PREHISTORY OF THE BRITISH CRYSTALLOGRAPHIC ASSOCIATION

by

DAVID BLOW FRS1 AND STEPHEN WALLWORK2

1Biophysics Group, Blackett Laboratory, Imperial College, London SW7 2AZ, UK
2Department of Chemistry, University of Nottingham, Nottingham NG7 2RD, UK

SUMMARY

Development of a unified organization for British crystallographers was hindered, especially during the 1960s and 1970s, because of the separation of crystallographic groups for physicists and chemists. This was due partly to loyalties to different parent societies and partly to associated financial problems. The British Crystallographic Association was eventually formed by the creation of groups that were affiliated jointly to the parent societies and to the new Association. Founder Members and industrial Founder Sponsors made the Association financially viable, and it is now one of the largest crystallographic societies in the world.

Keywords: British Crystallographic Association; Chemical Society; Royal Institution; X-ray crystallography

INTRODUCTION

Although X-ray diffraction was founded in physics through the work of Laue, Sommerfeld, Friedrich and Knipping, it rapidly became an interdisciplinary subject.1 Its potential for discovering the arrangement of atoms in crystals was recognized by William Henry Bragg and his son William Lawrence Bragg. Though they were both physicists, structural research was providing information that was fundamentally chemical. It was appropriate that W. H. Bragg’s appointment to the Royal Institution in 1923 was not only as Director of the Davy Faraday Laboratory but also as Fullerian Professor of Chemistry.

The Royal Institution was able to play a key role in the interdisciplinary development of X-ray crystallography because it was not a university. In the 1920s departmental divisions in universities between physics and chemistry were usually rigid. The crossing of subject boundaries at the Royal Institution was facilitated by a family atmosphere within the research team, attracting not only physics-trained graduates such as Kathleen Yardley (later Lonsdale) and Gordon Cox, but also chemists such as J. Monteath Robertson. All these three went on to head departments of chemistry in universities where they introduced crystallography as the main line of research. As a result, crystallography was broadened to include molecular geometry, intermolecular interactions, and the possibilities for chemical changes in the solid state, alongside the physical interactions between atoms and ions, and the physical characteristics of crystalline matter. Meanwhile,
W. L. Bragg founded research schools in the physics departments at Manchester and Cambridge universities whose specialities included crystal structure determination of chemical materials alongside physical crystallography. He was also conscious of the important applications of crystallography in industry, and in 1942 he held a large conference in Cambridge on relevant topics. He then founded, in 1943, an X-ray Analysis Group (XRAG) within the Institute of Physics.

**INTERNATIONAL COOPERATION IN CRYSTALLOGRAPHY**

The first international X-ray diffraction meeting was held at Ewald’s mother’s house on the Ammersee in 1925. Among those attending were Ewald, W. L. Bragg, Debye, Waller and Wyckoff. Another important meeting was organized by W. H. Bragg at the Faraday Society in 1929, which laid the foundation of a more formal international collaboration between crystallographers. Committees were set up to introduce a coordinated abstract scheme, to standardize crystallographic nomenclature, and to prepare and standardize space group tables. Publication of the first edition of the *International tables for crystallography* in 1935 was a major achievement, in which Kathleen Lonsdale played a particularly important part.

The war severely hindered international cooperation in Europe, but in 1943 W. L. Bragg made a hazardous journey to Sweden to re-establish contact with Swedish scientists. At the annual XRAG meeting in 1944, Ewald made a plea for the establishment of an international society for crystallography. As a result, an international meeting of crystallographers in 1946 decided to set up the International Union of Crystallography and to found a new journal (*Acta Crystallographica*) to take the place of the (then) defunct *Zeitschrift für Kristallographie*. This meeting also received substantial input from other countries, especially the USA.

**THE CHEMICAL SOCIETY AND THE INSTITUTE OF PHYSICS**

Thus crystallography rapidly established an international organization, which united the various aspects of the subject from crystal physics through crystal chemistry and into the broader disciplines of chemistry, geology, metallurgy and materials science, and pointing onwards into biology. In postwar years, however, interdisciplinary collaboration in UK crystallography ran into some difficulty. In those years it was considered essential for a professional academic scientist to be a member of an appropriate society. The relevant societies for physics and chemistry were the Institute of Physics (IoP) and the Chemical Society (CS). In the 1950s the IoP was not only a learned society, organizing and sponsoring scientific meetings: it was also a professional association, accrediting members at various levels, providing career advice and professional insurance, and publishing journals that were offered to members at a reduced price. The overhead costs of examinations, accreditation, publication, advisory services and insurance enforced a large annual subscription, equivalent to one or two weeks’ salary for a young lecturer.

The CS was the learned society predominantly serving academic chemists. In universities, membership of the IoP or the CS conformed closely, in most cases, to departmental boundaries between physics and chemistry.
Originally, XRAG provided a valued meeting point. Because chemical crystallographers had no corresponding group, many chemists joined the IoP at the cheapest grade of Subscriber and could take part in XRAG with no additional payment. XRAG meetings catered for the interests of physical, chemical and biological crystallographers, and to some extent those of mineralogists, geologists and metallurgists.

This amicable state of affairs continued until 1966. By that time the volume of research in chemical crystallography had grown to such an extent that it was felt there should be a Chemical Crystallography Group (CCG) of the CS. Under the chairmanship of Monteath Robertson, the new Group encouraged more activity among chemists in using the techniques and results of structure determination. Though this was a useful development, it caused some ill feeling because it created a separation between physical and chemical crystallographers, when a single group had been so successful in the past. Some chemists continued to belong also to XRAG.

Without anybody wishing it, the barely significant difference between physical crystallographers and chemical crystallographers had been set in stone because of the rigid walls between physics and chemistry departments in many universities, which maintained the firm separation of the IoP and the CS.

(There were some changes over the years. In the 1950s the IoP, predominantly a professional institution for scientists in industry, was expanded by a merger with the Physical Society, which had been more like a learned society for academia. In a parallel development the CS merged in 1980 with its industrially oriented opposite number, the Royal Institute of Chemistry, to form the Royal Society of Chemistry (RSC). XRAG became the Crystallography Group (CG) of IoP in 1969. For brevity and consistency in what follows, the two Groups are called the CG (of the IoP) and the CCG (of the CS or RSC).)

On the initiative of the CG committee, under the chairmanship of Ted Steward, a United Kingdom Crystallographic Council was set up in 1969 which tried to prevent overlaps between crystallographic meetings, both of dates and topics, and to encourage occasional joint meetings. It catered not only for the chemists and physicists but also for other crystallographers. It fulfilled a useful function, but because it had to avoid challenging the roles of the CG and the CCG it proved too weak and ineffective to become a unifying British crystallographic society.

In 1970 it was proposed that a European Crystallographic Meeting be established, the forerunner of the present European Crystallographic Association. What organization would represent the UK on the European Crystallographic Association? The UKCC had no funds of its own, nor any power to commit funds for meeting organization. The CG secretary (Stephen Wallwork from the Chemistry Department in Nottingham) initiated formal discussion on the matter between the committees of the CG, the CCG and the UKCC, followed by a joint members’ meeting in 1971. This was perhaps the first time the CCG and the CG had formally collaborated.
Meetings of the International Union of Crystallography created another meeting point for crystallographers from different disciplines. Every Union belonging to the International Conference of Scientific Unions holds international meetings at regular intervals. In the UK, The Royal Society had, by the 1970s, set up 17 British National Committees. Each National Committee represented the British Adhering Body (The Royal Society) in the business of its Union. The National Committee was also responsible for distribution of a Royal Society block grant to assist scientists in attending international meetings. In many cases, one scientific society fully represented the appropriate activity in the UK, the division of the grant to individuals was recommended by that society, and the National Committee had an easy task. In subjects such as crystallography, where more than one society represented the activity in the subject, the National Committee had to decide in detail how the funds should be distributed.

The National Committee would always include representatives of the committees of the relevant societies, other members appointed by The Royal Society, with a Fellow of The Royal Society as Chairman. From 1976 to 1978 Arthur Wilson was Chairman of the British National Committee for Crystallography (BNCC).

After discussion at a UKCC meeting in May 1978, Wilson wrote a paper for the BNCC meeting on 30 June on the need for more effective organization for crystallography in Britain, bringing the different disciplines together more closely. He proposed that a subcommittee of the BNCC might provide this. It was agreed that this proposal should be further discussed at the next BNCC meeting on 9 October.

This was to be the last BNCC meeting under Wilson’s chairmanship, and The Royal Society had already appointed David Blow as his successor. Wilson’s train from Cardiff was seriously delayed on 9 October, and eventually Blow took the chair and started the meeting. Routine items were dealt with, and the committee began to discuss Wilson’s paper, and action that might be taken to advance his proposals. At this moment Wilson arrived, and Blow moved to vacate the chair. ‘Stay there,’ Wilson said. ‘I like what I hear, and ask you to continue to chair the discussion.’ So Blow, even before becoming Chairman of the BNCC, found himself deeply involved in the problems. The Committee agreed to set up an ad hoc group including officers of the CCG, the CG and the UKCC which (for economy, because many members of the group were also members of the BNCC) would meet on the same day as the next BNCC. This group was to consider and prepare a report on establishing a closely knit association of UK crystallographers, within the known financial constraints.

The last three years: May 1979 to April 1982

The BNCC did not meet again until the afternoon of 16 May 1979. The ad hoc group meeting took place in the morning, for which Andrzej Skapski prepared a discussion paper, ‘Formation of a British Crystallographic Association’. It referred to the ‘seminal influence of the Wilson paper and the discussions which resulted’, and it considered the financial problems: ‘A reserve fund of £4000–5000 would be invaluable in aiding the BCA to start its activities.’
The ad hoc group failed to reach a unanimous conclusion, but their deliberations were reported to the BNCC meeting that followed it. The BNCC agreed

to ask Charles Taylor to report the discussion to the UKCC as its Chairman;
to ask Skapski to prepare more detailed information about the costs of his proposals;
to explore the possibility of running the CCG and CG Newsletters cooperatively;
to invite the two Group Committees to consider reciprocal ex officio membership arrangements;
to ask the Group chairmen (Skapski and Taylor) to explore a possible discussion between the Executive Secretaries of the CS and IoP;
and to ask John H. Robertson (Leeds) to write an article suitable for publication in the two Newsletters.

This was just a foretaste of the extensive consultations, discussions and deliberations that were to follow.

John Robertson’s article said that ‘the crystallographic community of this country is divided into two major portions; there is consequent loss of much of the richness of our subject, and consequent frustration for our committees.’ Later, Wallwork published in the two Newsletters a proposal that CG and CCG members should automatically belong to a new national organization. The Groups should exist unchanged, as joint groups linked to their own society and also to the new organization. Wallwork envisaged a gradual evolution. Each Group would be run by its own committee initially, with representation on the new national body. In comparison with the UKCC, the new organization would be much more powerfully placed to be the national representative of UK crystallography.

Important steps were taken at the J. M. Robertson Symposium held in Glasgow in September 1980, a landmark meeting because it included the two Groups. Wallwork’s proposals were discussed at an open meeting attended by about 40 people, and he was asked to formulate more detail. Activity now changed gear, and progress became much more rapid. The detailed proposals were discussed at a meeting on 17 November attended by 16 representatives, who decided that the proposals should be drawn up in a form that could be presented to the Councils of the RSC and the IoP, and to various crystallographic bodies concerned. They set up a Working Party with five members, and the Working Party invited many others to take part in particular meetings (table 1).

It was feared that these proposals might antagonize the IoP and the RSC. The main reason, often mentioned but never minuted, was that the big societies might lose members who discovered that they could get membership privileges in their Group much more cheaply, by resigning from their society and paying a much smaller subscription to
a new organization. The number of possible defections, which appeared huge to the Working Party, would probably have seemed an insignificant fleabite for them. The IoP’s Executive Secretary, Louis Cohen, made generous offers of assistance in several ways, and the RSC was said to be equally favourable.

The Working Party rapidly agreed the name ‘British Crystallographic Association’ (BCA) and began work on a draft constitution. Wilson, who had much experience of this kind of drafting, was the mastermind in this activity. The Working Party also set a target date for inauguration of the BCA at a crystallographic meeting in Durham, already planned for early April 1982, a target that maintained a sense of urgency.

There were two key problems. One was the strong loyalty felt by many to their parent societies, as well as to the Groups they sponsored. The other was finance. These two problems were closely linked.

Wallwork’s proposals would solve the first problem in that any member of the CG or the CCG would automatically become a member of the joint BCA/IoP or BCA/RSC Groups. The member would experience no change in the relationship with their Group or its parent society, but would automatically become a member of the BCA. This solved the Group loyalty problem, but it seemed likely that, at least in its early years, a large proportion of BCA membership would join by this route, bringing little revenue to the new organization.

The BCA would clearly need resources to allow it to organize meetings, and to give it strength and stability. Several possibilities were considered. A capital contribution from a scientific charity had been sought, but none was forthcoming. Contributions from individual companies making or selling crystallography products could be solicited, coupled to appropriate privileges at BCA events. Blow suggested inviting crystallographers to become Founder Members, making a one-off payment equivalent to a life membership on favourable terms (perhaps £100 or £150). The Founders would be strongly committed to the success of the BCA. Companies might become Founder Sponsors on a similar basis. A scheme on these lines ultimately provided the inadequate starting capital for BCA. In view of the financial problem, it was considered essential that the BCA become a registered charity, gaining a significant sum from tax refunds on Founders’, Sponsors’ and members’ payments.

The Working Party met frequently, and painstaking detailed work was done on the draft constitution. Discussion with the Charities Commission began in May 1981, almost a year before the target inauguration date, but could become realistic only after the constitution was considered complete (August 1981).

Consultation with many interested parties was maintained, and it was necessary to keep the prospective membership fully informed. The proposal made in May 1979 to amalgamate the two Newsletters was finally implemented, and in March 1981 the first joint issue of a Newsletter, edited by Moreton Moore, was published by the CG and the CCG. Figure 1 shows the cover page and reproduces a short notice about progress towards formation of the BCA that it included. The second issue (June 1981) was entitled *Crystallography News*, and it is still published under this name.

After detailed consultation with the Charities Commission, small modifications were made in October to the draft constitution. These satisfied the Commission, and the draft
was forwarded to the Inland Revenue for approval. Unsurprisingly, a considerable delay followed. The last meeting of the Working Party took place in February 1982, but the Inland Revenue’s response was still awaited. It was inappropriate to set up a financial existence for the BCA until charitable status could be assured. In March the Chairman learned that the response to the Charities Commission was imminent. For several days he took up residence in the waiting room provided at the Commission for visitors—a quiet room for reading and writing—making the Commission officers very aware of the Working Party’s sense of urgency. Finally, about three weeks before the inauguration date, the Commissioners indicated that the draft constitution was acceptable to them, and that if this were adopted unchanged by the new BCA Council, the BCA would be accepted as a Charity. A statement was circulated, indicating that formation of the BCA could proceed.

The inauguration, 6 April 1982

The Working Party had also prepared detailed plans for the inauguration. They had asked Sir David Phillips to stand for election as President, and Dorothy Hodgkin as Vice-President. Hodgkin, who anticipated having to spend much time in Africa with her husband, felt she might not be able to fulfil her duties, but was persuaded that this would not create a problem.
It was originally planned that Hodgkin should deliver the Inaugural Lecture that was to follow the Inaugural Meeting, but she pressed Phillips, and through him the Working Party, that it would be more appropriate for the Inaugural Lecture to include contributions from each of the Groups, and that Henry Lipson and Monteath Robertson should be invited to speak after her. Unfortunately, Robertson was not able to attend the Durham meeting, but Lipson spoke (figure 2).

The Inaugural Meeting was attended by 127 people, and the recommendations of the Working Party were accepted unanimously. The Officers of the BCA Council and three Ordinary Council Members were all elected as proposed. Table 2 gives the full membership of the BCA Council at its first meeting on the following day. At the end of the Inaugural Meeting, Brian Isherwood proposed the establishment of an Industrial Group of the BCA, and Blow proposed the establishment of a Biological Structures Group. This structure of four specialist Groups within the BCA still survives.

The Founder Members and Founder Sponsors were crucially important to the financial viability of the embryonic organization. Because of the late approval of charitable status, the BCA had not attained a formal financial existence before the Inauguration, but 23 initial Founder Members guaranteeing £100 each (as a 10-year membership subscription) were invited to sign the first pages of the book that would become the first BCA Minute Book, after the Inaugural Lectures. There were also five Founder Sponsors at this stage, offering £1850. Thus, the BCA came into existence with promises of just over £4000. With the grant of charitable status, Trustees were required, and the four inaugural Officers generously became Trustees of the Association in a personal capacity.

At the end of this historic meeting there was a great sense of euphoria (figure 3). At the same time, members of the Working Party were well aware that the financial resources of BCA were inadequate. Indeed, some even doubted whether it could survive. However, the financial position soon improved, helped by the Founder schemes. These
were held open until the end of 1982, after which there were 52 Founder Members, and also 31 Founder Sponsors who donated over £12000 between them.

Most importantly of all, the BCA succeeded beyond all expectations as a scientific organization, with its active groups, its exciting annual meetings and, crucially, its large

Table 2. Membership of the BCA Council at its first meeting on 7 April 1982

<table>
<thead>
<tr>
<th>Elected Officers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>President</td>
<td>Professor Sir David Phillips FRS</td>
</tr>
<tr>
<td>Vice-President</td>
<td>Professor D. C. Hodgkin OM FRS</td>
</tr>
<tr>
<td>Secretary</td>
<td>Dr A. C. Skapski</td>
</tr>
<tr>
<td>Treasurer</td>
<td>Professor C. A. Taylor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ex officio</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chairman, BNCC</td>
<td>Professor D. M. Blow FRS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group Representatives</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Crystallography Group</td>
<td>Dr R. W. H. Small</td>
</tr>
<tr>
<td>Crystallography Group</td>
<td>Dr Ruth Fenn</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elected Ordinary Members</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr J. W. Harding</td>
<td></td>
</tr>
<tr>
<td>Dr O. Kennard</td>
<td></td>
</tr>
<tr>
<td>Professor J. Zussman</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Co-opted members</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr B. J. Isherwood</td>
<td></td>
</tr>
<tr>
<td>Dr M. Moore</td>
<td></td>
</tr>
<tr>
<td>Dr S. C. Wallwork</td>
<td></td>
</tr>
<tr>
<td>Professor A. J. C. Wilson FRS</td>
<td></td>
</tr>
</tbody>
</table>
and enthusiastic membership. It has become one of the biggest crystallographic societies in the world.

ACKNOWLEDGEMENT

We thank the anonymous referee for constructive and critical comments, which have allowed the early part of this account to be substantially improved.

NOTES

4 J. H. Robertson, ‘UK crystallographers—can we be better organised?’, Chemical Society Chemical Crystallography Group Newsletter (June 1979); Institute of Physics Crystallography Group Newsletter no. 58 (July 1979).