieves the second at the cost of the first.
6. That conventional education is antipathetic to the diverger, hence it jeopardizes the nation's supply of creative talent.

The first five points are generally agreed in some form or other by the majority of authors. (Guilford, Eysenck, Catell, Torrance, Kline, Roe, MacKinnon et al). However point (3) has been and still is in contention. This problematic has been laid to rest for the author in the previous sections, in particular when related to 'savants' and other specific holistic cerebral models. Though it may be useful to note that previously researchers such as Getzels and Jackson, Hason, Wallach and Hogan (writing in the sixties and seventies) agreed that creativity and IQ were interdependent. For example most of the above
researchers noted that from their data the indications were that the top IQ sections of the groups they tested were also the most creative though this group was further split into high creatives and High IQ's.

Getzel's and Jackson, (1962), clearly differentiated between the high IQ and the high creative individual. Their studies differentiated children who were:

"both creative and intelligent, creative but not intelligent, intelligent but not creative and neither creative nor intelligent". (P. 243).

Their work with these children need not concern us here in as much as it concerns a great deal of classroom politics and aspects of survivalism on the part of several of the groups. Their main concern was that creativity per se, at the time of their research was nearly always stifled and indeed many of the creative children were labelled as difficult or rebellious. In fact this is still a current spectre in all educational establishments and specific courses. The great unresolved conundrum or is it unchallenged assumption, that holistic tutors can teach serialist students or indeed can/should divergent students be taught or tutored by convergent teachers remains unresolved. One aspect of both the creative and the intelligent student was indicated by their "tolerance of ambiguity". Ambiguity is when the individual can perceive no specific information or structural lattice due to new environments, missing information and little or no perceived rules or procedures. Barron (1968) suggests that the ability to remain open minded in such situations (ambiguity) is probably one of the keys to identifying creativity in individuals. Getzels (1975), MacKinnon (1976), and Torrance (1979) agree. Getzels states:

"From this point of view the core of creativity is not the unconscious, or regression to primary process thought, even in the service of the ego. It is not a withdrawal from the world. It is openness to the world". (P. 334).

Wallach and Kogan (1980) stated that in summary of their differentiated student groups that both groups of creative students seem able to switch rather flexibly between thematizing and inferential-conceptual bases (for the high intelligence), low creativity students seem inflexibly locked in inferential-conceptual categorizing and strongly avoided thematic relational categorising. The low intelligence, low creativity students tended to be locked in thematic modes of responding and were relatively incapable of inferential, conceptional behaviour. This flexibility factor and the aspects of thematizing and inferential conceptualising are primary aspects of the ability to tolerate ambiguity.
De-Re And De Dicto Modelling

Dennett (1981) and Stich (1987) refer to the importance of ambiguity in the individual in their acceptance or otherwise of belief systems. The greater the degree of ambiguity then the broader the "notionality" of belief. Belief being the result of an individual's interaction (or expression of) with various networks of causal relations to objects, attribute sets, action effects and the substitution in proportional part of de-re and de dicto values. (i.e. de-re, imaginary possibilities and de dicto, the psychological perception of reality). It is the de-re aspect that promoted ambiguity, thus promoting imagination and belief patterning. Also, Stich categorises de-re and de dicto aspects and notes that overlapping of categories also creates ambiguities. These researcher's findings fits into Wallach's earlier four part model with the de-re aspects corresponding to creativity and therefore again relating to a high ambiguity tolerance. Earlier, Klein (1951) suggested a difference between 'sharpeners' and levellers, i.e. those who accentuate unusual factors and expand and develop them and those levellers who tend to level down such features so as to make the perception more conventional and acceptable and less 'ambiguous'. Sharpeners are much more aware of inconsistencies and more questioning, capable of absorbing and using ambiguities to their own advantage. Vernon (1965), in his analysis of creativity of individuals was keen to identify that "intellectual rigidity" was one of the key indicators of low creativity as as is intolerance of ambiguity - however he does not back or cross reference it to the opposite actions and responses though by intonation he suggests that it is so.

Some very early work by Shafer and Murphy (1943) identified one disturbing trait in ambiguity analysis and that was that their manipulation of their subjects was powerful, in that when ambiguity was displayed it was easily manipulated. Subjects could be positively or negatively persuaded to choose specific images. Gear (1989) suggests that this manipulation factor is quite common in the art (high creative) world. This one lead to a situation where styles and fashions often lead artists around by the nose, at best forming "schools" of ideas, at worst sheepishly pursuing a "fad".

Treisman (1972) suggested at that time that this probably related to selective attention and the lab conditions relating to the subjects problem of dividing their attention between two different responses to a single stimulus, i.e. the aspect of ambiguity and abstract perception (de re) against the removed or punishment regime (de dicto) of the test situation. There may well be some substance in this when related to architectural students, and their own intellectual belief and demand systems. These when confronted by the often disparate and possibly opposite demand systems of their academic institution and degree course permits manipulation of the students. Tolerance of ambiguity is recognised as a personality factor (Vernon (1968), Klein (1980)); and as such are thought to be an aspect of nurture. For
example Dacey notes that to the surprise of researchers it was found that those who had difficult childhood's often did much better than those whose childhood's had been placidly safe. He suggests surviving a terrible and even dangerous childhood is not the same as being creative, but he suggests that "the two skills may have something in common". (P.225). He believes that needing to survive is a great generator of ambiguity. The author would suggest that the homily "Necessity is the mother of invention", is within the same parameters. However whether it is a result of nurture is also debatable. Perhaps parents who expose or allow their children to be exposed to such 'dangerous' situations is, the author could speculate, because they were in the same situation themselves, and is possibly because of a similar genetic make up.

3.10.2. : "SUPRA-RATIONAL" CREATIVITY

In an article written by Torrance and Hall (cited in Torrance, 1979), the concept of supra-rational creativity is explained. As opposed to the normal step-by step ability to solve problems imaginatively, this higher type of creativity involves unusual levels of insight, intuition, and even revelation. Whereas the first type may be measured by written tests, this extraordinary type cannot. As these two authors describe it:

"The altered states of consciousness which produce supra-rational creativity may be analogous to the vacuum state of the quantum fields. Quantum physics tells us that the vacuum state is a state of least excitation of all matter and energy and that any form of existence can be created from it given the appropriate initial conditions. The vacuum state contains all the rules, all the laws of nature for all the phenomena of the universe. The supra-rational mode of creative thinking may be simply the process of individual creativity gaining access to "cosmic creativity", a "vacuum state of consciousness" which allows instant revelation, intuition, and insight. Functioning from a supra-rational level of creativity would allow the individual to transcend the limits of a rational linear process and explore the virtually limitless field of the further reaches of creative potential".

(P. 17).

How may we know when a person is operating at the supra-rational level? Torrance and Hall review studies that have attempted to answer this question and list several characteristics as indicating its presence. Supra-rationally creative people:

1. Become highly excited when confronted with novelty.
2. Are capable of synaesthesia (that is, tasting colour, seeing sounds).
3. Integrate numerous polar opposites (for example, feminine-masculine; serious-playful) in their personalities.
Because of the above trait, are highly capable of resolving collision-type conflicts between others, they are great peacemakers.

Are able to withstand being thought of as abnormal and eccentric.

Sometimes appear able to perform "miracles" - acts that cause wonder and astonishment and are inexplicable by normal standards.

Have extraordinary empathy and super-awareness of the needs of others.

Possess unusual charisma.

Have a rich fantasy life and do a great deal of daydreaming.

Have unusual brain wave patterns, especially during creative activity.

Produce strong, rich and accurate images of the future.

It is not necessary for all of these characteristics to be present in order to conclude that a person is supra-rationally creative, but the more that are present, the more this special trait may be said to be available. It is clear that no battery of tests currently available would be able to evaluate this list of characteristics. Only direct observation of behaviour is likely to identify this loftiest level of creativity. Then only the references of the observers need credible analysis and acceptance, i.e. who checks the checkers for their values and worth? Can a non creative assess creative work, can fine music be assessed by someone who is tone deaf?

In the foregoing, the research has looked at building design, both talent and creativity and produced sufficient information to conclude that the research for creative talent in architecture is a very complex series of issues. Creative ability in architecture is not seen as a specific single entity. Indeed it is recognised to be the result of a whole series of interacting psychological activities. These activities overlap, work in a dynamic manner and within a time scale, and can be as variable as the cultural habitat in which the perceived creativity is activated. It can be insightful. The solution can appear to be a flash of genius (even to the perpetrator) or it can be the result of a series of failed attempts all progressing towards a successful creative conclusion. Even flashes of genius appear to be always the result of short, medium or long term retrospection. The greater the divergency of the individual or conversely the less convergent they are in their thinking processes, the more successful they will be in their desire to be creative.

Memory, imaging capacity and its aspects regarding spatial ability are also of importance particularly in modelling the interior and exterior forms of a building. These forms are probably fuelled by reconstructing past visual and physical experiences, not necessarily in any particular logical or sensible way, but by blurred general patterning; the more motivated the individual the less blurred or more refreshed the imagined result.
How then can selection tutors identify high (or even medium) creativity in their applicants. As has already been mentioned the staff can generally be assured about a candidate's academic abilities and general intelligence through their examination results. But are not aware of their Creative potential. So to what extend and how might tutors select for it? How do tutors do it? In the next section the author will survey some relevant creativity tests and attempt to ascertain their validity in relation to building design and the selection of capable candidates for architecture courses.

3.11.1 : IDENTIFYING AND MEASURING CREATIVITY

Bearing in mind the dynamic and multifarious nature of creativity it is important to understand that any procedure for the measurement of creativity must be multi-dimensional in its approach. This thesis is attempting to discover if design talent is identified as important element in any prospective student applying to a building design course and if it is, is it quantified and understood? Within the concept of design talent is the individuals 'creativity' component. Gowan (1977) would suggest that creativity is probably the principal component. This is supported by Taylor (1978) and Treffinger (1980) who argue that in any "gifted" (talented) individual or enterprise; it is creativity that is the dominant factor. Creativity, it is suggested (Guilford, et al., Torrance, et. al., Cattell, et. al., etc.) can be measured, that is; given certain criteria. It is now the task of the thesis to examine particular creativity measurement tests which may be appropriate to discovering building designers.

From the previous chapter, creative individuals have the following ergs, sentiments, profiles, abilities etc.

A. Are prepared to be flexible in the face of the accepted conventional view of experience. This flexibility engenders their own existence and accepts the unpredictable and irrational. Indeed these later aspects of the process are welcomed.

B. Is identified as particularly independent of character, not needing 'team support' to produce; this also includes decision making.

C. Creative individuals are better, because of their divergent nature at formulating more complete concepts. Thus because of this they have the ability to generate multifarious ideas and their capacity for abstract thought.
D. They are tough, opinionated people who are not frightened by their own and subjective views on issues and problems, are confident, aggressive, opportunistic and self-directed.

E. Are co-operative, gregarious, witty and at the same time introverted, manic and uninterested in anything but their own concepts.

Five apparently simple sometimes conflicting characteristics to identify, yet as many previously quoted authors (Ward(1974), Weeks, (1988), Price, (1989) Kusskin (1990), etc have stated that many of the individuals leaving schools of design appear to have developed little creative ability. Hudson (1968) would suggest that it is because they have very little creative ability to begin with. Schools of architecture are there to improve the quality of the work of all their students but it is possible that there are students who can never be taught to design creatively and they should be detected at interview stage and such students should be usefully directed to other courses. Klein (1975) states that selection tests are available for such problem areas; and would be of use to selection tutors in their search for suitable candidates. We must investigate the validity of such tests.

Selection tests have many detractors, and it is important to specify one of the problems in any 'testing' scenario. Following the identification of the Hawthorn Effect (Mayo (1949)), the problem of test syndrome i.e. not acting or reacting naturally is a major preoccupation with most researchers. Therefore Keagh's (1955) Defence Mechanism Test (DMT) is often considered essential in order to have validity in the test. In the realm of assessment and testing it should be noted that there is disagreement on the validity of such testing as Dacey (1989) notes:-

"A number of educational theorists have suggested that high creative ability should be included as a criterion for selection for the gifted programmes, but at present this view is not popular in most United States school systems. The major reasons for their exclusion is the lack of confidence in tests of creativity". (P. 138)

Treffinger (1980) was also critical of relying solely on tests, although he suggests that some tests could be of value as part of an overall assessment programme. He excepts the work of Torrance & Torrance (1978) and Gibbs (1979). The second work by Torrance and Gibbs is aimed at school children but as Treffinger notes:

"Torrance has provided longitudinal evidence for example, showing that students who displayed greater creative thinking and abilities in high school were characterised by more extensive creative abilities and accomplishments in later years". (P. 24).
These contradictory statements on the validity of creativity testing appear to characterise the problem with using selection tests. Amabile (1982) notes that psychologists tend to favour testing while non-psychologists are very sceptical as to their value. This phenomenon, is also commented upon by Newman (1979) and Eysenck (1979). The author however will consider the various tests on offer and where possible suggest suitable protocols for use by building design schools.

Curtis and Edwards (1969) were clearly uncertain of their validity. They believed that while tests themselves were of value the weakness lay in those interpreting the results. This is yet another aspect of testing that must be addressed. Feffer (1988) also draws attention to those administering the tests and their abilities or lack of such.

So what tests may be available? MacKinnon (1962) in his early work, identifying creative architects, used several tests to access the multifactorial nature of creative individuals these were: The Minnesota Multiphasic Personality Inventory. This eight scale test for personality abnormality identified:

"In all our male creative groups an extremely high peak on the MI (femininity) scale was observed". (p. 479).

He also used the Barron Walsh Art Scale of the Walsh (1959) Figure Preference Test. This he used to identify a preference for complexity and a predisposition for non-symmetrical form (this may explain the argument between the post-modern and high tech schools of design).

Another test, the Myers-Briggs Type Indicator was used to identify the type of individuals who:

"are not bound to the stimulus and the object, but to be ever alert to the 'as yet not realised'. (P. 480).

Indeed Myers Briggs was instrumental in developing a series of tests at Princeton University School of Architecture. Her tests noted that architects prefer a "thinking feeling" matrix of processing as distinct to other professional groups who prefer one or other (i.e. thinking or feeling) of the two processes.

Finally, Mackinnon used the Allport-Vernon-Lindsey study of Values Test. This was designed to measure the relative strengths of an individual's values (i.e. religious, aesthetic, economic etc.). For architects:

"It is the aesthetic, with the theoretical value almost as high". (P. 490).
It can be seen that MacKinnon, working in the 60's required four tests in order to identify his creative architects.

It is also important to recognize that MacKinnon used other control groups in his experiments. He tested writers, mathematicians, scientists and each group produced its own profiles though he did not specify any overall criteria for creativity in these other groups. This he attempted later with Hall (1960) through the development of personality inventories. The aspect of this work was that architects have higher levels of creativity though not necessarily intelligence. This mirrors Hudson's (1966 and 1968) and Stott's (1983) findings on creativity.

3.11.2. : THE TESTS

One of the primary protocols used in identifying creativity in individuals is one of the California Inventory Tests in particular the California Psychological Inventory (CPI). Anastasi (1980) reports that the CPI itself is a derivative of the Minnesota Multiphasic Personality Inventory. The protocol consists of 480 elements to be answered true or false. It is designed to assess the positive aspects of personality. Gilchrist (1982) notes that the CPI indicates two cluster scales which typically refer to, (a) academic accomplishment, and (b) the other being the cluster concerned with adjustment by social conformity - this includes scales of responsibility, socialisation, selfcontrol and good impression. She states that the CPI has:

"value in distinguishing more creatively accomplished adults from their peers". (P. 276).

MacKinnon (1962 and 1968) used the CPI to investigate the creativity of architects. He suggests it is one of the better forms of test because its mean and standard deviation scores were better than average.

The CPI is one of a battery of creativity tests which it is important to discuss. But there are other relevant tests. One such test has had some success. This is the Remote Associates Test, which was derived by Sarnoff Mednick (1962). Mednick states that those people who have many ideas associated in their minds and who have relatively loose associations among these ideas are most likely to be creative. The Remote Associates Test was developed to identify those individuals for whom this is so. The test presents thirty sets of three words that are known to have weak (remote) ties with each other in the minds of the majority of people. Also the close association of each set of three words with a fourth word is also known. The typical associations among the words used in the test have been
established through considerable testing. Torrance et. al., (1963) believes the test has value in assessing creative ability. In designing this test, Mednick chose many sets of words that are remote from each other but associated to a fourth word, and then asked individuals known to be highly creative in guessing the fourth word when presented with the sets of three. He picked the thirty sets on which these people scored best and made them into a test that he then tried out on many other creative people.

The results were interesting in that the test appears to make sharp distinctions between a wide variety of highly creative and ordinarily creative groups. For architects, science and maths teachers, college professors in several fields, and graduate psychology students, the test proved adept at distinguishing between those rated high and low in creative ability (Mednick 1962). This is confirmed by Taylor and Ellison.( 1972) It is more than possible to disagree with Mednick's choice of correct answers or to believe that other answers are just as good. However, the test appears to do well, what it was designed for, identifying quickly, simply (and it is generally agreed accurately), those who have high creative potential. It should be noted that potential is not the same as actual achievement. Those with promise do not always fulfil it. Perhaps Mednick's test may only be good at finding those who are already productive but it may be not so good at predicting ability.

Originality

The Story-writing Test was developed by Torrance (1966) to demonstrate stimulus freedom. It may also be scored as a test of originality. Torrance, in developing the Minesota test of Creative Thinking developed a scoring format that included twenty-two factors. When scoring imaginative stories, the qualities listed below should be considered separately. If the whole story being judged manifests the quality clearly, a score of two is given for that quality. If the quality is definitely not there, a score of zero is assigned. When it is hard to say if the quality is manifested, or if it comes through clearly but weakly, a score of one is given. The twentytwo scores for the twentyfour qualities are summed for a total score. Therefore, story ratings may range from totals of zero to fortyfour. (Torrance 1966). Only eleven are reproduced below; in order to provide an indication of the process

Qualities:

(1) Picturesque wording. Writing may be said to be picturesque if it is strikingly graphic, colourful, and descriptively objective.
(2) Vividness. This quality is shown through liveliness and intensity. There is a penetrating strength and force.

(3) Original setting. The setting or theme of the story is unusual and original, as compared with the more ordinary ones written by persons of similar age and training of course. Caution must be taken for settings that appear original but are really probably adaptations of comic strips and T.V. plots etc., etc.

(4) Individuality of style. Is there specialness about the wording and grammar that sets the author apart from the others?

(5) Becomingness. There is a sense that the author so well identifies with the characters of the story that she or he is "becoming" a member of the cast. The writer knows the characters so well that their personalities are clearly developed (to the extent that this can reasonably be done, in the case of short stories).

(6) Perceptive sensitivity. The writer not only knows the characters, but there is also considerable insight and empathy for their feelings and dilemmas.

(7) Imagination. Inventiveness, fantasy, unique situations, original actions - all are indications that this trait is present. There is a clear-cut departure from the norm.

(8) Finding the essence. All the words and phrases seem appropriate and essential to the plot of the story. There is not much "fluff".

(9) Flexibility. The writer avoids such cliches as "lived happily ever after" and "once upon a time". The style is fresh and vigorous, even excitingly different.

(10) Communication of emotion. A distinct mood of feeling is established: cheerfulness, gloominess, suspense, rejoicing, and so on.

(11) Coherent unity. Diverse elements are brought into harmony and unity. The story clearly "hangs together".

Table 6 Minnesota Test Elements
It has always been of interest to the author how such tests for high creativity are assessed, and whether do they need high creative examiners. If not, how is the value assessed? Scoring is important but who assesses the scorer. If scores only are used and there is no account of the individual who scored them, what value do the scores have? The author would suggest that scores are certainly important but that on their own they are not enough.
Observation is also important, but are the observers capable of recognising all high creatives? This was Gowan's (1972) point. In particular the brick test (see below) was used to score hypothetical creativity ability. However Akermann (1987) suggests it has value but of course it is not "culture fair". Dacey (1990) is also concerned about the validity of the scoring. Can a non-creative person assess properly a highly creative one. He states certainly not by observation alone. There are several well established though simple tests for identifying elements of creativity. The author has included a short list what he believes to be appropriate tests and they are included below

The Torrance Uses for a Brick Test (1962).

In a five-minute period the person must write down all the different kinds of uses for a brick. The scoring is not only for the number of uses thought up but also on how different they are from each other and on their originality. Haddon and Lytton (1980) also refer to similar tests one being the Shoebox test, Torrance (1962). In this the candidate must identify as many uses as possible for a shoebox. Scoring is related to flexibility, one point for each category of response; as with the brick, this test, because of its spatial nature immediately appears more appropriate to architectural selection.

The Torrance Circles Test (1962)

Also called the circles and squares task - again scoring is related to categories of response, related to scaled common results. Another is the "Vague shape of dots tests" which is derived from the picture construction task. Its scoring related to elaboration: one point for each new idea added to the initial response; fit to concept a category which attempted to score for sensitivity to the qualities of the stimulus.

Haddon and Lytton's Block-printing Test (1980).

Here the candidate is provided with an ink pad and a small block of wood and a booklet of absorbent paper. Candidates were required to discover how many different kinds of mark they could make and to use them as they liked. (There were twenty-six possible types of mark). Scoring was based on the number of marks discovered and their patterning added extra to the score.

Haddon and Lytton also produced creativity stimulation and assessment tests for children, these as well as the above, also included 'The camping party test' which as a sociometric test, disguised as another test for divergent thinking and the 'Problems that might arise in taking a bath' which had scoring again based on flexibility with one point for each
response, originality was also noted and scored. All these tests are relatively simple to manage and assess.

The Purdue Test (1972)

This is another example of an originality test and is scored in just the same way as is the Used for a Brick Test: one point for each answer given (fluency); one point for each answer that is truly different from the others (flexibility); and up to two points for each answer that is significantly different from the answers others give (originality). Here one would be particularly concerned about the quality of the assessor.

3.11.4: MEASUREMENT OF PERSONALITY TRAITS ASSOCIATED WITH CREATIVITY

This research suggests that at least fifty personal qualities are alleged to be associated with creativity, and several tests have been designed to measure each of them. Four traits were more clearly established than the others. These are; flexibility, independence, multi-faceted ideas and confidence.

Flexibility. The Asking Questions Test, a part of the Torrance Test of Creative Thinking by E.P. Torrance (1966a, 1966b, 1972), was used to measure flexibility.

It is also thought that risk taking as part of the confidence factor, is an important aspect of creativity. A very simple test was devised to assess the individual's response to risk. Atkinson (1964) records the "Ring Toss Game" as a simple yet explicit method of assessing the individual's propensity for taking risks.

In this test the candidate must make the decision on how many points they can accumulate by throwing a ring over a series of pegs, placed at various distances from the participant. The further away the peg the higher the score accrued if a ring lands on it. The nearer the peg the lesser the score. The ten pegs are placed, scoring one to ten from the candidate; who is given ten rings. The object is to achieve the highest possible score. Theoretically the highest score would be one hundred. That would mean taking high risk. However by taking low risk the candidate could try and land on the first peg - thus obtaining a maximum score of ten. Those willing to take a moderate risk would probably aim at the fifth peg. Interestingly, research indicates (Torrance 1980, Ghiselli 1982) that the inclination for taking moderate risk is highly associated with 'tolerance of ambiguity').
The Barron Welsh Figure Preference Test (1952)

Multifaceted Ideas and Preference for Complexity are tested by the above Preference Test, and it illustrates preference for complexity. Using paper and pencil tests to assess creativity has a number of problems. The major one, described as the dimensionality problem, is that the test may measure only some (or of course none) of the factors in creativity. A second problem is that the test may be attempting to measure valid areas of creativity but is an inadequate tool for them. There is insufficient external validation (such as looking at the subject's actual creative achievements) of the items used on the test. This is the 'criterion problem'. Other measurement difficulties of testing include the problem: that any test situation is often stress provoking.

However as noted by Lundstten (1980) and Reuzulli (1976) many of the foregoing tests are subject to the analysis of the tester. Both the tester and the test taker may have an off day, there may be effects on the test taker by time limits, the wording (and intonation) of instructions and the stimuli used may have different meanings for different individuals. These situations will have an effect on the validity of tests.

In an effort to circumvent these possible problems other researchers have attempted alternative approaches to testing. These have followed through, particularly in the form of checklists and questionnaires. These particular instruments are based on the research, (MacKinnon (1968), Cattell (1972), and Torrance (1980)), and are based on the characteristics typically processed by creative people. They can include questions like, "How many and what kinds of collections have you had in your lifetime?" and "Would you rather conduct an orchestra or play in one?".

Identifying creative interest, has been developed by Bull (1960) is called "The State of Past Creative Activities". The instructions are:

"List any creative activities in which you are or have been engaged during the past one to three years. These may include artistic, literary, or scientific activities (for example, taking part in a play, sketching, contributing to a journal, paper or magazine, constructing original scientific apparatus, exhibiting paintings, etc.). Please give details of the activity or product, including any public exhibition of the product". (O. 34)

Each activity is rated according to two sets of criteria. Then the individual is rated overall from one to nine. A variation on asking people about their creative experiences is to request them to present a portfolio of their work, so some representations of it, such as an asset of photos. The portfolio may then be rated as above. Superficially this appears to be the
schools of architecture's methodology only without any consistent, rationale and with very flexible criteria.

**Direct Observation of Creative Performance.**

This is probably the most obvious but the least developed method of assessment. Watching how people react in a situation seems a valid technique, but it is time consuming and can also be subjective, and difficult if not impossible in the selection/interviewing programme. However later it happens consistently in the architectural schools. This seems to be akin to closing the door once the horse has bolted in as much that intensive observation of the student after he has joined may be very inefficient if they have little design ability and it may be better to submit him or her to intense observation before they begin the course.

Perhaps the most common use of this approach is in the classroom, where teachers trained in observation rank their student after having observed them in a wide variety of circumstances (Treffinger and Ripple 1968) Herriot (1984) notes that personnel specialists in business and government are also beginning to employ this method and organisations like the armed forces have also used this approach for officer selection procedures.

Walkup (1967) recommends that in a search for creativity the interviewee be asked to attempt to find the solution to a problem of which he or she has no special knowledge. One of his favourites is to ask how the person would go about measuring the velocity of a rifle bullet over the first fifteen feet of travel. Walkup notes:

"It is interesting to observe how different types of people think aloud about this problem. Surprisingly, many simply refuse to tackle the problem at all. When pressed they end up saying that if they were faced with this problem in real life, their only course would be to search the literature and find out how it was solved in the past. Other applicants made a few feeble attempts such as suggesting the use of a stop watch, presumably because this is the only way they have seen velocities measured". (P. 12).

Walkup states that creative applicants usually come up with four or five ideas that are reasonably practical, even if the details have not been worked out.

Walkup also proposed that a job applicant be interviewed by a person known to be creative, who is told to discuss her or his own ideas for half an hour. If at the end of that time, you can't pry the two of them apart, you may be sure of the applicant's potential. This would appear to be important in a design school.
The majority of these tests appear straightforward in that the more you do, the more points are accumulated, and the higher the creativity score. Where elaboration or directly viewed analysis constitutes the test, again more is more - but in these tests clearly, the psychometric profile of the tester is very important. However what concerns the author is the aspect of 'thematic' perception, and its recording which if produced could also pile up the score but not necessarily provide provenance of creativity.

One particular aspect of creativity which has not been broached by tested situation is the concept of "the eye". Indeed its nature/nurture aspect has not been developed. Gardiner (1988) suggests that other than in genius is it worth speculating about the predictability of creativity - than in that individual. He suggests that individuals pursuing neurobiological analysis of creativity should be aware that:

"It is fair to say that biological processes are more immediately relevant to issues of giftedness than to issues of creativity. That is it is easier to speculate about the biological bases of unusual precocity or exceptional adult performance than to make analogous inferences about heightened creativity". (Page 317).

The concept of "the eye" for architectural design may well come under the heading of giftedness. How then can this giftedness be recognised?

Work by Smith Carlsson and Sandstrom (1986) have developed the Percept Genetic (PG) Test. They were trying to:

"elucidate the complex connections between some psychological dimensions in the creative professional artist and various 'qualities' in this artistic work". (P. 2).

The PG test is based on individuals being slowly exposed to certain surface image pictures. Other tests have been used but generally the PG test was deemed to be practical in identifying high as against low creativity scores. Draguns (1991) references many neuro psychology and neurosurgical tests which have been available since the 1950's. He suggests that clearly any account of creativity should in fact begin with the consideration of neurobiological genetic factors, for as Gardner (1988) notes:

"they are the antecedent to any behaviour whatever". (P. 316)

However Draguns points to the fact that with other than Rorschach (and his ink blot tests) most PG work has not been around for long enough to be able to become a recognised analytical or predictive tool, though clearly there is a genetic link. This thesis is not thought to be the vehicle to develop it.
We must therefore return to the two most valuable creativity tests, which have been accredited by authors (listed previously) in journals and used in experiments are the California Psychological Inventory and Guilfords Divergency Test. Both are believed to measure or at least identify creativity in the individual. Dacey (1991) notes that there are over three hundred creativity tests registered in the USA and probably several thousand unofficial ones. He states that all of these tests are basic constructs from three or four of the early creativity tests. Howell (1987) agrees citing Mendick, Torrance, Ghiselin and Welsh. So are there any tests that would be of value to schools of architecture for use in selecting their candidates?

3.11.4.1 PRACTICAL APPLICATIONS

In section 7 on motivation and in section 8 and 8.1 on assessment tests many relevant tests have been noted. However, has there been any application of such tests to admission procedures and selections at architectural or any other design schools?

It is recorded in the earlier section on selection (3.1, 3.4, 3.5 and 3.6) how students may choose schools from the many on offer, and how little actual objective information many students have when making their judgements on which schools they should apply to. It was also noted how the system of portfolio review and selection by an interview panel all too often breaks down. Is there a better method for selecting students using some of the tests that have been previously described. The author after considerable research has failed to locate any examples. However it is rumoured that the following schools have at sometime in the last thirty-five years used some form of testing to assess their applicants abilities, these are

- School of Architecture, Princeton University, New Jersey, USA
- School of Architecture, Lima University, Peru
- School of Art, Rhode Island NYS, USA.
- School of Architecture, Alabama State University, and
- In the United Kingdom, Architectural Association, London.
- School of Architecture, Bristol University, Bristol.

In 1953 Princeton University School of Architecture in liaison with the School of Psychology instigated what was regarded as ground breaking research into selection methods including that for architects. This work was assisted by Isabel Myers Briggs who was later to develop the Myers Briggs Indicator tests previously referred to. Gratz (1952) refers to the new form of selection being tried at Princeton University. He refers to
"several psychometric tests". These were to be mandatory to all students applying to the university. Nebraga (1989) stated that the tests were instituted in order to assist in the processing of applicants to the university. It was hoped that the tests would identify those with design ability who would then be offered a place or further interview. Nebraga did not administer any of the tests himself and he seemed unaware of the actual structure. He was a second year student at the time. He also reported that there was a large degree of secrecy surrounding the actual papers. Green (1953) reported that Princeton had recruited at least six other schools to assist in its selection program, and that it hoped to add many more in the future. However, Ross (1961) reported that Saunders (1955) was correct in his complaints about the data collected by the architectural staff as compared to the psychologists working on the same project in the school of architecture. Ross only refers to the grand interschool project in passing, in the context of data handling failure. The author cannot trace Saunders paper anywhere. Green (1956) notes that the majority of the schools who were contributing to the Princeton selection program were no longer doing so and that the project was probably coming to an end. The authors' visit to Princeton in 1989 uncovered no data whatever in the main libraries nor were there any surviving staff from that period. Letters written to the AIA requesting detailed or indeed any information relating to the project have so far remained unanswered (1993).

Swerin (1966) noted that the tests were often used in the southern states (Atlanta, Georgia, Austin etc.) as a filtering mechanism stopping black students from entering professional courses normally considered to be the reserve of whites. Swerin states that it was dominance of "white culturally biased questions" (P23) which ensured that black students would be unlikely to be able to answer them. In other words the tests were not culturally fair. This, he states, crucially undermined any faith there may have been in the use of testing in schools at that time.

Direct telephone communication with each of the above centres identifies that no one currently employed at any of them has any direct personal recollections of such tests being undertaken. Neither is there any record of any readily accessible or recognisable data being stored in Princeton universities' library.

3.12.1 SUMMARY

This section of the research has been of value to in that it identifies a considerable effort on the part of psychologists to identify what creativity is and how it may be constituted. It is an area of considerable complexity and diverse opinion. The field of genetics was also investigated and it has suggested to the author that considerable further research needs to be done in order that a proper formula can be developed to assist in the search for innate
creativity. Though it does offer considerable information in the context. It was interesting to note that some of the other aspects like divergency, drive factors, imagery, cognitive ergs, age and spatial modelling abilities are all relevant, assessable and could be of value in personality analysis. Indeed the palpable lack of recognition of a possible inherited genetic traits is in itself interesting and needs to be addressed in the field research. The research reviewed peripheral aspects of the subject such as dyslexia, lefthandedness some of Leary’s culture blockers and offered views on the relevance of preconceptions and often accepted perceptions. These are areas that the field study must attempt to investigate. It is also clear, that it is claimed that creativity and other areas such as motivation and giftedness can also be tested for and quantified. The research offered several elementary tests which could identify basic creative ability and it would be to identify in the field study whether any of these tests are used in the schools as tools in the selection tests.

From the above it can be seen that a further two problems have been generated for the research, one being giftedness and other genetic factors, the other the usage or otherwise of creativity assessment tests. Therefore the field study must identify the attitudes of the schools to these concepts, The two research problems are as follows:

Problem 4 There are many creativity tests which might be of value in selecting students for design courses, are staff aware of them and why do none appear to be used?

Problem 5 Design may be a form of giftedness that some individuals have and others do not. Do selection tutors recognize this or what views do they hold? Do they any objective or subjective criteria for assessing it? Should schools be doing more to define this ability and searching for it?
PART 4

FIELD STUDY
PART FOUR.

4.1 : THE FIELD STUDY

4.1.1 : THE THESIS AND RESEARCH PROBLEMS.

At this point it is relevant to restate the thesis and its research problems. The thesis is that schools of building design in the United Kingdom are not producing designers of sufficient creative ability, capable of designing buildings of aesthetic worth because they are not searching for gifted students or for students with 'creative' ability. To support the thesis the following five research problems were developed.

1. Tutors who select students for design courses are not necessarily selecting for design ability but rather for students who have the ability to complete the course.

2. Due to imprecise selection procedures tutors become victims of their own stereotypical views on what makes a successful designer and make subjective selections based on their own belief systems.

3. Schools of building design accept students' often with reference to the students' ability to be able to comply with the schools own academic agenda (i.e. perhaps arts or science biased) rather than the candidates on ability to design.

4. There are many creativity tests which might be of value in selecting students for design courses, are staff aware of them and why do none appear to be used?

5. Design may be a form of giftedness that some individuals have and others do not. Do selection tutors recognize this or what views do they hold? Do they have any objective or subjective criteria for assessing it? Should schools be doing more to define this ability and searching for it?

The first problem identified in the research was that; depending on the nature of the design course the agenda of the individual schools (whether disclosed or undisclosed) are such that specific biases are knowingly or unknowingly sought in candidates applying to the school. For example it could be in structural or environmental engineering, sociology, planning or interior design, thus, selectivity for creative or innovative design ability or competence may be of secondary importance to the school, though for candidates seeking a
career in design that could well prove frustrating and latterly lead to poor design whatever this may be.

The second question raised was that tutors engaged in the selection of candidates for design courses were not only selecting in regard to the resources and disposition of the school but also selecting candidates, using their own personal criteria that had no regard to objectively accessing, (used in the context of scaling or quantifying) the creative aptitudes of aspirants to their courses. Thus the exploration of this hypothesis required the investigation of the personal canons doctrines and postulates of the individual staff members during the selection process. The process itself needed to be regarded in its practice, i.e. how may interviewers were involved, where is it done etc.

The third concern regarded the quality of the designers that many design establishments produce. It also concerned the unusually large 'drop out' rates from design courses; in comparison to the is it that many candidates were selected for reasons of school survival (ie without sufficient students the school could be closed or their budgets severely cut )rather than design performance? Therefore the interviewers responses during the selection sessions required examination in the areas of social interrelations, personal bias and identifying the interviewers responses to, and expectation of the candidates "types" (i.e. what Herriot refers to as interviewer/candidate stereotyping).

The fourth hypothesis is initially straight forward, do design institutions use creativity tests (as discussed earlier) as an element of their selection processes, yes or no? If yes, which ones, and what benefit have the tests provided and what long/medium term value are they? It then may become less straight forward; If they do not use creativity tests, why not, and what reasons are there for not doing so?

The fifth problem area is based on the concept of natural eurhythmny and having the eye. Is design talent a form of ‘giftedness” which some individuals have,do staff agree or disagree. How do they recognize it and should it be sought in applicants to architectural courses when possible,or can anybody be taught to be creative?.

It is important to establish to whom the research is referring in the text. The interviewer, respondent or interviewee all denote a member of staff, e.g. admissions tutors, heads of school and so on, while the term candidate, applicant or student all refer to those individuals applying for places on design courses.
4.1.2: METHOD

The field study was primarily designed to discover the previous research problems which it was believed would not only support the thesis, by providing meaningful data for the research but also to perhaps suggest useful stratagems to improve the student selection process in the academic design school.

In discussion with tutors it was determined that the instrument needed to be broad ranging in its approach and that because of the very nature of the process under study the offering of 'closed type questions' would not produce useful information for this research. Keeping an open answer format and using a 'prompt list' aid instrument, appeared to be the most appropriate (see appendix A1 for questionnaire). Because of this nature of the data being collected the instrument was designed as both a 'free response' and 'precoded' document. The 'field coded' sections were at the beginning of the instrument and were more related to gathering statistics and general information about the architecture school. The latter parts were more open ended and 'precoded' in nature. The respondent was given a copy of the document and was offered alternative points and asked to provide his or her preference rankings of choices or attitudes. The interviewer, while administering the questionnaire was at the same time discussing, probing and supporting the respondent in the process. The nature and running order of the response categories were the result primarily of the writers work and teaching experience, aided by some work done by the Royal Institute of British Architects Statistics branch in student involvement priorities (1987) and the American Institute of Architects survey of student subject preferences (1982); both of which produced lists of subjects and interest areas.

The questionnaire was set out into five main sections broadly following the five main problem areas, with up to seven subsets in each. The wide ranging nature of the research areas and subsets required that at each stage of the writing up of the results, each subset be treated in a complete form. That is, rather than providing all the questions in one section, and all the results in another, questions and results are provided consecutively with then a final analysis section which overviews the whole and develops the thesis.

4.1.3 : THE RESEARCH

The initial research planned to use the developing instrument initially at two centres, thought it inevitably ended up being more due to the complexities involved before committing the author to a final questionnaire. It was always envisaged that the methodology involved in obtaining the data would be through a structured instrument, gathering through ranking, specific attitudes and opinions. The majority of information gathered would be in the
(belief) category with strong normative components, in particular relating to design "quality". This may establish if there was response bias in relation to the attitudes of academic staff to student candidates and then the students later performance? Possibly this student performance could be identified by the high student dropout and failure rates discussed earlier in the research? This was the instruments' brief, to identify such discrepancies. As stated earlier many of the questions by necessity, needed to be open ended. The questionnaires were never to be self-administered. In every case the researcher was present. The respondent was given a copy of the questionnaire to follow, as it was read out, the researcher would then, in note form document the respondents answer.

4.1.3.1 : PROCEDURES - SAMPLING

A pilot study was initially organised. However the questionnaire was in continual development throughout this pilot stage. This reflects the complexity of the problem. The pilot study also generated several peripheral issues which needed to be identified, if only to secure them in a periphrastic position.

It seemed to be the case that during the process of gathering data for the research it was discouraging to identify that at many of the institutions visited in the UK there were two 'views' available. Firstly the public view and then the private personal view. Often this may have been due to (at that time) pressure from the Department of Education and Science, from the Royal Institute of British Architects (which although split on the matter appeared to be in favour on the DES initiatives) from the European Committee on rationalising architectural education in Europe (1986) and from the professional press, to cut the thirty six schools of architecture in the United Kingdom to a number (Building Design, 16 August 1986) nearer 28. This would resulted in a loss of eight (8) schools and within the remaining reduced number, it was intimated that many of the surviving schools could lose their post-graduate courses. With this sort of background problem - which, (1995) is still on the agenda, even though in 1992 the majority of schools expanded their student cohorts. All the institutions visited were not keen on disclosing any information into the public realm which could be detected by any of the aforementioned agencies and possibly be used as a lever in any government instituted closures scheme.

Therefore most of the responses to the questionnaires which were concerned with what the schools believed were confidential or sensitive in nature were often 'off the record'. The author frequently felt that because of the nature of the research, being in the architectural school with a questionnaire was seen as a threatening act.
4.1.3.2 : DESIGN SCHOOL LOCATION

There are thirty six university, polytechnic and art college, schools of architecture in the U.K. (1994). Geographically they are located from Aberdeen, (Scott Sutherland School) to Plymouth University), with the majority of schools located in major cities including eight in London and the greater London area.

As discussed in sections 1.1.2.5, because of the nature and diversity of schools of architecture it is important to research a selection of different types of school, rather than assessing those located in urban centres where the majority are based. Therefore it was decided to also visit other institutions located in contrasting suburban and rural zones. Table 7 indicates the schools locations and later in the text their generic designations are provided.

Jensen (1974) has designated the terms urban, sub-urban and rural as follows.

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-Category</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metropolitan</td>
<td>Urban</td>
<td>population of more than one million.</td>
</tr>
<tr>
<td>Small City</td>
<td>Sub-Urban</td>
<td>population of less than 500,000.</td>
</tr>
<tr>
<td>Small town</td>
<td>Rural</td>
<td>population of less than 50,000.</td>
</tr>
</tbody>
</table>

There are further sub-divisions within these parameters, but this broader classification provides a basis for the selection of schools. Since this research was initiated it has been discovered that these three designations are also those used in North America in the texts and in the colleges' own publicity, to identify the locations of schools of architecture. However this could be argued that these titles are somewhat generalised. In a city, is a green and leafy suburb - metropolitan; compared to a tight little industrial town which could be classified as semi-rural?

Urban, rural and suburban schools each generate their own environments. Shein (1989) suggested the following; Urban schools, generally located in city centres have few students living in the proximity of the school (unless in the hall of residence). Most students may have to travel considerable distances from their accommodation. This can lead to isolation and appeals only to certain types of individuals (and of course those who live at home). Rural schools generate a great deal of student 'togetherness' due to the ease of access and scale of the town. Travel distances are short providing a tighter community and thus a different type of ambience. Crux (1982) states there is considerably more student interaction and therefore support in county schools as compared to city centre schools. This type of school environment may also attract a particular type of student.
To some extent the successful architects, as being an independent loners (MacKinnon (1962), Rowe (1987), McGuire (1990) etc. may be reflected in the urban scenario. Are the most successful schools, urban based? Regrettably there is no concrete evidence to confirm or refute this concept. Though it is generally recognised (again no scientific evidence exists, it appears more as a belief system through undercurrents of conversation) that the difference in school locations is worth noting as it is popularly thought that urban city centre schools probably produce a higher level design innovation. However, suburban and rural schools can produce better design competence and technical understanding.

An HMI report (1985) on Public Sector Education in Architecture, visited eighteen schools throughout England, but did not differentiate regarding location; other than to note that (page 16) inadequate education was being provided in some schools due to lack of reasonable accommodation. The centres were not named and a telephone enquiry elicited no further information except that it was related to various national urban and city centre 'locations'.

Another aid in the selection of schools for the survey sample was the RIBA's schools table (1993). This is arranged in a hierarchy of schools related to their entrance requirements, i.e. how many 'A' level points were required for entry. The top five schools for 'A' level points and therefore the most difficult for students to gain entry were:

Cambridge University School
University College School, London (The Bartlett School)
Edinburgh University School
Sheffield University
Newcastle University (RIBA 1990)

Bourner and Hamed (1987), have recorded that 'A' level results, and their resultant points awards, when used for entry to undergraduate study - generally give no real indication of later degree performance. This probably explains why many of the above "top" schools are not always considered to be the best design schools, in terms of design quality, creativity or innovation.

It is interesting however to note that at the present time, (1991) many other schools of architecture would challenge for a place in the top five, due to their reputations, (however this is established, whether by success in design competitions, job placements, examiner's reports etc.) The sample was purposely selected from across the broad RIBA range of schools three from the top end three from the middle and three from the lower range.
A further method of identifying suitable institutions to take part in this research was the professional press. Educational journals occasionally publish a series of analyzes of institutions and create tables of what are thought to be the current 'hot' favourites, among design schools. The last United Kingdom national survey with which this research has discovered was the Times Higher Education Supplement, August 1983, (since then they appear to be surveyed and ranked by regions without a national overview the most recent being in the Times May 1996). It stated that Canterbury School of Architecture was the best public sector school for teaching "architecture" in the UK, (scoring on criteria such as teaching, accommodation, professional bodies ratings, student opinion and work, the views of other schools of architecture, staffing and other data) higher than all other University and Polytechnic schools. Also, professional journals and magazines offer essays on the selected schools end of year portfolio and studio exhibitions. These articles offer an opinion of how the schools have been operating and a critique of the quality of the students work on show. These vary in style and in analysis. Though it should be stated that when these are published they certainly influence many students in their choice of college. As was evidenced at Canterbury that for some time following the 'Times 83' report, applications for places almost doubled; as the piece was obviously read by 6th form career tutors everywhere. The 'grapevine' is another method of selection. However it depends who you talk to and when.

Scale may also be important. Some of the larger urban schools had as many as one hundred students in the first year of their full time courses. Others only one hundred and fifty students in the whole five years of their course. Atkinson (1970) suggests that the larger schools tend to be more cliquish with some staff not knowing students by sight, which the researcher feels is an important factor to be considered in this inquiry, particularly when tutors are asked to view student abilities.

In order to provide a sample of UK schools for the research Gartshore and Mayfield's (1988) selection of design schools was used. This research used three urban schools, three suburban schools and three rural schools. These schools were selected from the Gartfield et. al. list because the student numbers at the schools were below 200 "in school" students. (allied to the RIBA points league as described). This represents a maximum of 40 students per year. Bee (1989) suggests that this is the maximum number of students that any teacher or year can retain elements of detail about each individual.

The schools in the United Kingdom were contacted in the first instance (1986). All replied that they would be happy to take part though five schools indicated that they were pressed for time and they would need more specific information. Each respondent was then
approached personally by telephone and a short description of the research was given. Only one of the short listed schools felt unable to take part due to their very short academic year. The three schools which were visited in 1986 were all known to the researcher who had personal experience and contacts in them. Over the following three years to 1989 appointments were made by telephone with the other six schools, based on the response letter and contact made in 1986.

Table 7 identifies the nine schools chosen for the research. Their designation, whether urban, suburban or rural is shown below. Their confidentiality has been protected by providing cover names taken from the English Civil War. Also included in the list is the dates of visits, second visits and the time taken for the interviews. Colleges and Universities visited in Britain and Europe. Colleges visited in Britain in chronological order and can be seen overpage.

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Visit Date</th>
<th>Interview time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Suburban</td>
<td>Brentford College</td>
<td>1986, 1987 (Mar)</td>
<td>2h, 2h</td>
</tr>
<tr>
<td>2 Rural</td>
<td>Chalgrove University</td>
<td>1986, 1988 (Nov)</td>
<td>2h, 1h</td>
</tr>
<tr>
<td>3 Urban</td>
<td>Cheriton College</td>
<td>1986, 1988 (May)</td>
<td>3h, 2h</td>
</tr>
<tr>
<td>4 Suburban</td>
<td>Edgehill College</td>
<td>1987, 1988 (Apr)</td>
<td>2h, 1h</td>
</tr>
<tr>
<td>5 Urban</td>
<td>Langport College</td>
<td>1988, (Oct)</td>
<td>2h</td>
</tr>
<tr>
<td>6 Urban</td>
<td>Marston College</td>
<td>1988, (May)</td>
<td>21/4h</td>
</tr>
<tr>
<td>7 Suburban</td>
<td>Naseby University</td>
<td>1989, (June)</td>
<td>2h</td>
</tr>
<tr>
<td>8 Urban</td>
<td>Newbury College</td>
<td>1989, (Oct)</td>
<td>3h</td>
</tr>
<tr>
<td>9 Rural</td>
<td>Shewsbury College</td>
<td>1989, (Nov)</td>
<td>2h</td>
</tr>
</tbody>
</table>

TABLE 7 - Nine UK Schools of Architecture in the field Study.

It should be noted from the above list of schools that several were visited more than once (the first three were visited in order to test the instrument). On those occasions the author met the same individuals as previously and discussed the research further, assimilating additional information as it was offered.

4.1.4: INSTRUMENTATION

The Questionnaire, Content And Construction

The questionnaire was based on the problems stated earlier. This combination of subjects
ranged from the collection of statistics, direct yes or no answers and a series of headings which demanded ranking by the interviewee, most of the latter two sections being in a free response format. The following instrument was constructed as previously stated in five main categories which directly covered the problems under research.

The Design Of The Instrument

The Field Study

The field study protocol can be reviewed on page 176 and the following 7 pages. Before that there follows a description of the instrument with its contents broadly annotated, indicating the areas for data collection for the research.

The first section gathered information regarding the first research problem on recruitment policy. This was general statistical information, i.e. number of students in each year, the number of staff. The proportion of males to females. History of the school, number of applications the first year, for the postgraduate course etc.

The second section of the instrument follows up on the data required for the hypothesis. It attempted to discover the perceived strengths of the school. Did the school unknowingly (as suggested by HMI) specialise in environmental engineering, sociology, management or some other subject. Were the staff aware of this? Did they advise students?

The third section was again related to the first 'problem area' in identifying the academic/design environment. It concerns the selection of students for places in the school

This had sub sections as follows:-

1. Qualifications required.
2. How are references regarded?, are there particular aspects of the individual's character or ability sought by the school?
3. The 'make up' of the selection panel. (One or two members, all male? etc.).
4. What proportion of students are interviewed?
5. Why are particular students interviewed?
6. How are overseas students selected?
7. Mature students and their selection.

The above list is trying to identify the following issues.
1) The qualifications are important as they may indicate what biases the schools have. Are they art (studio), environmental, science, structurally, alternative energy, sociological? What emphasis do they have? Do they prefer arts, mixed (arts and sciences) or science orientated subjects. (In America for example this is not a problem as often the size and scale of the options offered for U.S. degrees are such that students can arrive with almost any academic orientation.)

As reported earlier it should be remembered that like Entwistle and Wilson (1977), Wallach (1976) state that using past academic criteria as a predictor for most vocational subjects such as architecture, engineering, commercial art or design are inappropriate. Wallach suggested an analysis of extra curricular activities as a predictor for these areas. See also Gilchrist (1982).

2) Do schools actually read and believe references? Do they look for any particular character or abilities? Or do they use their own judgements. Do schools accept that possible non-creative, non-designer referees can make objective assessments of their applicants? Or are they (those schools which do not hold many interviews) simply seeking good academic results so that candidates can perform academically rather than creatively?

How do schools undertake their interviewing process? Do they use large panels of tutors (as recommended by Wurster (1958) Romieniec (1968), Kline (1975) Fear (1978) and Herriot (1984) or do they do it in small groups of two or three staff or is it done on an individual one to one tutor/student basis? Which is recognised by all the above authors as being the least efficient method.

Section four of the instrument was related to the analysis of the second, third and fourth research problems. The first section 1, 2, and 3 supports the second problem and the remainder the third and fourth. As these three problems have constant parallels and continual overlapping it was felt that an absolute separation would not be appropriate nor would it be possible without producing a reductionist model which may have had little value. Similar nuances, statements and attitudes would be reflected throughout these sections which were as follows.

1. Candidate's personal appearance.
2. Candidate's character traits. Candidate's academic.
3. Personal interests, hobbies and their relevance.
4. Portfolio recognition.
5. Candidate's interest in the subject (vacation work etc.).
6. Male or female preference.
7. Political Interests.

These seven sections were developed after prolonged discussion with Peter Heyer (1986) and Ian Mayfield (1988) and other members of staff of Canterbury and Southbank University schools of architecture.

This section was attempting to identify what Kline refers to as the situation where, “the assessors personal needs, drives and likes, transcend an objective view.”

1. We saw earlier in the text the view of the 'suit'; can a suit hide a high creative, non-establishment (in design terms) person who is acting as a conforming rebel (Gilchrist (1982)). This also goes back to Kline (above) and tutors seeing themselves in their appointees.

2. Character traits are difficult to define and are most easily assessed from candidates references and personal statements However what traits are identified as being important to selection tutors?

3. Academic interests as related to future career success is important but complicated by issues in the first section. However many authors, while agreeing that academic interest and performance is important in predicting careers and success in subject areas such as mathematics, music and pure sciences, in areas where creativity is involved most authors agree that their predictive qualities are negligible (Wallach (1926), Treffinger (1980).Gilchrist (1982) and Gardener (1988)

4. Hobbies and other personal interests are seen (by the same authors above and many others) as being of better predictive value. If they indicate creative activities, and motivations then that is a better key to a 'successful' creative career.

5. The Portfolio - surely the most important element of any selection procedure is the portfolio, Gardiner (1982) suggests that the portfolio is the key to an applicants motivations and creative ability though he requires that a panel of at least three and hopefully more should assess them. Portfolios are generally taken quite seriously by schools; however what are they looking for - can tutors put it into words?

6. Again, is a further check on the hobbies and pastimes a question? What interests
do candidates have that are directly related to their application: to a vocational subject.

7. A question of political correctness. Are females and males given the same form of interview. MacKinnon notes that most of his high creative male architects, have a high degree of femininity. Yet conversely, as has been noted in the text the female dropout from schools is much higher than for males. It is also difficult to recall many very successful international female architects.

The above criteria were used in order to establish what possible common elements there were between all of those interviewed that could lead to a consensus of what might be recognised as design acumen.

The fifth section of the instrument directly relates to in the research the final question, which is concomitant with the thesis that design giftedness may exist and therefore how should tutors recognised it. It questions the respondents on how, as individuals, they might recognize creativity and investigates what objective criteria they use in order to select students for their design courses. The fifth section of the instrument had the following parts.

1. Have staff had professional training for interviewing prospective students?

2. Was the interviewer aware of any battery tests that may aid their decision making?

3. Can anyone be taught to design?

4. Does design talent (giftedness) exist, and if so how do you recognize it?

The fifth section with four parts was constructed as follows.

1. It is generally agreed (Kelley (1955), Holland (1966), Jackson and Messick (1967) and Kline (1975)), that it is essential to have professionally trained interviewers in order to be effective in selection processes. What training have tutors had and how has it assisted them in their selections. What has been their success rate.

2. Is directed to A, what tests do they use and why those tests? Why do they not use others experience success rates etc., what?
3. The nature versus nurture debate. Is it necessary to be 'gifted' in design. Is talent necessary or can design be taught (as Abercrombie (1962, 1964), Campbell (1966), Martin (1966) all agree it can) to any one with average abilities? Staff may have a view on this as it will to some extent orientate their selection techniques.

4. Follows directly on from C as a check and also as an opener to a discussion on the nature of the good designer.

That the content of the information gathered by the instrument would be discursive and probably polemical, and therefore capable of a degree of interpretation was obvious. The method of collecting the data therefore had to be tailored to gather more specific data. This was done in discussion with the interviewee in the following manner.

The first section on student numbers etc, required a simple mechanistic response, the respondent either had the details to hand or could get them in due course. Everyone interviewed was broadly happy to discuss the approximate numbers of students involved in each year of the course and would 'guessedimate' backgrounds and genders. The factual information if not available was promised to be forwarded later. In the field study five such promises were not kept. Two were collected at the time and the remaining two received by post. Much of the information was obtained later about the U.K. schools from the RIBA statistics department.

The author established, during the field research that the first section, had the desired effect of relaxing the respondents and funnelling them into the next section on strengths of the schools which was more difficult. The third section was by contrast easier being again mechanistic. The fourth section appeared more difficult for the respondents as it required personality, theirs and the candidates analysis. The final section was more straightforward with little problem encountered in answering. This outline mapping belies some of the problems encountered by the writer. For example the second and subsequent sections were by their nature discursive and the researcher needed to describe the expand the heading provided. As often the respondents had previously not considered the points or realised that their roles were as variegated as they were. In other words the respondents had seldom involved themselves in a self examination process relating to their roles as admissions tutors and interviewers.
Table 8 below identifies the broad areas of the instrument, its various sections and how they relate to the research problems.

**Research Problems And Supportive Issues In The Instrument**

<table>
<thead>
<tr>
<th>Research Issues</th>
<th>Appropriate Instrument</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research problem one.</td>
<td>School recruitment policies Section 2 (part only)</td>
<td>Section A</td>
</tr>
<tr>
<td>Research problem two.</td>
<td>Selection methodologies Section C; 1,2,3,4,5,6,7. Section D; 1</td>
<td>Section D (part)</td>
</tr>
<tr>
<td>Research problem three.</td>
<td>Selection panel members C continued Personal canons Section D; 8,7,6,4</td>
<td></td>
</tr>
<tr>
<td>Research problem four</td>
<td>Practical aspects of interviewing D; Interviewers responses to candidates Section D; 2,4,7.</td>
<td>Section D</td>
</tr>
<tr>
<td>Research problem 5.</td>
<td>Interviewers training Section E; 1,2,3. (Problems 4 and 5) and Section F; 1, 2.</td>
<td></td>
</tr>
</tbody>
</table>

Table 8 Pilot Instrument Layout. The instrument follows overpage and for seven pages.

**Procedure**

As described earlier the nine schools were contacted directly by telephone and then were sent a follow up letter with a brief description of the research. Later a telephone appointment was made and the visit arranged. After a short tour the author and the respondent would return to the respondent's private room. The researcher, would then offer the interviewee the questions and would "assist" by general discussion. For example in Section D, part (2), of the instrument dealing with the student candidates personal appearance, the instrument offered seventeen (17) elements from which five (5) were to be ranked in descending order of preference. Initially the majority (though not all) staff thought this question to be superficial in terms of interviewing prospective candidates.
A. GENERAL

SCHOOL ...........................................................................................................

IDENTITY - INDEPENDENT FACULTY ETC. ..................................................

...............................................................

ESTABLISHED ...................................................................................................

NUMBER OF STUDENTS FEMALE FOREIGN

FIRST YEAR ........................................................................................................

SECOND YEAR ....................................................................................................

THIRD YEAR ......................................................................................................

FOURTH YEAR ...................................................................................................

FIFTH YEAR ......................................................................................................

NUMBER OF STAFF .......... FEMALE .................................................................

AVERAGE NUMBER OF STUDENT APPLICATIONS FOR FIRST YEAR (AVERAGE OVER FIVE YEARS PLEASE).

...............................................................

B. CONSIDERED STRENGTHS OF THE SCHOOL

FROM THE FOLLOWING LIST SELECT NO MORE THAN THREE AND LIST THEM HIERARCHICALLY, I.E. TECHNOLOGICAL, (MATERIALS & BUILDING), DESIGN PRESENTATION, DESIGN PHILOSOPHY, COST ANALYSIS, PROFESSIONAL PRACTICE (MANAGEMENT), LAW AND CONTRACT, STRUCTURAL ANALYSIS, BUILDING ENVIRONMENT, (HEAT, LIGHT, SAND), HISTORY, PHILOSOPHY.

...............................................................

...............................................................

..............................................................
C. STUDENT SELECTION

PLEASE OUTLINE THE SYSTEM USED FOR SELECTING STUDENTS FOR FIRST YEAR OF COURSE, INCLUDING HOW MANY POINTS OR HOW FLEXIBLE YOUR POINTS REQUIREMENTS ARE.

1. HOW MANY POINTS DO YOU REQUIRE FOR MINIMUM ACCEPTANCE?

2. IN THE REFERENCES, WHAT IN PARTICULAR DO YOU LOOK FOR?

3. HOW MANY STAFF SCRUTINISE THE APPLICATIONS AND WHY? DO THEY HAVE TRAINING IN STUDENT SELECTION? DO THEY HAVE A TRACK RECORD IN SELECTING SUCCESSFUL STUDENTS? ARE THEY THE ONLY PEOPLE AVAILABLE AT THE TIME?

4. HOW MANY STUDENTS ARE CALLED TO INTERVIEW FOR FIRST YEAR?

5. WHAT ARE THE CRITERIA USED (CAN YOU LIST THEM IN DESCENDING ORDER) WHEN DETERMINING AN INTERVIEW IS NECESSARY?
OVERSEAS AND MATURE STUDENTS NOT IN UCCE ETC.

1. How are decisions concerning overseas students made?

2. How are decisions concerning mature students made?

Are they always interviewed?

Are they given any priority?
D. INTERVIEWS

1. AT FIRST YEAR HOW MANY STAFF ARE NORMALLY INVOLVED IN INTERVIEWING EACH APPLICANT?

2. ARE THEY SINGLE OR JOINT INTERVIEWERS?

3. IS THERE MORE THAN ONE INTERVIEW?

4. WHAT DO YOU LOOK FOR DURING THE INTERVIEW? CAN YOU CHOOSE FIVE OF THE FOLLOWING AND ARRANGE THEM IN DESCENDING ORDER.

PERSONAL VISUAL NEATNESS OF APPEARANCE, COLOUR SENSE IN THE APPLICANT'S CLOTHING, ORIGINALITY IN APPEARANCE, CLEANLINESS OF HAIR AND FINGERNAILS, GOOD LOOKS, BEAUTY, ATHLETIC BUILD, GOOD FIGURE, MATCHING ATTIRE, CO-ORDINATED ACCESSORIES, I.E. PORTFOLIO, WATCH, NECK ATTIRE, SOCKS ETC. EYE COLOUR, HEIGHT, WEIGHT.
5. Appearance and Manner: To which of the following do you attach weight in coming to your decision? Please tick.

Quiet, Reserved, Talkative, Confident, Smiling, Laughing, Questioning, Eye to Eye Contact, No Eye Contact, Expressive Hand Movements, Exhibits Egoism on Portfolio, Aggressive, Moves A lot, Leans across the Table, Slumps in Chair, Sits Back in Chair.

6. Aptitudes and Qualities: Please tick which (five) of the following you look for in an applicant.

Mathematical Ability, Discursive Ability, Musical Ability, Special Technical Ability, Colour Awareness, Historic Referencing, Philosophical Approach, Social Awareness, Mechanical Ability, Psychological Awareness, Logical Approach Maturity, Innocence, Ingenuity, Political Awareness.

7. How does your assessment vary between male and female applicants?

8. Are there any particular hobbies or life experiences which you look for or which would lead to exclusion, politics etc?

9. How important is the portfolio?

180
E. 1. DO YOU HAVE ANY OTHER METHODS OF SELECTION BESIDES: APPLICATION FORMS, INTERVIEWS, PORTFOLIO ETC? I.E. SPECIFIC EXERCISES RELATED TO EARLY WORK ON THE DEGREE COURSE?

2. DO YOU EVER EVALUATE YOUR DECISIONS AGAINST OUTCOMES. I.E. DESIGN UNITS, EXAM SUCCESS ETC?

3. HOW DO YOU ACTUALLY ARRIVE AT DECISIONS AT THE END OF THE INTERVIEW? IS THERE A RATING SCALE OF SUITABILITY? IS THERE ANY FORM OF SUMMARY SHEET TO AID DECISIONS?

F. 1. HAVE ANY STAFF BEEN ON INTERVIEW TECHNIQUE OR PERSONNEL ASSESSMENT COURSES? IF YES, COULD YOU STATE WHICH COURSES.
2. IF NO, CAN YOU STATE WHETHER THE INTERVIEWER/S WOULD BE FAMILIAR WITH:

(A) GRAVES DESIGN JUDGEMENT TEST,
(B) THEMATIC APPERCEPTION TESTS,
(C) MEIER AESTHETIC PERCEPTION TEST.

3. DO YOU THINK THAT CERTAIN INDIVIDUALS HAVE AN INHERENT APITUDE FOR (ARCHITECTURAL) DESIGN. (I.E. A NATURAL ACUMEN, A TALENT).
They therefore needed to be prompted into an exploratory discussion, from which their
ranked preference was then derived. This analytical coaxing and discursive approach was
necessary for sections B, D(1), (3), (4) and 4D(8). During these sessions the researcher
did not record each individual's attitude response; but rather the author "just got on with it".
Interview times however were recorded, the shortest being ninety five minutes and the
longest being three hours this does not include the time spent in introductions, being shown
round the studios to view students work and the school facilities.

Once the data, and the other sets of information had been collected there then existed the
problem of analysis. The responses to the pilot study were collected over a considerable
period, starting in 1986 and finishing in 1989, (i.e. the first was done in October 1986 at
Edgehill College and the last one was at Shewsbury in November 1989), though the
majority of this field research was done between April 1988 (Edgehill College, second
visit) and November 1989 (Shewsbury College) when a total of nine institutions were
visited.

However before 1988, four of these colleges had taken part in the developmental
instrument. These were Edgehill College, Langport College, Naseby University and
Chalgrove University in 1986/7. On each occasion the researcher was received by the tutor
involved with student admissions. At Langport and Chalgrove the tutors were also the
undergraduate course directors.

On the author's visits to all nine colleges, during the interview the researcher, using the
instrument would take notes registering rankings and prompting responses to categories
where the respondent could not always make a clear decision. Notes were taken on a
separate pad. Later, always within twentyfour hours but usually the same day, the
researcher would transcribe the responses into a keying sheet, which designated the
questions, multiplicity of answers and replies of the tutor, the location and the school. The
response categories from each institution were retained in the same manner. During this
period the researcher also ran through the session again making further notes, relating to
various aspects of the interview. Such as:

i. The overall attitude of the respondent - positive, negative, curious, interested etc.

ii. The general 'feel' for the school, i.e. large, well maintained, good facilities,
number of students around.

iii. The respondent and their room and its contents.
Any general detail aspects or ambience that prevailed that might add to the understanding of the responses.

This then went through a general checking and editing process to ensure that the instrument had been used and data collected to the benefit of the research.

4.1.5: THE DATA

As discussed earlier for reasons of consistency the research data is laid out in the same manner as the research protocol. Following the collected data, in the next section the results will be analyzed using the same format as previously. There were five main sections each with their own subsections. In the following chapter each of the sections will be annotated A, B, C, D, and E with the adherent subsections annotated 1, 2, 3, 4, 5, etc.

SECTION A

The first question was, that in the resourcing and the resultant possible structural bias of many design courses, does a specific view of "what design is" and how it should be done arise? In order to investigate this possibility it was necessary to obtain both a microview, in terms of the schools' requisites etc., and a microview, based more on the teaching staff's appraisals.

In the United Kingdom schools, the statistical information obtained mirrored that of the Royal Institute of British Architects, statistics and education departments. The six British Institutions that produced figures for 1986/9 identified a shrinkage of forty percent (40%) in student numbers from first year to the sixth year of their courses.

It was also noted that in the two UK schools (Naseby 1989 and Newbury 1989) that kept separate figures on their student intakes that thirty two percent (32%) in Naseby and twenty seven percent (27%) of students in Newbury school in their first year were female yet only twelve percent (12%) and nine percent (9%) respectively of postgraduate students in their sixth year were female, thus identifying a high dropout rate among women. These two school postgraduate percentages are higher than the national average, (i.e. sixty percent (60%)). Nationally it is only twenty seven percent (27%) (1991).

The average size of student group taken into the first year of the colleges visited, taken as an average since 1986 to 1989 was thirty seven (37) students in each first year, with
overpage These figures could also be described as a popularity guide to the various courses

Naseby University  19 applications for each place
Langport College  8 applications for each place
Cheriton College  7 applications for each place
Chalgrove University  7 applications for each place*

*(There are other circumstances relating to the location of this University)*

Protocol: Section B: Strengths Of The School

Strengths of the school; Unofficially most schools of architecture are 'known' or have a reputation for particular subject areas. Naseby University is very much known for its technical excellence, particularly in environmental engineering. Newbury College and Edgehill College sustain reputations as design schools. The majority of schools all seen to have a bias towards particular subjects. This was identified as a major weakness by Her Majesty's Inspectorate, (1985). But do schools that have such specialities recruit towards that speciality, and are their courses biased in that specialist direction?.

All schools have resource allocation centres; which must orientate them one way or another. Or it may be that the fewer resources a school has, the more time students spend in the studio on the drawing board; though this does not necessarily produce good design. In this Pilot Study none of the respondents have admitted any speciality because as one tutor suggested, (Langport College 1988) it may "identify weakness in other areas". At the same time, a science bias was apparent in the Universities, the great majority of whom offer a BSc degree. Many schools are located in Science or Technology faculties whose regulations for the science degree set the requirements for entry. This is generally a demand for an 'A' level in Physics, or other science subject combined with 'A' level Mathematics (though very occasionally this is relaxed). These subjects are stipulated in order to satisfy the BSc tripos of the University Science degree. In the interview session all tutors said (11) that they preferred to see 'A' level Art as a preferred subject but failing that 'O' level art; 'A' level design was the next most popular subject (8 tutors). All tutors (11), required English language, mathematics and science subjects at GCSE level. Interestingly 4 tutors did suggest that students need not necessarily have an 'academic' art subject, but proof of any interest in art, i.e. sketches, photography, film making were deemed to be acceptable.

In the interview group only art 'A' level was a common factor other subjects were of 'A' level languages (3No), music (2No), Geography (2No) and Sociology (2No). The other
preferred 'A' levels ranged from economics through to history.

In the writer's visits to the schools, without deviation, all of the schools in response to section two ranked the following areas as strengths of the school.

i. Design 9 first scores;
ii. Design Presentation 6 second scores;
iii. History 4 third scores;
iv. Building Technology 3 fourth scores
iv. Building Environment 3 fourth scores;
v. Structural Analysis 2 fifth scores.
v Professional Practice none
vi Law and Contract none

Protocol: Section C: Student Ability

The next section is in support of the third hypothesis that students are given places on design courses not always because they have any ability to design but often because the academic institutions are seeking individuals who can successfully complete their courses and also to keep student numbers high.

The first part was the collection of statistics relating to entry qualifications. Heavily applied to schools require high grade qualifications for admission. Low demand schools will accept low grade qualifications. What makes one institution popular and another less so is difficult to establish. Good reviews in the press, prominent ex-students, teaching reputations and resources, social prestige, historic profile, and excitement or whatever of location all contribute to an institution's popularity.

However there is a degree of flexibility in the grades demanded at the beginning of the recruitment season and those demanded at the end of it. Recruitment can begin as early as November in the previous academic year, and end in October at the beginning of the new academic year. Schools which have places to fill in order to keep their courses going will, at the end of the recruitment drive, accept very low academic grades indeed. This is never publicly admitted but is common at the less popular centres. "Bums on seats" is often seen as the most important criteria, and often governs parts 1, 2, 3, 4, and 5 of part 3 of the questionnaire in the selection process.

Is it possible to be more objective about the criteria for student selection? The more popular schools specifically, the older university schools, often offer places based on prospective academic performance, against most selectivity advice - Wallach, Gilchrist et. al. This is
particularly true in relation to overseas students. What degree of design acumen is then sought in these circumstances? Section D, part 1, on interviews covers this aspect of design acumen more fully.

Protocol: Section C : Sub Section 4

Numbers Interviewed

At the two UK University schools, few students (except interestingly for women at one college) are called for interview, an average of fifteen percent (15%) only, at both institutions from the UK, (no specific criteria were offered for this percentage) and overseas students are never called. At Langport College on the other hand, all students must present a portfolio of work and all UK students are interviewed. Overseas students must send a selection of their work by post. Though generally at most colleges overseas students with the requisite qualifications that can satisfy the academic requirements can enrol automatically.

In the University sector in Britain, considerable emphasis is placed on the students prospective 'A' level results and their 'statement of interest' on their UCCA application forms. Universities visited by the author, noted that because of the few universities training architects the demand for places at university centres was much greater than for those at Polytechnics; (this may eventually change now that the majority of polytechnics have become universities by 1993). Therefore interviewing everyone would be impossible and interviewing only a few could be criticised as unfair to the other applicants. Therefore Universities varied in their approaches to selection.

The researcher established that in the UK institutions visited (and taking part in the survey) the interviewing procedures were as follows:-

Nasbey University

Undertook little interviewing preferring to rely on UCCA projected A level results that indicated a student's intellectual ability. In 1987 they interviewed 32 students 9 female and 23 male. In 1988 they interviewed 11 candidates including 6 females

Chalgrove University

Interviewed all its short listed female applicants, "around" 48 (1986) and those students whose references did not particularly identify the development of the individual's
architectural abilities or interests. The college offered no specific reasons why all women candidates were interviewed in that year. However previously it was noted that the group with the highest dropout/fail rate nationally as being female. The school generally interviews in total about thirty percent (30%) of its short listed applicants. Students were interviewed occasionally by one tutor, but it was hoped that two tutors would be involved in every interview (1986 and 1989). No strict records are kept of interviews. This appears common to all schools.

The Polytechnics (Most were designated Universities by 1993)

Stated that they interviewed all their short listed student applicants, generally about ninety per year per school. This was normally done by at least two members of staff. It was also recorded that none of the schools visited ever followed up their interviews to discover how accurate the interview predictions were eg. were some tutors better at identifying creative candidates than others which selection techniques were better than others?

Protocol: Section D: Sub Sections 4 5 6 7 Stereotyping Students

What is the legitimacy of this research (recruitment problem)? which is; that interviewing tutors may often be victims of their own very personal stereotypical views on what makes a successful designer and therefore they make subjective selections of candidates based on their own belief systems (often referred to as self imaging).

The interviewing section of the Field Study was produced as a series of response scales (based on Comvey's (1968) factors) relating to particular elements that tutors might identify at an obvious level. Section 2 attempts to abstract the physical characteristics that the tutors looked for in candidates. During the interview an alternative group of factors was given verbally. The interviewee had to determine which from both groups were the most appropriate. The alternative list was in reverse order. This was done as suggested in Kline's (1975) analysis of the 'Greenspoon' effect, that opposing ideas produced in juxtaposition (without the analyst's 'inputs') increased the interviewee's objectivity while reducing subjectivity. The factors and alternatives proposed in opposition to the questionnaires postulates are as below.

**Physical Appearance**

**Factors Listed In The Instrument D4.**

Personal visual neatness in appearance, colour sense in the applicants clothing, originality in appearance, cleanliness of hair and fingernails, good looks, beauty, athletic build, good
figure, (male or female) matching attire, co-ordinated accessories, i.e. Portfolio, watch, neck attire, socks etc., eye colour, height, weight. These from Shouksmith (1968) p. 78 and Schein (1973).

Antonyms Provided Were (presented on a separate card)

Was he / she; disturbed by overweight people, very tall or very short individuals, discordant colour dressing, old and worn clothing, dirty shoes and clothes, greasy or unkempt hair, 'ugly' (your own understanding) applicants. Punk applicants or unattractive eccentrics, heavy makeup etc.

After the respondent had read the sub-section D.4, in the instrument, it was then discussed by the interviewer. At the point when the respondent was about to reply the opposites list was read out and then respondent was given the typed list of opposites to read. After some time the respondent was then asked to choose his ranking.

Some of the responses to these pairs are recorded here. In this section respondents were asked to rank the descriptions in a hierarchy of their priorities. The Table below identifies the characteristics chosen by the respondents.

The grouping of the interviewers preferences on an applicant's physicality are listed in descending order below.

1. Neat appearance  
2. Cleanliness  
3. Athletic build  
4. Good looks  
5. Good figure  
6. Colour coordinated clothes  
7. Matching attire  
8. Coordinated accessories  
9. Weight  
10. Eye colour  
11. Height

The interviewee's responses to the questionnaire appeared to the researcher that they were often self-imaging in their selectivity. From the UK studies the researcher believes that the interviewers were often reflecting themselves and their value systems in their searches and were also exhibiting quite a few stereotypes. The author would offer the following quotes, each of which reflected both the physical, and to some extent the directly observed character of the individual tutor who made it.

i. "We have no punks in this school of architecture"; (Naseby University 1989).
   This tutor was dressed in a 3-piece tweed suit with a gold Albert watch and chain.
"If his socks match his tie or other garments, that is as good a criterion as any;" (Chalgrove University 1986). This tutor was wearing matching 'monochrome' waistcoat, tie and socks, all in the same colour, bright yellow!

"Figurative work in the portfolio is probably more representative than abstract art"; (Shewsbury College 1988). The tutor's office in which the interview took place was lined with his own paintings. These were water colours and ink sketches. All the pictures were of local village scenes and buildings, all figurative work.

There were many other statements of similar character gathered during the interview sessions. What has emerged from this section of the pilot field work on this sample, is a conventional, soberly dressed and, if the mass of literature is to be believed, possibly convergent type of individual being sought by many tutors which tends to support the view that tutors may not only be judging on explicit academic criteria but aspects of the candidates appearance may influence the decision to offer a place. It should be noted at this point of the text that all the responses will be examined in the discussion section of the field study.

Personality Traits
Protocol: Section D - Sub Section 5

Character, for the initial descriptive list, taken from Tom (1971)Schein (1973)and Cook (1979) is as follows.

Quiet, reserved, talkative, confident, smiling, laughing, questioning, eye to eye contact, no eye contact, expressive hand movements, exhibits egoism on portfolio, aggressive, moves a lot, leans across the table, slumps in chair, sits back in chair. (See Ramsden 1978).

These adjectives were chosen, again not related to creative ability, but to identify the profile types that may be chosen by selecting tutors. The issue is, as per Gilchrist (1982) are tutors seeking out individuality or just confirming their own expectation of the interview scenario. How do tutors identify creative individuals beyond the portfolio, do they try? The testing antonyms (which are delivered as a group rather than as specific opposites) provided separately were:

Slovenly, mendacious, machismo, aggressive, demonstrative, slimy, greasy, engraciating,
pushy, sleepy, boring, uncouth, rude, randy or disrespectful.

As per the previous description at the interview the author introduced the above ergs to the individual before the responses from the original questionnaire order had been selected. The results were arranged in hierarchy as follows from thirteen responses from all the institutions visited in the pilot study. Appendix 3, Table A, identifies the actual scoring.

From these the table below identifies the ranking produced:

1. Confidence 9  
2. Reserved 8  
3. Smiling 7  
4. Eye to eye contact 6  
5. Questioning 4  
6. Leans across table 4  
6. Laughing 2  
6. Egoism on portfolio 2  
7. Talkative 1  
7. Aggressive 1  
7. Slumps in chair 1

Three (3) elements received no or low scores and therefore did not register on the scale, these were:

a. Quiet,  
b. Expressive hand movements,  
c. Moves a lot.

Please note where there is a tie in the scores the number in the column will remain the same. This will remain the same in all tabulated columns.

Abilities

Protocol: Section D : Subsection 6 : Aptitudes and Abilities

In the final "subject" section the established hierarchy was as set out below as a choice from fifteen points, though only eleven were selected by the respondents. Taken from Fear (1978) and Mayfield and Carlson (1966).

They were as follows:

Mathematical ability, discursive ability, musical ability (used in the first three interviews of the Pilot Study), special technical ability, colour awareness historic referencing, philosophical approach, social awareness, mechanical ability, psychological awareness, logical approach, maturity, innocence, ingenuity, political awareness.
In section D, part 6, on traits and abilities the subject analysis of the responses was as follows: The table below provides the actual ranking and scoring.

<table>
<thead>
<tr>
<th>Element</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Political awareness</td>
<td>8</td>
</tr>
<tr>
<td>1. Musical ability</td>
<td>8</td>
</tr>
<tr>
<td>2. Historical referencing</td>
<td>6</td>
</tr>
<tr>
<td>3. Discursive ability</td>
<td>5</td>
</tr>
<tr>
<td>4. Philosophical awareness</td>
<td>4</td>
</tr>
<tr>
<td>4. Logical approach</td>
<td>4</td>
</tr>
<tr>
<td>5. Mathematical ability</td>
<td>3</td>
</tr>
<tr>
<td>5. Ingenuity</td>
<td>3</td>
</tr>
<tr>
<td>6. Social awareness</td>
<td>2</td>
</tr>
<tr>
<td>7. Psychological awareness</td>
<td>1</td>
</tr>
<tr>
<td>8. Maturity</td>
<td>1</td>
</tr>
</tbody>
</table>

This section was not given rank weightings or scores. Interviewees 'ticked' five values, which were then collated.

Elements interviewers preferred to see in candidates

This particular section was developed in order to identify the possible bias of individual tutors. Were they political by activity, technically or scientifically minded, had a social conscience etc, etc. Interestingly, possibly due to the social climate at the time but political awareness came first in the list. However music was also a surprise item (for the author) with no less than eight selection tutors placing it as an important aspect of an applicant.

Why was this a surprise to the researcher? In the preliminary discussion of this subsection between the researcher and the interviewer and a brief running through of ideas, many of which appeared in the instrument, only two tutors mentioned music, (Langport and Edgehill) before reading the instrument. However after reading the list in the instrument which included music all tutors placed it in their rankings.

In later discussion it appeared that these tutors believed that when the student had an interest in music (particularly related to an ability to play) an instrument was indicative of a wider cultural awareness. It was thought that this would then translate as being identifiable in their design work. This almost universal feature for these particular tutors to reason in this way was again an unexpected one and needed to be studied more carefully at any future stage of continuing further empirical work.

Section D, Subsection 7,8, and 9
Appendix A identifies the responses to the above questions.

**Female Assessment**

Protocol: Section D, Subsection 7
All schools were trying to raise the number of female students in their departments.

Most, if not all the explanations were as follows:

To raise the female numbers to reflect the demographic characteristics of the population. (Naseby and Brentford).

To ensure equal opportunities.

More women were applying than ever before and at two centres there was apparently an active University policy of positive discrimination for minorities and women. (Chalgrove 1988 and Naseby 1989).

**SUB SECTION 8**

This was an open ended section with each tutor being asked to list 3 (three) particular hobbies that they like to see in applicants. The following list gives the top 6 (six) subjects and the number of tutors who elected them.

<table>
<thead>
<tr>
<th>School</th>
<th>Hobby</th>
<th>Subject</th>
<th>Subject</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brentford</td>
<td>Painting</td>
<td>Sketching</td>
<td>Travel</td>
<td></td>
</tr>
<tr>
<td>Chalgrove</td>
<td>Sketching</td>
<td>Travel</td>
<td>Sport</td>
<td></td>
</tr>
<tr>
<td>Cheriton</td>
<td>Sketching</td>
<td>Travel</td>
<td>Reading</td>
<td></td>
</tr>
<tr>
<td>Edgehill</td>
<td>Sketching</td>
<td>Travel</td>
<td>Music</td>
<td></td>
</tr>
<tr>
<td>Langport</td>
<td>Sketching</td>
<td>Reading</td>
<td>Sport</td>
<td></td>
</tr>
<tr>
<td>Marston</td>
<td>Painting</td>
<td>Reading</td>
<td>Travel</td>
<td></td>
</tr>
<tr>
<td>Naseby</td>
<td>Sketching</td>
<td>Travel</td>
<td>Reading</td>
<td></td>
</tr>
<tr>
<td>Newbury</td>
<td>Sketching</td>
<td>Sport</td>
<td>Music</td>
<td></td>
</tr>
<tr>
<td>Shewsbury</td>
<td>Sketching</td>
<td>Music</td>
<td>Sport</td>
<td></td>
</tr>
</tbody>
</table>

Sketching (8 tutors preference); Travel (6); Reading (4); Sports (4) Music (3); Painting (2)

The second point travel, refers to specifically visiting and recording buildings and architecture, a contradiction, all tutors wanted art as an 'A' level but placed 'painting' low on the scale - below travel? That music appears fourth on the list contrasts with the
The portfolio was seen to be very important by every UK school. Tutors were asked to identify their interests when reviewing candidates portfolios. They were then asked to choose the 5 (five) interests they looked for in the portfolios. Because of the complexity of the issues, the overlapping nature and the possible interdependence of the subject matter they were not asked to rank their own observations and requirements only to try to list them out. In order to begin the process a series of prompts were used these were distilled from Clark (1976) and Gardner (1982). The list was as follows, as suggested, in no particular order:

- Colour, Form, Imagination, Artistic Arrangement, Architectural Content
- Insight, Rendering Ability, Overall Impression, Logic, Motivation
- Symbolism, Texture, Organisation, Style, Variety.

This produced the following result; the number in brackets relates to the tutor choices.

Motivation (7 tutor choices); Imagination (6), 3D Rendering Ability (6); Architectural Content (5); Overall Impression (5), Insight (4); Artistic Arrangement (4). Variety (4)
See appendix 2(a).

The section on portfolio analysis produced a tie between motivation and three dimensional representation abilities. A close third was architectural content. As a combination of subjects these may be seen to be appropriate to the vocational aspect of the architect’s work.

Discussion with the respondents on the value of the portfolio became protracted and few specific definitions were available. The researcher believed that motivation was related to the energy and quality displayed by the work and personally perceived by each tutor. This will be discussed later.

**Staff Selection Methods**

Protocol: Section E, Subsection 1

All schools discussed the method of selection of students, they all recorded that because of the "demand" for places that other than reviewing the application form and the candidates statement of interest and the references, and then if necessary or relevant an interview was
offered and at that time a portfolio review was undertaken. At that time a decision was
then made about an offer. In response to a query about how or if any managed weightings
procedures were involved, the answer was no in all cases. However other pressures such
as numbers and various social minorities representation requirements may partially direct
some decisions, section E 3 indicates some further techniques. None of the tutors
interviewed knew of any other method of interview that had ever been used in their
institution.

Student Quality Follow Up

Protocol: Section E, Subsection 2

In response to the question, Did interviewing staff ever formally followed up any of the
students they had interviewed in order to identify how they had performed during their
time at the school and then to test that against their recorded interview assessment, the
answer was a resounding no. No school visited had ever undertaken such a study.
However most tutors suggested they had feelings about the students they had seen
initially. This did not constitute an objective study. This appeared conclusive. No tutor
has ever done a follow up of the performance of the students they selected. According to
Cattel and Klein (1977) failure to follow up on selected personnel ensures the selection
procedures used are never at the cutting edge of the process could therefore lead to an
eventual organisational failure.

Selection Processes

Protocol: Section E, Subsection 3

The majority of schools did complete summary sheets which were then sent to the
admissions tutor (if that was not already their role already). The summary sheets were
different for every school; with in general the assessor had to choose between factors and
traits and to assess them by indicating with a tick in one of the following ways. Typically,
Excellent, good, fair, weak, no admission, or very good, good, weak, poor/reject. etc
An example of a typical summary sheet used at interview is shown below:

<table>
<thead>
<tr>
<th></th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Weak</th>
<th>No Admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Interests</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Appearance</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

source Naseby.
With at the end, the recommendation that the candidate would be: 1. accepted unconditionally; 2. accepted conditionally; 3. waiting list (high, middle, low) and reject.

Interviews were generally of twenty minutes duration. Any weightings which the selection tutor used were purely subjective other than those mentioned in E 1 above. There was a similar format for these forms at all the schools visited. Some of these forms can be viewed in the Appendix.

Creativity Assessment

Protocol: Section F

Section F of the instrument embodies two Research Problems. The first, that building design schools apply little or no recognised objective creativity testing in the form of aptitude creativity or intelligence testing. Secondly, that building design may be a talent, a form of "giftedness". If it is how do selection tutors recognize it or select for it?

Qualitative Assessment Awareness

Protocol: Section F - Sub Section 1

This section attempts to identify what techniques are used in interview sessions, whether they are objective, subjective, professionally recognised (i.e. interview staff had been trained), or ad-hoc. As can be seen from below none of the institutions visited had ever trained their admissions staff in interviewing techniques.

In all the institutions visited during the pilot study none offered any scaling or quantitative tests, nor had they in the past. All relied on the interviewer's personal judgement for the selection of students or on a points systems for those who could not attend or who appeared such strong academically qualified candidates that a judgement could be made. This judgement was the academic assessment that the student would "be able to complete the course". Indeed the majority of admissions tutors expressed considerable reticence and scepticism about the efficacy of any form ability or creative assessment tests. Only at Naseby and Newbury was there any degree of open mindedness that testing could be of value.

None of the institutions had heard of any of the tests mentioned in the questionnaire. Of the nine people interviewed only one had ever taken any form of battery test (it was a careers analysis tests in his final year at architectural school - when the tests results suggested practicing as an architect as a future occupation. The individual wasn't impressed (Edgehill).
Eight of the nine respondents rejected tests as of no value in assessing artistic or creative ability! Placing a value on creativity or aesthetics was seen to be naive and it could be a 'politically' dangerous measure, "There can be no proper or correct art that can properly be assessed as better than any other", (Cheriton College 1987). Comment without knowledge should be rejected as it lacks value. However, it should be born in mind that all the interviewee's information about the performance of personality or giftedness battery testing was at best second hand, generally gleaned from colleagues or from the popular press rather than journals.

Can Anyone Be Taught To Design

Protocol: Section F - Sub Section 2

This question engendered considerable discussion and opinion. It was suggested that the difficulty begins when students have to realise their plans in terms of 'spatial form', i.e. conceptualising from the two dimensional plan form to the three dimensional intellectual model. Being able to visualize external form and internal space volumetrically require a specific type of thought process, (Edgehill and Langport were particular in identifying this problem), even thought design solutions demanding double, triple and quadruple height areas within one space are seldom seen on the undergraduate course. Split levels and mezzanine designs prove measurably difficult for many students.

It was generally agreed that the area where the majority of students found greatest difficulty was in the application of aesthetics to the final building envelope, in other words the exterior elevations, or how a building looks. Design can be taught, though how students use that teaching is of course an individual response. "Unfortunately the students response was not always within the levels required or expected of the school", (Naseby 1989).

The system of assessment was then discussed. It was agreed that plans, sections and essays on buildings could generally be marked fairly easily. If the student failed to satisfy the planning brief then the building just didn't work or if the written analysis was wrong in the details, then a marking scale could be registered. Assessing the aesthetic value of a student's work was seen to be more problematic, the major question is still "what is art". One tutor (Shewsbury College) noted:

"Is a building bloody ugly because I think it is. Or is the building so different that I just don't have the judgement or experience to assess it"? (Personal interview 1989).
Another aspect of this attitude was revealed at Langport College where the researcher was told of one particular student who had a terrible reputation in every subject, who in his design scheme attracted an assessment of 3.5 from a possible maximum of 10 from this internal tutors but was awarded an average mark of 8.5 by the external examiners, who would not move from that mark. The externals were unaware of the students "history" and had marked what they had seen and not marked the individual's reputation and the quality of his previous work. From this the author would note that aesthetics is problematical to assess but also within the school environment other problems and issues are involved.

The majority believed that depending on the innate qualities of the student and the degree of their design talent, they would be either more, or less easy to teach. Interestingly 8 tutors recorded that their best students worked alone and were seldom seen in the college, (thus confirming MacKinnon's, Roe's and McGuire's views on creatives in architecture) other than for lectures or occasional compulsory design crits. It was noted that the weaker students also had a similar attendance profile. 'Average' students tended to be in more often. Other respondents had not noticed attendance one way or another, stating that most students were always available or 'around' because of time tabling or 'sign in' systems.

Section F, part 3, was perhaps the key point of the whole questionnaire and it is worth transcribing here.

"Do you think that certain individuals have an inherent aptitude for (architectural) design (i.e. a natural acumen, a talent, or "giftedness")?

All the respondents were asked the following questions:-

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there such a person as a natural designer?</td>
<td>7</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Is there such a thing as Design Talent? (and if yes):</td>
<td>9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>A. Is it a natural phenomenon? (or)</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>B. Is it the result of a design education?</td>
<td>3</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>C. Is it a combination of both A and B?</td>
<td>8</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

From the above, it could be seen that the majority of staff, by 12 to 2, 14 to 1 and 9 to 4 appear to believe that design talent or giftedness in design is not necessarily related to design education. They believe it exists and they believe there are such persons who are natural designers. When asked why, if they believed design talent to exist did they not search it out, the general response was that there were no 'fail safe' methods of doing so. Their (the admissions selectors) intuition was probably the best guide they or anyone else had in determining if a candidate did or did not have creative design acumen.
4.1.6: ANALYSIS OF THE COLLECTED DATA IN THE FIELD STUDY

The analysis of the data collected in the previous section will follow the same format as the interviewing instrument, beginning with section 1 and running through to section 6.

The first section of the instrument regarding the hypothesis that school resourcing and biases have an impact on the "design" that was offered was particularly well shown through the data.

Section 1 of the instrument concerned the collection of statistics regarding student numbers over the years of the course. All the schools visited showed high dropout and failure rates and they appeared to be particularly high in the female student group. All schools identified that up to 65% of their total 'wastage' (students not completing the course) was due to 'dropout' rather than examination failure. This dropout factor is a worrying statistic in itself. The average 'wastage' in the schools visited was 40% the RIBA national statistics for the five year course recorded in 1986 was 52%.

The high female student wastage (60% in those schools which returned figures) is of concern. Nationally 63% of all female students who begin an architecture course do not take their final part 3 examination after 7 years. These statistics suggest that women are possibly less willing or able complete the lengthy course. This may be related to the structure, content, duration and any built in course biases or it could be down to differences in the life career events of the two sexes?

The number of students choosing to leave the courses is again significant though reservations were drawn on the reasons for their leaving. For example it was significant that all institutions visited accepted that following the third year of the course and obtaining their first degree many students would either.

A. Leave the career for another in the same industry - i.e. interior or landscape design, town planning, building or estate management etc.
B. Take more than one year out in training - it could be up to three years
C. Students would change colleges for various reasons - new ideas, boredom, dissatisfaction, etc, etc.
F. Leave the career for another - completely unrelated to it.
E. Stay in employment and not return to complete their education (yet remain working in an architectural environment).
D. Drop out all together.

Though it is clear that there is a significant wastage rate there appears to be no corrective
mechanisms to stop it. The RIBA statistics section has been aware of it for many years and the schools declare their uneasiness on the subject. All appear helpless to reduce the problem. Indeed it is identified and agreed by all the respondents that it is a problem.

Section 2, relating to the strengths of the school was complex. Heads and others with external activities - i.e. publicity, recruitment etc., displayed a 'public and a private' view. The rating of subjects was of no surprise, design and design presentation were placed at the top of the list.

These findings were of concern and important in the context of the second hypothesis for the following reasons:-

1. They reflected the HMI (1985) report in that responses were stereotypical. The schools themselves did not seem to understand, know to or admit to their own specialist areas. However their students did (who, when in discussion identified specific centres within their curricula which received particular stress and attention by staff and resources from the school). (Naseby, Cheriton, Newbury and Chalgrove).

2. When presenting points i, ii and iii, as developed from the data, as the school's main interests to attendant prospective students, were they misleading them?, when the school possibly has its own agenda? Also, in order to obtain exemption from the RIBA examinations the school must be seen to teach the whole syllabus. Thus, why schools should have specialities or particular orientations appeared to be seldom explained.

3. It's possible that potentially 'Design Creative' students accidentally attend schools with high technical orientation and thereby have their creativity smothered, or leave the career due to a lack of motivation and interest.

4. Conversely convergent type students could end up on divergent style open design courses and divergent students end up on convergent technical style courses.

5. This not only could be an example of schools not seeking out design talent, but inadvertently stifling it.

The HMI (1985) report noted in paragraph 12L-
"In choosing a particular school, candidates find it difficult to differentiate
sensibly between courses that claim for example, to be design centred, technology centred or art based". (Page 8).

This suggests that schools indicate the direction of their courses both in their prospectuses and in their public profile. This is contrary to the author's researches. Nor was it identified by Gartshore and Mayfield (1988), who in a considerable section of their report, attempted to determine the reasons for some schools having a high science bias in their 'A' level entrance requirements and others which had different subject preferences. Indeed Mayfield has confirmed that this "school speciality" was known about 'at an ethereal level' but difficult to allocate to particular schools who seldom admitted it (oral communication 1990).

Gartshore, et al, state that although there are very few schools which publically make these prerequisites for sciences or arts a 'minimum' requirement, there are quite a few who see them as a general unpublished rule. While this is not satisfactory, in terms of academic or scientific 'proof' it does clarify three aspects of the problem.

(1) Schools do operate differentiated courses with their own specialities.

(2) Candidates have little knowledge of this and therefore have difficulty in differentiating between them, in order to maximize their own potential.

(3) There is not enough information published by the schools or by the professional bodies to understand these specialisms. Thus students may find themselves involuntarily doing subjects and courses for which they are psychologically and temperamentally unsuited.

It is clear from the research that the schools did have their own specialist areas. In the UK these are not published - which could lead to problems particularly when at Chalgrove few interviews are offered and thus the candidates have no opportunity to discover details of the course if (as appears unlikely), they knew what questions to ask in the first place. In Europe at the schools visited the academic bias was more clear.

Schools in Technical Universities and Fachhochschulen were very much technology orientated. Schools attached to arts foundations were more design and arts centered. This data goes a considerable way to establish the legitimacy of the second hypothesis; that because of differentiated courses, schools seek particular subject biases in their applicants examination subjects, rather than seeking out specific or general design ability.
Selection Stereotyping

Section C

This part of the instrument relates to the research problem that tutors select students for design courses often, because they can complete the course, rather than any ability they may have as designers.

The research relating to entrance qualifications most probably reflects the real world. Market, or demand conditions set the entrance criteria. In a year of high student demand for places minimum qualifications rise across the board. In a year of weak demand entrance qualifications fall across the board. The "bums on seats" requirement for departments to fill their student quotas to keep their courses in existence is probably the one guiding factor for many schools though while it was discussed during the survey it was always in the context of some other establishment rather than the respondents own college.

The need for quotas of students acts to an extent like a "loose cannon on the deck" disrupting not only the schools selection criteria but also for this research, ensuring that the complete flexibility of the examination entrance criteria does not allow for specificity.

Interviewing Processes

Protocol: Section D: - Sub Section 1, 2 and 3.

An important aspect of the assessment process is the interview. While the polytechnics (now new Universities) and the art college stated they interviewed all their short listed candidates this is not the complete picture. The problem is that many of the students who are interviewed at whatever university and polytechnic never actually end up at that institution. Many candidates who have achieved higher than expected results obtain places just before the start of term in departments where recruitment is low or in architectural departments in universities which had not previously offered interviews but just sent, what at an earlier point appeared to be impossibly high 'A' level requirements. The student goes straight to that university. Indeed this maelstrom of change and activity during the 'A' level results period to a certain extent makes the interview period less effective and quite inefficient. At Cheriton College 1988, the researcher recorded at only twenty three of the forty one students in the first year had been interviewed by the College. The others had been recruited following the publication of 'A' level results and the PECAS (now
UCCA) redistribution system. At Langport (1989) the researcher discovered there was a similar situation; (eleven students out of thirty two had not been interviewed) Of the first year entry in 1988 at Naseby, fifty six percent (56%) were interviewed. It would appear to be a commonality; which again does not allow for consistency in the statistical aspect of selection and its viability vis a vie the school’s declared policies on inspecting the potential of prospective student work. This helps clarify research problem three. The other sections, regarding numbers of selection tutors involved, the number of interviewers required and, gender bias are all as previously recorded, and often identify what in management terms would be referred to as unacceptable methodology.

Stereotyping Of Students

Protocol: Section D - Sub Section 4

Sub Section D was developed to support the second research problem, which was that interviewing tutors are often victims of their own personal stereotypical views of what makes a successful designer. They therefore make subjective selections based on their own belief systems rather than attempting to use more objective scaling or quantifying techniques.

This section attempted to identify any preferences in physical type that the selection tutors may exhibit. To note if they were actively seeking individuals with an individual flair for dress or personal physical presentation. The work of Goffman (1959) Williams (1963) and Hudson (1966) all indicate that creative individuals not only think in particular ways but is more than likely that creativity will also manifest itself physically in dress, appearance, attitude and body language. However the selection tutors appeared to be seeking what Getzels and Jackson (1962) called, 'docile quiescent' students who are unlikely to give the teacher a hard time, the conservative high IQ rather than the creative high IQ type.

This is similar to both MacKinnon's (1962) and Hudson's (1968) researches. However while the data identified a conventional well groomed healthy profile it also uncovered another factor which was not so obvious. The researcher noted that regularly the descriptions provided by the tutors of the physical characteristics of the candidates closely matched the respondents own physical appearance. This substitution of self as a icon for selecting candidates is generally subliminal but as part of a selection process for what is termed creative high IQ students this does appear somewhat inefficient if not ineffectual. Indeed occasionally the line between idiosyncrasy and downright professional incompetence is often crossed on the part of some selection tutors. For example one tutor
who was wearing chrome-yellow tie, waistcoat and matching socks, when challenged why he placed co-ordinated clothing, tie, etc., at the top of the range appeared unaware of his own dress. After discussion it appeared to be a matter, "well I've done ok so far" and "I match my socks and tie!". While this implied success may be true for that particular individual it can hardly form the basis for objective selection judgements.

Subsection 5 As can be noted from the previous data and the subsequent ranking of the traits by the tutors the rank order is interesting in that the traits are not unexpected. They tend to be what Klein (1975) and Herriot (1984) refer to as 'role expectation' traits, i.e. The interviewer will act in a particular way, thus ensuring that the majority of candidates will offer the same mannered responses when they want something in particular. However the author would suggest that schools of design should be looking beyond the general. Again the data clarifies the research problem, that tutors are often victims of their own stereotypical belief systems.

The author would add that during the interviews throughout the analytical discussion and disclosure sessions many of the points previously discussed in the earlier sections of this research by McKinnon (1962) and Dacey (1990) were raised by the researcher. It was within that context that the respondents made the rank order that they did.

Subsection 6, attempted to identify those characters which admissions tutors would use to assess the thinking and creative abilities of candidates. The highest ranking that was given to political awareness was surprising. General discussion was unsuccessful in determining why it should be. One tutor at Langport (1988) stated the old axiom:-

"The price of bread is political and in order that students will later be successful they must be aware on which side the bread is buttered". (Personal communication 1988).

Other than the broadest reasoning no specific train of political thought was encountered. This section also produced a dilemma for the researcher which was, that during the questionnaire section (D.6,) the following occurred. As discussed earlier in preliminary discussions with tutors on abilities and traits to be looked for in students, no one ever mentioned music. Later however when shown the list of traits and abilities, the same persons rank music highly. The researcher cannot explain this other than to suggest that the individuals concerned are choosing from the list which may to them seem to be the culturally acceptable public norm. However it has created a worry as to the "planting" of ideas by the researcher in otherwise possibly unfertile ground.
Below are responses to the questionnaire in terms of interviewees abilities and appearance as discovered by part D, sub sections 2, 3 and 4. The tables below identify the hierarchies

Sub-section 2 Sub-section 3 Sub-section 4

<table>
<thead>
<tr>
<th>Candidates</th>
<th>Candidates</th>
<th>Candidates</th>
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<tbody>
<tr>
<td>Personal Appearance</td>
<td>Personality</td>
<td>Abilities/Trait</td>
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1 Neat appearance 1 Confident 1 Political awareness
2 Cleanliness 2 Reserved 2 Musical ability
3 Athletic build 3 Smiling 3 Historical sense
4 Good looks 4 Eye to eye contact 4 Mathematical ability
5 Good figure 5 Questioning 5 Philosophical Awareness
6 Original appearance 6 Leans across table 6 Logic
7 Co-ordinated assessories 7 Laughing 7 Discursive ability
8 Clean hair 8 Portfolio ego 8 Ingenuity
9 Matching accessories 9 Talkative 9 Social awareness

Above: Tutor Interview Responses Data.

What the above identifies is a very generalist approach to selecting individuals for design. Indeed the theoretical research in this thesis identified certain specific characteristics, applicable to designers few of which are encountered in the results of the pilot study. Scrutiny of the hierarchy of the twenty seven traits developed by the research in section D suggest a particular fatuousness in some of the approaches to the selection of students.

In the end, it appears to be the personal choice of the interviewer and what they imagine they see in the students and their portfolios. Of course the major problems arise when the admissions tutors are not very good at their task of selecting suitable candidates. This was the main thrust and content of the fourth research problem.

It should also be noted that Comvey's antonym procedure proved difficult to apply creating occasional confusion and weakening the "natural flow" of the discussion. Indeed it could have had the effect of "closing down" an otherwise 'open ended' ideas exchange. In the final four visits, Langport, Marsden, Newbury and Shewsbury all in 1989, this process was not used.

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Staff Selection Methods And Creativity Assessment

Protocol: Section E and F

The basis of this research is that some students have more natural 'ability' or are gifted in 'design creativity' than others. Though other than in examination grades this is seldom mentioned in architectural texts. In every school of design that the author has visited to date, (1995) it is obvious from their annual exhibitions that some students have more design 'talent' than others. These exhibitions would suggest that in a creativity profile analysis across any group of design students in any particular year, containing an average of thirty five students there are an average four or five schemes which fall into the "inspirational and desperate" category of design ability. It is only very irregularly that innovative designers show themselves. Perhaps Galton's (1890) 'eminent men' researches identifies a similar point.

The research has noted the continuing processes in Design schools ensures the continuation of the existing system. However, whether it is a sensible system or whether an analysis of current procedures will assist in making the process more satisfactory to all concerned is yet to be seen.

Hypothesis five in section F concerns the lack of objectivity applied to students selection to design courses. Also staff in all institutions have no formal interview training and no assessment aids to assist them in identifying creativity.

Sub section 2, addressed the question of testing for creativity. Were any of the institutions visited using any tests or formal methods of analysis in their student selection processes.

None of the schools visited offered any form of objective testing.
Sub section 3 of section F embodied the final hypothesis.
Is there such a thing as "Design Talent"? and as a supplement, Can design be taught?

The following quotes, additional to those recorded in section E, subsection 4, may well be illustrative.

"Yes, design acumen does exist", Naseby (1989).

"Yes, you can teach design, but if those being taught have little design ability then the results are abysmal", Cheriton (1988).
"There can be little doubt about it, all you have to do is walk around the studio; Though it's easier to recognize in the later years rather than the earlier ones", Newbury (1989).

Yes, of course but it is by degree - some are good at overall form, others good at bits", Cheriton College (1987).

It can be seen from the above (which although a small selection is representative) there appears to be a general consensus that there is indeed a trait which the interviewees recognised as design talent.

4.1.7: FUTURE FIELD STUDY

However one aspect of the Field study was its need for development. The requirement for further specificity was noted. In general it demanded further expansion into other areas relating to the research as well as clarification of questions and related areas. It was also clear that 'shorthand' summary sheets would be useful particularly for sections D and E. Specific questions relating to portfolio analysis are notoriously difficult, indeed one of the problems recognised by the Field study was that of the definition of the work displayed in the portfolios. This was particularly important in the context of the interview situation when only one (or two) tutors examine the candidates work. Did Tutors allow their biases to divert their attention from what was actually displayed in front of them as distinct from their own expectations of what should be there, or what they would personally like to see in terms of content? This subject needed further definition. Also an analysis of alternative forms of selection need to be included if there were any; and how the schools weight or evaluate their decisions? What rating scales are used and if they exist who established them and on what criteria.
PART 5

SUMMARY AND CONCLUSIONS
SUMMARY AND CONCLUSIONS

This research into selection procedures in Schools of Architecture with the added possibility of the existence of a talent or giftedness in the design of architecture, and the subsequent survey of what criteria architectural schools apply in regard to seeking out this design talent when recruiting their students has proved useful, in as much as it may begin to explain why considerable elements of our built environment suffer from what the community refers to as unappealing design.

5.1 : OVERVIEW OF THE RESEARCH

The research issues have been concerned with identifying large student drop out rates, the confusing issues regarding the perceived cultural role of the architect, the differing curriculae of the schools, the assessment processes used in schools and finally identifying if the realm of psychology had anything to offer in searching for creativity, in the sense of which particular aspects of the individuals traits or capacities may assist in the creative/design process and how this could assist the schools selection programs in identifying, students with design giftedness/creativity. If the schools could find it, then through judicious teaching and educational programmes this acumen can be nurtured, thus ensuring the ultimate benefit of an architectural design course both to the individual and society. That benefit would be the enhancement of both the living and work place by the provision of a better quality of building design. After all it is the individual designer who fundamentally bears the responsibility for the final building.

There are over thirty thousand registered architects in the United Kingdom and it was recounted that it could be assumed, that at least one in three of these is engaged in a building of reasonable size every two years. With the average project completion time of two years, then the community should have at least 2,000 competent pieces of designed architecture each year. However as Weeks recounted it appears that from the large number of buildings completed each year by architects only a handful of projects can be described as architecture, the rest he says are only buildings. This considerable deficiency is a serious
reflection on the competence of the school trained graduate and therefore must reflect directly on the methods of education.

The research has been broadly disappointing. The main thesis has taken considerably longer to produce due to the complexity of the model and the almost total stereotyping of official views that pervades design education. These views range from the Education committees of the RIBA ARCUK and to a certain extent the DES, through the heads of schools, to the publicly portrayed image of the schools and the profession. This presentation leads to another problem which confronts those wishing to become architects and that is their own probable misconception of the role. Historically and currently the title 'architect' has multiple associations for its adherents. Friend of Kings, leaders of men, high creative and high social prestige all combine to attract applicants to its ranks for these reasons alone. There is a failure on the part of the profession and the educational establishments to disabuse applicants from these concepts. Indeed this style of elitist perhaps 'snobbish' sentiment is still presented publicly by many senior figures. Another more accurate picture of the role of the Architect could be represented as a high responsibility, very complex management centred career with very low remuneration when compared to the career earnings of other professionals.

That a considerable number of students had both an unreal view of the architects role and were unaware of their architectural schools curriculae, would appear to be a poor basis for producing talented architectural designers, let alone offering and inducting students to a course of education. An axiom encountered in architectural education is that the weakest students will probably find a job anyway, because the building industry is so massive, that everyone can fit in or find a living somewhere. While this may once have been true, it is not the philosophy that any design school should take, and identifies a surprising level of moral turpitude which should be admonished in the strongest possible terms.

This also opened up the discussion on the direction of architectural education. Is it vocational or academic in nature? The research noted that it was an unhealthy amalgam of both. There appears to be the minimum cogent academic or vocational framework for the training of an architect. The schools work within a curriculae laid down by the RIBA and ARCUK and are flexible in their individual identification of their course needs. These research problem areas were clearly illuminated in the field studies. It is interesting that the United Kingdom, in common with European and American schools of architecture have a similar philosophy in their approach to selecting candidates for their courses, and that they equally have vast fallout and failure rates. Why should these rates be so draconian?
The research suggests that following:-

a. The "liberality" of the subject and particularly those involved in it, negates any real demand for a scientific analysis of the situation.

b. That graduates will find a job somewhere in the industry (if not as an architect) is a common belief.

c. The UK has been an international leader in the massification of building design education. Introducing testing may have harmed this growth.

d. The economics of school survival ensures the slackness in selection procedures in many schools.

One of the problems is the philosophical base for most architectural schools and this follows the debates and conclusions of the 1956 Conferences on architectural education and the resultant "massification" of the profession the schools accepted the concept that "anyone can be taught to design", that is; if they have average intelligence.

Jane Abercrombie's work seems to have been damaging to the quality of the design standards of the profession and therefore ultimately the built environment. Schools of architecture themselves have no definite ideas on what constitutes good creative design. Even worse it was established by the research and agreed by other authors that the schools had undisclosed agendas of their own. These agenda were primarily concerned with specialist subject areas, often with no direct design relationship. It could be said that specialism in environmental matters (i.e. water, ventilation, heating and electrical supply) effect design but for the purposes of Her Majesty's Inspectorate these were deemed to be indirect. It was stated by the inspectorate, that such specialisms created particular emphasis to design courses and therefore may act against a student's interests or produce graduates with a particular attitude to design.

It is explicit in the research that the majority of design schools are independent organisations, concerned with their courses and the quality of their product. It is also transparent that they are equally concerned with their own economic survival and as such are regularly required to admit to their courses students who have only the lowest scalable abilities in design. Regrettably because of the existing system far too many of these individuals appear to survive the lengthy courses and then perpetrate their poor design ability on the rest of the community.

In the research, the analysis of architectural models was of concern. The models were all reductionist in nature most however were multiple derivations of the earliest Vetruvius
model (see Wooton) of Firmness, Commodity and Delight. Most authors are involved with the firmness and commodity of buildings, the delight factor is mentioned but never elaborated. "There are just some things that cannot be defined". Yet, university degrees, in design and fine art, design competitions, student crit sessions, art and design exhibitions are all elaborated and defined by hierarchical marking or assessment in the sense that aesthetic judgements are tacitly and explicitly made.

This constant fear of providing either in print or in curriculae, an analysis (in any form) of aesthetic quality is a continual worry; as it happens all the time in the real world. It appears from the many models for the production of architecture, that analysis of the practicalities of the end product of design rather than the synthesizing of the design process itself seems to be a result of the fear of cultural politics (what is art?) added to psychological ignorance.

The reticence in analysis of 'design content' and design acumen is universal. The research identified very little historical evidence regarding it. Ruskin, Wooton and others refer to 'having the eye', having ability in eurhythmy, being "gifted in symmetry and balance" and so on. These writers all identified that to provide 'delight' in buildings, some definite yet undefinable ability was required to be present in the designer. Generations of critics and practising architects have recognised this ability, though it appears that currently educationalist and professional bodies now often fail to do so.

What was also shown to be suspect were the claims made by the schools for the numbers of students who both made applications and who had attended interviews. Many schools consider that this is their controlling mechanism. Both academic and artistic ability can be assessed at that point. The research discovered that there were two seasons for this selection procedure. The first was the pre 'A' level result season where many schools interviewed candidates and the second post 'A' level result season where there is simply a scramble by both students and colleges to collect placements.

5.2: THE RESEARCH PROBLEMS

The research was concerned that because of the visual evidence of much of the surrounding built environment, schools of design were not trying hard enough in searching out individuals with design talent.

The first research problem was established by the field research and were; in the case of schools of design organising their courses related to their resources and resource centres.
This was not confirmed by the field study. None of those interviewed would admit to any particular bias in their courses. They know of other biased courses but often appeared incapable of analyzing their own to discover biases or not. The background theory disclosed that many organisations were concerned with these built-in biases, but the schools would not or did not recognised any biases in themselves.

Furthermore because of the economic realities of existence of schools, they must in the end opt for their own survival by filling their course with candidates of varying degrees of design ability and academic quality. It was recorded that it is inevitable and because of the post "A" level rush many students join courses which have built biases and are unprepared for them. This can lead to either frustration for their own ideas on design, or their own abilities and their needs for development being sidelined (but not necessarily deliberately) or ignored. The part of the questionnaire which dealt with this resourcing issue was responsible for confirming the large dropout and failure rate both in the United Kingdom and overseas. Could this be related to the post "A" level rush? In the research the discourse covering the dropout rate was extensive but produced no overall reason for it.

However it is clear that the schools must put their own courses in order with full disclosures of their curricula and providing specific structures of course content for candidates to read before they apply. None of the institutions visited offered any form of detailed design course criteria in their prospectuses, specific information was available on laboratory, field and lecture activities, in science, structure, history etc. as distinct from design philosophy and direction other than in the most generalised and non informational way.

The second research area was inextricably allied to the first. Students are often selected without interview or are studying at a school having been offered a place at the last moment. The field study established that many selection tutors were seeking those who had sufficient intelligence or academic ability to be able to complete the course and a student presenting a good/interesting portfolio was a plus. Students rejected from schools because of weak portfolio's attended interviews until offered a place or with good "A" levels, College Diploma or other acceptable admission.

However as the field survey discovered from those interviewed that there is a basic dichotomy which exists within their teaching, their student selection activities and what they all believed about innate design talent. That is, they all believed that design acumen
exists and then when it came to the actual selection process they appeared to have difficulty in putting their beliefs into practice. In the context of selection everyone interviewed accepted that design giftedness exists, they were all looking for something they could recognize as ability but when pressed they appeared unable to identify any criteria objectively. Indeed the issues involved (ie.objectively testing for talent against sensing talent) became almost unbridgeable. The socio political and personal ego barriers which appear to perpetuate the current system would appear to be unchangeable. Selection tutors ignore testing and hope that they might get it right 'once in a while' by continuing in the current malaise The guardians and executors of the fetal designer are the staff of the design schools. Central to the energies required later by the teaching staff to train designers are the factors or traits which the selection panel members sought in their candidates initially (their own opinions and traits that they brought with them into the selection process, what ever they were, it is perhaps inevitable that tutors on selection panels, if they are architects who also lecturer in architectural history or graphics or engineering will be biased consciously or subconsciously towards their own speciality. There appears to be no objective control in this matter). When tutors were asked to define what they recognised or defined as creative building design, or design talent, or giftedness in design, little of objective value was offered. Certainty words like energy motivation, craft, imagination, ingenuity, depth perception, were used. No specific useable tool was produced for universal or even consistent recognition, that would be acceptable to the majority of selection tutors. It appeared to be selection by hunch. They should be more objective if at all possible, it should be obvious that the less natural ability a student has, the more effort the studio staff will be required to input.

The research established that there is no coherent or objective methodology in place in any design school that qualifies or tries to quantify what 'design talent' is. Most schools place heavy reliance on previous academic achievement. However many authors state that academic entrance qualifications as evidence, and as a guide to vocational degree performance particularly in a creative undergraduate programme, is at best weak and at worst misleading and spurious.

This is also self-defeating for the schools. It was noted that many selection programmes are seen as "add on" activities to the normal school programme. Staff often require to be 'whipped' to take part. It was recorded that small scale interview panels are not appropriate to selection procedures. Indeed it should be obvious to most observers that the selection programme is one of the most important elements of a schools activity. If students are selected who have a measure (no matter how small) of design talent the whole mood,
dynamic and the design activities of the school would probably improve. From the tutors point of view, they would have able students, who would then need probably less tutorial time on elemental subjects than other weaker, less able students. It would appear therefore that not only is the schools lack of determined searching for design ability in its applicants is a failing, but so too is their assessment criteria too often being based only on entrance qualifications for access.

The third research problem was perhaps the most disturbing, it was that tutors select students based on their own stereotypical views on what makes a successful designer. Their decisions can therefore be totally subjective rather than objective. Indeed they were often victims of their own psychological stereotyping in that they appeared to select (against all credibility for a creative course) what Hudson and others have referred to as docile, quiescent students at the high intelligence, middle creative grade. Rather than at the high creative, mid to high intelligence grade as suggested by the focal theory. Of course high creative, high intelligence profile students would be ideal, but as no tools are used to identify such psychological profiles few are in actuality found. Hudson and Leary both noted the theoretical numbers of these various groups in society and it would lead the author to suggest that there are sufficient numbers of individuals available to make good designers if the schools would make the effort to find them.

5.3 : THE RESULTS

The traits and the requirements that tutors were seeking were discussed in the analysis section of the main field study. Therefore an appropriate list distilled from the earlier psychology focal theory section, indicating which trait's seem most applicable to the design creative individual will now be included.

Creative Designers:

(A) Are naturally divergent in thinking pattern.
(B) Possesses elements of convergent thinking in order to positively assert one correct answer, though from (A), immediately recognising that there are probably many possible answers.
(C) Have higher than average intelligence. Intelligence is necessary in order to manipulate the aptitudes that make up creativity. (Wallach & Kogan 1965), p. 254.
(E) Are more likely to question the status quo.
(F) Have a high tolerance of ambiguity.
(G) Have a willingness to "have a go". (Cropley A.J. 1980).
(H) Are unafraid - indeed revel in their own ideas and spontaneity. (Dacey 1989).
(I) Seek individuality in appearance (dress etc.), (Hudson 1974).
(J) Have high levels of flexibility (Cattell).
(K) Are independent of spirit and in activities thus requiring less managing and directing.
(L) They probably engage in solitary activities. (Simon 1983).
(M) Have high spatial abilities.
(N) Originate the most ideas when required to do so, (Rogers C.R. 1953), p. 149.
(O) Will hold their ground when under critical pressure.
(P) Demonstrate greater than average determination and perseverance.
(Q) Are more open to experience and are less defensive about change and accepting new information.
(R) Are more sensitive to the existence of problems, (Rogers 1953), p. 149.
(S) Are resourceful in adverse situations.

This list is arranged in the order which the author believes to be the most appropriate and sensitive to this research.

This research indicates that a design creative individual need not have all the traits however; the more the individual has, the greater their creative ability will be. In the tutors selection of traits and abilities only four of the above are consistently sought out or recognised as elements of creativity in an individual, i.e.

(C) Higher than average intelligence.
(H) High spatial ability.
(O) Will hold their ground under critical pressure
(P) Open to experience.

The tutor’s stereotyping of physical appearance and intellectual abilities was not satisfactory considering the information available in the literature on basic creativity.

The schools seem to be failing in their selection procedures, both from a lack of professional experience and probably from a lack of concern because:
A. They appear to believe that anyone of average intelligence can be taught to design.
B. They know that courses must be filled with students or they lose funding and may collapse.
C. They believe that the building industry is large enough to take in most poor graduates even if they end up as plumbers mates.

Broadly then, it could appear that the schools are unconcerned about an individual's actual abilities before they enter architectural schools, and care even less what happens to them after they leave. It is society who must witness and experience the results of this.

Research problem four confirmed the concepts generated through hypothesis three. Because of the subjectivity of the interviewing processes it was evident that there were no forms of objective scaling or testing. Indeed the field study indicated that there was considerable antipathy towards the whole philosophy engendered by testing particularly in the area of the arts.

However the field study identified the contradictions evident among the participants. They all believed that testing was suitable for most subjects but not the arts. This gaping dichotomy was never explained. However it may be related to the American experience in the 1950s while was discussed in the background and focal theory sections. In 1954 the architectural school aptitude test for design creativity was inaugurated by the American Institute of architects. It was instrumented by the Princeton Educational Testing Service and operated independently by the schools of Architecture. Students on courses were tested, rather than applicants. It was a disaster as it was never administered properly. It gained little acceptance by the architectural schools nationally to whom it was seen as another unwelcome chore. Individually and collectively the architectural councillors (who were also the test administrators) placed little credence in the ability of the tests to measure future performance either for or in a architectural curriculum. It was also noted in The American Psychologist, that this was a prime example of a good idea being wasted by poor methodology.

It was wasted because the councillors were:

a. Not experienced psychologists
b. Not properly and thoroughly trained to undertake the testing procedures
c. Started with the wrong attitude. They had little belief in the project (It was not recorded whether they were volunteers or not)
The program was seen as additional workload to the timetable.

The program was not identified as financially advantageous to the school or those doing the testing.

This is likely to be the future of any other testing procedures which would be operated independently by the schools, unless considerable resources were allocated for existing staff training or for consultant psychologists to undertake the analysis tasks on site.

It would appear very unlikely that such resources will be made available. Yet without some form of testing and scaling of design ability, how will this circle of attracting the wrong people; educating them without reference to their abilities and the resultant production of dreadful buildings be broken? Architectural and Art teaching staff often tend to believe that their assessment of an applicant's creativity is sufficient. It could ensure a school developing an almost dynastic form. i.e. staff like students, students flattered, emulate staff, this produces continuity of staff iconography, graduates are employed as staff, the circle is complete.

The research identified the problem that exists within the creativity development and design teaching sector. When the final research problem was put to everyone on the survey all agreed that creative design ability exists as a human acumen. The focal theory accounts for disparate cerebral activity and it would appear reasonable to suggest that creativity may be a further, though as yet unmapped independent brain activity. It is also possible that creativity may be located in that mercurial zone of the cerebral soup of inter-connecting neuronic material; though this research and now current D N A research would suggest that would be unlikely. In the individual this creativity centre can be underdeveloped and dormant, or it may be minimal or non existent. It could be median capacity or it could be, physically a large part of the cerebrum. This aspect of creativity and its physicality probably have genetic aspects, currently work on this is progressing. As Leary noted, the culture blockers which society often layers over individuality can often effectively stop creativity development, Maslow and Pavlov also showed how it happens.

However it does not detract from the research area concept that design ability may exist. It exists in the majority of the population, this was identified in the focal theory section. That it is, in Hudson's terms actively "depressed" through cultural structuring does not negate the fact. Indeed it is more than a possibility that there are many highly creative people who are more than capable of being designers who have never had nor ever will have the opportunity to discover their own potential. As their potential is never sought out
it is therefore up to the individual to discover it in themselves. However if the educational process prefers docile pupils and spends its time teaching the majority into that mould, then their self-identification ability is likely to not exist. Rabbi Burns was accurate when he wrote:

O if god the gift to gee us, to see ourselves as others see us.

The author would suggest that many weak designers are licensed to design because of the self regenerating design education system; while many other unknown but possibly able designers are doing non-design work, perhaps this situation requires remedying.

The research has progressed, the five research questions provided information which assists in identifying the problem of why society has been served with a degree of recognisable building design failure.

As Samuel Butler noted:-

"Everyman's work whether it be literature or music or pictures or architecture or anything else, is always a portrait of himself".

If the individual does not have innate design talent, it is most unlikely that they will be able to produce good architecture.

5.4 : CONCLUSION

Schools of architecture would be out of business if they were required to run their schools efficiently. The maxim that 'any intelligent person can be trained to design' may well in part be true, to a degree. However the level of creativity and intelligence required is never stated nor is it noted that they can design badly as well as designing ably. It is a partial truth which has for many reasons been cited in this research, unfortunately it is too often the foundation of international design education.

Tutors and lecturers must labour hard and long with students with low creativity abilities. They may need work much less with students who have high creativity traits. It must therefore be in their interests, in time, energy and financially to positively screen applicants for design creativity. Yet Schools do not professionally screen applicants? As has been noted, positive screening has no credibility for historic, political and financial reasons. Yet neither is there any creditable universal recognition criteria in the existing system. A system that is based on selecting and training people.
This research would suggest that criteria for measurement or scaling could be initiated. That creativity exists and needs further examination is now obvious. In the design context the author would suggest that those without any creativity - (they possibly have reiterative ability) could be termed 'design blind'. This nomenclature is necessary as a general label for those unable to exhibit any, or at the very least, have a very low level of design ability. Indeed the introduction of such a designation demands further development. The author would suggest that if "design blindness" is acceptable, then it could be considered as the base, or lowest level of ability. It must be possible therefore to develop a scale of ability. The following is a possible ranking, though manifestly it is capable of further calibration. The following four basic groups are proposed.

(A) "Design Blind"
For those incapable or unaware of design.

(B) "Design Sensitive"
For those capable of analyzing and positively discussing design but not capable of producing it.

(C) "Design Capable"
For those who in the opinion of others can produce an acceptable level of design solution.

(D) "Design Creative"
For those who can produce a high level of design moving towards an innovative solution.

Within these four basic criteria schools of design should be actively searching (rather than sitting and waiting for them to turn up) for design capable and design creative students.

In the early 1950’s the Princeton experiment was a failure. It was noted as important that the schools themselves are not expected to test their candidates. This raises the question of who should do the testing. Who would do the regulating and funding. The American experience is contradictory, some systems are accepted and others not. In the UK there is no acceptance of any ability tests. Schools may be worried that perhaps using such tests not enough applicants would be filtered through to the courses. Also two further things could happen.
(1) Some Schools might close through a lack of students.

(2) Other Schools might need to directly change their courses in order to adapt to design sensitive students and therefore not necessarily be design centred.

The concept that all schools of architecture are sacrosanct is probably untrue. At the vocational level, at which the majority operate at the moment, based on the evidence of their product and the number of fine buildings produced per year then some of them should probably not be in business. However at an academic/educational level where history, art, general environmental matters could be taught, without the final recourse to being an architect but giving degrees in environmental sciences appreciation and economics there is probably more of an argument for greatly expanding their role and numbers in society.

The UK as distinct to the USA and Europe has possibly a major advantage in the introduction of testing. In the UK, Schools require accreditation of their courses by both government and professional institutions. It is unlikely that government would become involved as it would set precedence for other courses. However the professional bodies in this country ie the RIBA and ARCUK are in a different position. It would possibly make sense, and it could be in their interest to set up, organize and run any such tests perhaps bi-annually at centres throughout the country. The performance in such tests could determine that applicants with below average scores would have no access to design schools or if that was not possible then later access could be blocked to the professional bodies themselves.

5.5: THE TESTS

Many tests are available for testing general creativity computer models are also on line for assessing test scripts and models. The most common and probably the most applicable to this research are the Torrance tests, brick Test, Spatial Ability, and Tests of Creative Thinking. We have seen that divergent thinking is of primary importance not only to architectural design but to other design areas as well, and the California Psychological Inventory among many others is more than capable of identifying this trait. Many of the pertinent tests are outlined in varying degrees of detail in a previous chapter of the research. It would be the next stage of this selectivity research to analyze the basic structure, content and appropriateness of these tests for their specificity for building design.
5.5.1 IMPLICATIONS OF THE RESEARCH.

In the introduction it was stated that the thesis of the research was to discover why such large parts of the built environment were so badly designed. This research would suggest that one of the prime reasons for such bad architectural design must reside with the architectural institutes and their attitudes towards filling their courses. Whilst this attitude continues within the schools the community is ensured a continuance of variable design.
APPENDIX 1

Pilot field Study
SURVEY

A. General

School

Identity - Independent Faculty etc.

Established

Number of students    female    foreign
First Year
Second Year
Third Year
Fourth Year
Fifty Year

Number of Staff    female

Average number of student applications for First Year (average over 5 years please)

B. Considered strengths of the School

From the following list select no more than 3 and list them hierarchically, i.e. Technological, (Materials & Building), Design presentation, Design Philosophy, Cost Analysis, Professional Practice (Management), Law and Contract, Structural, Analysis, Building Environment (Heat, light, sand), History, Philosophy.

C. Student Selection

Please outline the system used for selecting students for first year of the course, under the following heading UCCA and applications.

1. How many points do you require for minimum acceptance.

2. In the references, what in particular do you look for?
3. How many staff scrutinise the applications and why? 
Do they have training in student selection? 
Do they have a tract record in selecting successful students? 
Are they the only people available at the time?

4. How many students are called to interview for first year?

5. What are the criteria (can you list them in descending order) used when determining an interview is necessary?

Overseas and mature students no in UCCA etc.

1. How are decisions concerning overseas students made?

2. How are decisions concerning mature students made? 
   Are they always interviewed? 
   Are they given any priority? 
   Must they be from Architectural Practice?

D. Interviews

1. At first year how many staff are normally involved in interviewing each applicant?
2. What do you look for during the interview? Can you choose FIVE of the following and arrange them in descending order?

Personal visual neatness of appearance, colour sense in the applicant's clothing, Originality in appearance, Cleanliness in general, Cleanliness of hair and fingernails, Good looks, Beauty, Athletic build, Good figure, Matching attire, Co-ordinated accessories, i.e. portfolio, watch, neck attire, socks etc. Eye colour, Height, Weight.

3. Character Please suggest which five of the following you look for in applicant.

Quiet, Reserved, Talkative, Confident, Smiling, Laughing, Questioning, Eye to eye contact, no eye contact, Expressive hand movements, Exhibits egoism on portfolio, Aggressive, Moves a lot, Leans across the table, Slumps in chair, Sits back in chair.

4. Subject Please suggest which five of the following you look for in an applicant.

Mathematical ability, Discursive ability, Musical ability, Special technical ability, Colour Awareness, Historic referencing, Philosophical approach, Social awareness, Mechanical ability, Psychological awareness, Logical approach, Maturity, Innocence, Ingenuity, Political awareness.

5. How does your assessment vary between male and female applicants?
E. 1. Have any staff been on interview technique or personnel assessment courses?
   If Yes, could you state which courses.

2. If No, can you state whether the interviewer/s would be familiar with:
   (a) Graves Design Judgement Test
   (b) Thematic Apperception Tests
   (c) Meier Aesthetic Perception Test

3. Do you think that certain individuals have an inherent aptitude for (architectural) design.
   (i.e. A natural acumen, a talent).
APPENDIX 2

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Page 1  Data Collected in response to Questionnaire Section  C Sub Sections 2, & 3, Section D Sub Sections 1, 2, & 3, Section E Sub Sections 1, & 2, and Section F Sub Sections 1 & 2.
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The scoring is as per the later American study, that is that the interviewee's choice of five elements from the list were scored in reverse order: i.e. 1 = 5 points, 2 = 4 points, 3 = 3 points, 5 = 1 point. The ultimate result of the numbering gives the order of the characteristics. The 1 to 5 score was chosen above by the respondent. Please note the score at the edge of the table above.
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<td>15. Political awareness</td>
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Page 4  Data Collected in Response to the Questionnaire  Section D Sub Section 6  Regarding a Candidates Traits and Abilities as identified and Ranked in order of preference by the Interviewer.
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BIBLIOGRAPHY
BIBLIOGRAPHY.


CRUX, M., (1982) Observed Interview. HOS Canterbury School of Architecture with CNAA Visiting Board (June)


238


FOSTER N. (1987) The Sainsbury Arts Centre at UEA. Lecture PCL


GARDINER S. (1987) One Step Backwards’ article in The Observer. London/Manchester


GARNHAM (1986) Artificial Intelligence. Chicago. CUP


GRATZ, P.J. (1952)  Training to be an Architect. AIA Journal (April)


GREEN R. (1953)  AIA Students selection tests. Princeton AIA


The Evolving Systems approach to Creative Work in
Creative Research Journal 1 p 27-51


Personality Inventory correlates of Creativity among Architects in Journal of Applied Psychology. Vol.53 No.4 pp 322-326

Teaching Approach and the development of Divergent Thinking Abilities in British Journal of Educational Psychology Vol 38 pp. 171-80

Genetic Replication and DNA. Harvard HUP


A Discourse on Novelty and Creativity. Albany State University of New York Press

The Art of Remembering .in The American Psychological Review. 37 pp 21-39

Collected Papers. Manchester: Manchester U.P.


Down From The Ivory Tower. Chichester: Wiley.


Personal interview at Brighton with HOS of Architecture. Pratt Institute, New York 20.7.86


Advances in Intrinsic motivation and Aesthetics. Chicago CUP


Are Schools of Architecture Choosing the Right Students. Architects Journal, 151, April, pp 84-87.


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<th>Author</th>
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<td>KHATENA, J.</td>
<td>1976</td>
<td>Major Directions in Creativity Research in Gifted Child Quarterly No. 20 pp 32-61</td>
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<td>KOSSLYN, S.</td>
<td>1987</td>
<td>Seeing and Imagining in the Cerebral Hemispheres: A Computational Approach in Psychological Review 94 pp. 148-175</td>
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<td>McGuire, M.F.</td>
<td>1990</td>
<td>A Life in Architecture. in Frank Loyd Wright ed M.Gottschlich F.L.W., Society</td>
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245
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<td>What is a Designer. Reading: Hypen Press.</td>
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<td>A Psychological Study of Physical Scientists in Genetic Psychology</td>
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ROE, A., (1946) The Personality of Artists in Education and Psychological Measurement. 6 pp 401-408

ROE, A., (1951) A Psychological Study of Physical Scientists in Genetic Psychology Monographs 43 pp 121-239


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VERNON, P E., (1968) Intelligence and Attainment Tests. London: ULP.


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