

Snapshots

John L. Finney¹

Received: 8 September 2016 / Accepted: 9 September 2016 / Published online: 30 September 2016
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Abstract Musing over half a century of interactions with Alan Mackay, a rich array of images of past occasions emerges, personal as well as professional. Some are serious, some playful and some approaching the bizarre. Leafing through a few of these snapshots, I attempt to illustrate some of those aspects of Alan that have demonstrated to me not just his broad radical intellectual imagination, but also his generosity and humanity.

Keywords Generalised crystallography · Generosity · Humanity · Imagination · Non-crystallographic tilings · Three-dimensional printing

So Alan is 90! If my arithmetic and memory are correct, then this means I have also a significant anniversary to celebrate: we have now been colleagues for over 50 years. Not always in the same place, as I left Birkbeck in 1993, but our paths have crossed sufficiently since then that I hope I can still claim the honour of being a colleague of his.

50 years of knowing Alan means there must be a lot to talk about. So I jotted down on an A4 sheet an array of words and phrases that, to me, characterise Alan. Things and events relating to him that have stood out to me over that half century. I have the page in front of me now, and it looks like a random list: Democritus, Strathnaver, Burakumin, Hobsbawm, Zhabotinsky, I Ching, Porridge,

Phuket, Daniel 12:4, Seiko, Limerick, etc. The list reminds me of an intellectually challenging quiz show on BBC television: *Only Connect* [1]. The challenge of the show is to find links that connect sets of apparently unrelated words (try playing it yourself [2] and see how difficult it is!). My challenge now is to try to weave together some threads that will connect at least some of these words and phrases to give an impression of what Alan has meant to not only my science, but to me personally.

Footfalls echo in the memory [3]

I'm back in Birkbeck College, London, in a mid-1960s summer. I've recently arrived as a green Ph.D. student in Bernal's Crystallography Department to join his group on liquid structure. The research in the department was organised into several groups—Harry Carlisle ran the protein crystallography group, Jim Jeffrey the cement and industrial materials team, Rex Palmer and his colleagues focussed on solving small molecule structures, and of course Bernal's group worked on liquids. But where did this odd guy Alan Mackay fit in? He didn't seem to be a member of any of the groups and he didn't seem to have any funding for a team. He seemed to be working on his own on a whole range of topics that I could, at that time, see little connection between. They were, it seemed, all related to something the department called "generalised crystallography". What the heck was that?

So was I introduced to one of what I see as one of the Alan's key characteristics: he worked on problems that *he* found interesting. That they weren't areas of science that the funding bodies gave importance to didn't appear to matter to Alan—he seemed to be more than happy working on his own, and connecting with others on those aspects of

Special issue honoring A. L. Mackay.

✉ John L. Finney
john.finney@ucl.ac.uk

¹ Department of Physics and Astronomy and London Centre for Nanotechnology, University College London, Gower Street, London WC1E 6BT, UK

science which resonated with them. Luckily, I turned out to be one of those people, as it seemed that “generalised crystallography” included (classically) non-crystallographic systems such as the random sphere packings I was working on as ideal structural models of simple liquids.

Thus Alan helped open the eyes of this young scientist to the wider horizons of structural science—what you can get when you remove the classical crystallographic restriction of elements distributed on a regular, repeating lattice. I thought I was pretty revolutionary working on completely non-crystallographic systems like random packings, but Alan’s development of generalised crystallography showed me that even “my” (actually Bernal’s) packings were only one small part of a wider science of structure.

But Alan did more than broaden my visions: he also began to involve me in some of his generalised crystallography work. Showing typical generosity, he asked if I would go in his stead to a meeting of the Institute of Physics in Brighton in 1969 and present a paper *he* had been invited to give. It wasn’t about work on which I had particular expertise, but I appreciated the opportunity to present interesting science in front of an expert scientific audience. Hopefully I didn’t make too much of a mess of it.

But this wasn’t the end of the matter. Again with typical generosity, a couple of years later he gave me a draft for comment of a paper partly based on the work I had presented for him in Brighton. There was my name next to his as co-author! OK, it did involve other work which I had been specifically responsible for, but it set that into a wider generalised crystallographic context. So we put together a final version of what was an attempt to develop a description of arrangements of atoms in terms which do not depend on arbitrary axes. The abstract of this “Structuration” paper [4] illustrates the breadth—as well as the novelty—of what Alan was attempting: “*An outline is given of the Birkbeck programme of work describing the statistics of regular (crystal) structures and the regularities of statistical (liquid and glass) structures in reaction to the tendency to regard all structures as crystalline but with imperfections*”. My liquid work was a small part of the overall picture, and Alan’s involving me with exploring the bigger picture was not only stimulating, but encouraged me that I too could perhaps contribute significantly to pushing forward the boundaries of structural science.

After this joint paper, our paths began to diverge as I focused on the liquid structure work rather than more general structural matters. However, together with a visiting Japanese colleague Keishi Gotoh, we produced another joint paper some years later on sphere packings on a spherical surface [5] during working on which Alan commented that he had hoped that the earlier “Structuration” paper would lead to a closer collaboration between us.

Perhaps I didn’t recognise the signals at the time, but in retrospect it seems that I missed a great opportunity. Perhaps if I had taken up Alan’s implied offer, I might even have had a role in his great achievements in three-dimensional non-crystallographic tilings! Ah well! To continue the T.S. Eliot quote heading this section: “Down the passage which we did not take, Towards the door we never opened”. But thanks for trying, Alan!

The internationalist and his (dangerous?) sense of humour

Alan’s concern to help young scientists get going was not limited to encouraging their science. He and (sadly now deceased) Doris Evans at Corning Glass took every opportunity to introduce me to scientists throughout the world, and to their cultures. So the scene changes to Kyoto in 1972, the location of the 9th International Congress of Crystallography. This was my first trip to the Far East. Being an impecunious young lecturer, I’d booked a shared room in a fairly basic (Western-style) hostel by the main railway station. On day 1 of the conference I bumped into Alan who asked where I was staying. Realising that I was not taking advantage of experiencing Japanese hospitality, he suggested I should join him in the ryokan in which he was staying, a generous opportunity that wasn’t to be missed, so I checked out of the hostel and began to enjoy life “Japanese style”.

The introduction to Japan and its offerings didn’t stop there. Alan had already built up an extensive network of Japanese colleagues, and on one occasion, he asked me to join him in a meal with one of them. This led to a very interesting evening that gave me insight not just into little known aspects of Japan but also his mischievous sense of humour.

During the evening, he drew a particular Japanese character and, playing dumb that he didn’t know what this character meant, asked his Japanese colleague to explain it. Of course he knew very well that it had a particularly obscene meaning that no Japanese would be impolite enough to explain. On receiving the expected reply that this was “...a very difficult character...”, he looked over at me and gently laughed at causing this mild embarrassment.

The evening continued with Alan describing to his Japanese colleague how he had walked around a nearby area where a Burakumin community lived. He had told me earlier he had done this, and explained that the Burakumin were originally members of outcast communities in the Japanese feudal era, and was still an outcast group at the bottom of the Japanese social order that has historically been the victim of severe discrimination and ostracism. He asked our colleague to explain about the Burakumin. I

think he expected to get the denial from our colleague that this outcast group still existed in Japan, and was playfully amused when that denial came. I worried then that his sense of humour was perhaps rather close to the bone and potentially capable of inciting international incidents (!), but it didn't seem to create problems in his building long-lasting friendships across international borders and cultural differences. A browse through the visitors' book that he keeps in his London home bears witness to the wide extent and great warmth of those friendships.

Just before the end of the conference before I travelled to another meeting in Tokyo (where Alan had used his membership of the International House of Japan to book accommodation there that my budget could manage), Alan took me to a second hand bookshop. My understanding of kanji was very limited, so I could get little out of the contents of the books, though I could admire the bindings and the range of calligraphy. On leaving the shop, he presented me with two slim, obviously quite old, traditionally bound volumes he had just bought. "An old I Ching" he said. I still treasure these, and the memories they bring back of Alan's generosity during my first foray into Japan. That I have been back many times since and really enjoy being there is due in significant part to Alan's "tutition" on that first visit.

The teacher and the colleague

The "day job" in Birkbeck was, of course, teaching and research. The Crystallography Department's core course was the M.Sc. in Crystallography, which introduced physicists, chemists, biologists, geologists and others to the techniques of structure determination. It was very much a technical, classical course on the practicalities of crystallographic methodology—not a course that I could imagine Alan, with his much broader interests, being particularly interested in teaching. But as he did teach on the course, what did he teach and how did the students react?

I found out recently from one of the course's graduates, who himself has recently retired from a distinguished crystallographic career. Perhaps just quoting what he said will illustrate how Alan approached his teaching:

I was also taught and confused by that remarkable polymath Alan Mackay who seemed to decide what he was going to teach as he entered the lecture theatre and then managed three hours without notes! Always interesting, stimulating, and always challenging (at least to me) [6].

That polymathic character was obvious to our colleagues at Birkbeck—not just to those in the Crystallography Department but more broadly amongst the academic

staff across the disciplines. Being a relatively small college, members from all departments would use the Senior Common Room up on the fifth floor, so interacting with colleagues from other departments was relatively easy. Alan took advantage of this: you would often see him—and be invited to join him—discussing things non-scientific with historians, political scientists, literature experts, etc. He also instituted a regular cross-disciplinary discussion group in the common room to discuss issues that interested him. The inaugural meeting not surprisingly focussed on a generalised crystallographic topic: the Belousov–Zhabotinsky reaction. This classical example of non-equilibrium thermodynamics that results in a nonlinear chemical oscillator was realised physically on the table around which the discussion took place.

Later years

I left Birkbeck in 1993 for University College London. UCL may only be a couple of hundred yards up the road but it did mean that our paths crossed less frequently. But when they did, for example at the annual Bernal Lecture, or the regular Physics Department "reunion", he would inevitably come up with the latest interesting ideas he was working on—for example, he must have been amongst the first to see the potential of 3d printing.

But of course not all these interactions were on scientific issues. There was a particularly poignant occasion on which he said that he and Sheila had been to the far north of Scotland and visited Strathnaver, from where his Mackay ancestors had been evicted during the Highland Clearances. The visit had clearly affected him very deeply. His concern for man's inhumanity to man, and wanting to do something about it, was further evidenced by his membership of British Pugwash, to whom he suggested ways in which practising scientists in the West could usefully connect with scientific colleagues in difficult and isolated situations in Iran.

The last scientific meeting he and I attended together (Fig. 1) was particularly appropriate—a celebration of the life and work of our joint mentor Desmond Bernal at the University of Limerick (Bernal was born in the county) in 2006. Alan's presentation to the meeting was entitled: "J. D. Bernal: his legacy to science and to society" [7]. Reading it again, I am struck by how much of what he says about Bernal applies also to Alan. For example, how he saw that "one item was related to many others and it was only a few steps to connect any item with any other". Or his emphasis on "the nature and importance of this network of science, locally, internationally and through time". And to paraphrase another comment he made about Bernal: with only slight financial resources for his research, he chose

Fig. 1 Alan L. Mackay looking up at the Bernal family home Brookwatson, Nenagh, Ireland, when the participants of the 2006 meeting at the University of Limerick (mentioned in the article) visited the Bernal home. This must have been a very emotional moment for Alan (photograph by John Finney)



problems that could be solved with the people (often only himself) and equipment to hand.

Bernal has often been described as a polymath, but Alan's Limerick talk used a broader description: *polytropic*, from the Greek *polytropos*. The translation he gives is “of many stratagems, versatile, wandering, ingenious”—meaning active in very many dimensions or directions. When I started writing this, I was going to characterise Alan as both polymath and one of the literati. But I think I would now go for polytropic.

A personal note

As I hope comes out in the above, being able to count Alan as a colleague has meant a great deal to me. Not only professionally—the help, advice and intellectual stimulation he gave me, especially as a young scientist, I value tremendously—but personally I owe much to him and to Sheila. He helped open my mind to the cultures of the East (in particular Japan and China). Partly through him, I have been able to forge collaborations and personal friendships worldwide. And I hope we supported each other in carrying forward our ideas that, though once considered “off the wall” (e.g. liquid structures from my end, non-crystallographic tilings from Alan's), are now more generally accepted.

Alan's Limerick paper quoted from a letter that Bernal wrote to Lawrence Bragg when Sir William Bragg died in

1942. In that letter [8], Bernal told how William Bragg took him up and helped him through all the critical stages of his career. And that Bernal “had always meant to tell him how grateful I was, but somehow one never does and then it is too late”.

Thankfully, it's not too late for me to similarly thank Alan.

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