

Chapter 1

International Association of Academies (1899–1914)

Science has always been, to an increasing extent, international in its need for shared thought and for joint action. The importance of its international character has steadily increased. We cannot fully understand the way science advances nor the way in which it affects our lives without examining that international factor in its make-up. Equally, science is affected by events outside the world of science, which is not a closed world but one which interacts with individuals and with the communities they create.

Until the middle of the 19th century, the international dimension was not yet as strong a contributor to the development of the large mass of scientific knowledge, nor as vigorous a stimulus to co-operative action, as it has become in the present century. It was for a long time more a question of communication, and mutual enlightenment. However, from the middle of the 19th century useful modes of collaboration became clear, in fields related to our global existence: such as astronomy, geology, geodesy, cartography, and the several aspects of biology. The same is true of factors in our personal lives, as for example in the settlement of standards and measures of time. Units of length, weight and volume needed to be agreed quite early, and, as society became more integrated, the need for precision and for wider acceptance grew. Then, as the discoveries in electricity of the early 19th century began to be applied and were seen to be widely useful, totally new kinds of measures and their units had to be devised and agreed. Even in their earliest primitive forms these matters of measure have always been of common concern to both thoughtful and practical men. The development of their scientific treatment and the desire to work on them grew together. The internationalisation of biological nomenclature had already been well founded in the 18th century.

It all looked simple and desirable. In 1918 a report of a committee of the Royal Society, making plans for a meeting to consider a new Association, said of associations:

Some are intended to establish uniformity in the standards of measurements. Some are intended to advance science by co-operation. Some merely encourage personal interchange of opinion. Of those which aim at directly organising scientific progress, some do so because it is considered essential to co-ordinate observations taken in different places, while some aim just at economy of labour.¹

This statement would serve well enough as an introductory guide to the philosophy of the international associations we are looking at here, but, while such an analysis could

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reflect the experience of the 20 or so years from the last decade of the 19th century, it is far from sufficient to describe the complexity of the international system of the last decade of the 20th century.

In the 20th century the scientific community created a world-wide system of mutual co-operation in discovery and in application. Trade, industry, and transport were involved, as were new methods of publication, traditional and novel, of transport and of electrical and electronic communication. There was political recognition of science as a factor in economic and cultural life, so governments come into play.

Conversely, science has turned to government funding where private resources fail. Some scientific activities are generated within the machinery of government, not only for the obvious military purposes, but also for welfare or taxation.² It is possible and legitimate to view this history in sociological terms.³ Indeed, it is unwise to neglect this dimension since science does not exist in a sociological vacuum. However, some recent writers have recounted, and commented on, the history of the early international scientific organisations with little regard to its scientific components. In such a study as this one must not let 'scientific' sink out of sight in 'international'.

The most widely active and influential body on this world-wide stage of scientific co-operation is the International Council of Scientific Unions. The history of ICSU is a part of world history. It is presented here as a story full of organisations, of discoveries and inventions, of co-operation and controversy. But, since, as a wise man said, 'History is the essence of innumerable biographies', it is also full of people.

Science classical

This is not a tale where one can say 'To begin at the beginning.' The beginning is too far back, as far back as you like to go, into classical antiquity, into the rise and fall of Egypt, or of the succession of Chinese cultures,⁴ into the rise of Islam and its links with the Western Europe of the Middle Ages or of the ancient speculations and achievements of India.⁵ By the middle of the 19th century science was a world phenomenon, a heritage possessed in pieces by many groups, some individual, some co-operating groups, some linked with states and nations. Although the need to communicate had always been acted upon, it became apparent to some in the later part of the 19th century that it was time to make some co-ordinated effort to unite the entire scientific heritage into a shared whole. So let us make that our beginning, around the time of the great discoveries in such areas as mathematical physics, in industrial chemistry, in the physiological basis of heredity which occurred towards the close of the 19th century.

It was partly as coincidence, partly as consequence, that we see efforts to develop internationalism in science at a time when the practitioners of several sciences had become conscious of new prospects. The developments of mathematical physics at the hands of Helmholtz, Boltzmann, Kelvin, Maxwell, and others were matched by the discoveries in radiation of such men as Röntgen and Hertz, in matter theory of J J Thomson and Becquerel. In chemistry, the consolidation of an atomic theory

revealed elegant order in universal matter, and the powerful methods of organic synthesis greatly extended the variety of beneficial substances. In biology, new ideas had grown out of the acceptance of Darwin-based theory, while, at the other end of the scale of living matter, new microscopic techniques and new biochemical equipment enlarged one's vision of the features underlying the life process itself.

In applied science, such advances as the understanding of the nature of metals or the application of advanced mathematics to engineering were not only altering the comforts of life in the advanced countries, but also promising new life the world over. At the same time, applied science was exhibiting its power to threaten. The complexity of the moral dilemma is illustrated by the life of Alfred Nobel and his legacy.

It was in the area of communications that science had most strongly conferred benefits on itself. Scientists have always communicated, by whatever means were available. In the era of Kepler and Tycho Brahe, personal contact was essential. Although much science developed as separate disciplines, much progress was necessarily made when discussions were interdisciplinary, as for instance in astronomical or geodetic matters. The study of the correspondence of such dedicated communicators as Oldenburg, Mersenne, and Leeuwenhoek in the 17th century, or Benjamin Franklin in the 18th, occupies many a happy scholar for years on end. The travels of scientific men occupy large parts of their many biographies, with personal contacts sometimes assuming great significance, as for example in the encounters between Davy and Gay-Lussac.⁶ In earlier times movement was slow but unimpeded, and the present-day scientist may well be astonished to learn that Davy could travel to Paris at a time when Britain and France were at war. In some fields, notably astronomy (e.g. the transit of Venus in the years 1761–9) and geodesy (e.g. Biot and Arago's work on Spanish territory for measurement of an arc of the Paris Meridian in 1806), international collaboration was essential because related observations had to be made over distances that went across borders or into distant territories.

The conditions for scientific co-operation are thus created in part by science itself. In the 19th century the means of communication changed radically. The telegraph, then the telephone, allied with the railways, made it easy to send messages, to speak tongue to ear, and to meet face to face, to be complemented by air transport and electronic communication in the 20th century. We are concerned here with the world of science; but not only must we deal with the role of learning at large in this first chapter, we must not lose sight of it at any time.

The Academies

The word *Academy* (*Académie*, *Akademie*) came into modern languages from Plato's gathering of friends in a garden to discuss common philosophical interests. It was a useful label for the kind of gathering which groups of people with enquiring minds began to form around many centres from the Middle Ages onwards. Most were local in their affiliation, and such academies of limited territorial commitment grew up in

many of the small kingdoms and principalities which characterised European government for centuries. With the rise of some larger nations, however, there developed national academies (not always bearing that word in their titles). Academies of local commitment and academies of national authority both played a part in the events of the late 19th century we come to later.

The creation of national academies of science is spread over a long period. By the middle of the 19th century there had grown up many national organisations for scientific collaboration, some venerable national academies like the Royal Society of London and the French Académie des Sciences, rooted in the 17th century, being taken as models in many countries. The dating of ‘foundation’ of many academies is often imprecise because in most cases the formalities were preceded by informal gatherings, the success of which confirmed the view of some group of enthusiasts that their colloquies could be systematised. The Royal Society of London was the earliest (1660) to have taken on a form and status capable of surviving without interruption into modern times.⁷ The Académie des Sciences followed it in 1666 to undergo, during the political and constitutional upheavals of the end of the 18th century, changes which never diminished its central role in French science.⁸ In Italy the Accademia del Cimento and the Accademia dei Lincei (those whose sight was keen as that of the lynx) had risen and been dissolved, the Lincei to be revived again in the 19th century and continue into modern times. In Belgium one sees the kind of political and sectarian complications which are to be encountered in many countries: the formation of an Académie Royale des Sciences et des Beaux Arts de Belgique, later divided into separate French language and Flemish language entities. We see the formation of academies of science by royal decree in Russia in 1725, in Sweden in 1741, in Denmark in 1742, in Spain in 1847.

The German situation is unique, and was to influence events in the international pattern of science at several periods in the late 19th century and in the 20th. In Austria an Akademie der Wissenschaften was founded in Vienna in 1846. In the German territories, consisting of a large number of autocratic principalities, many academies of greater or less importance were created, mostly reflecting the personal interests of rulers. Some were important: the Bayerische Akademie der Wissenschaften dates from 1759, the Preussische Akademie der Wissenschaften was formed first in 1700 and revived in a more permanent form in 1812. There were some academies associated with particular towns, such as Göttingen, a dependency of Prussia which tolerated a degree of independence, and Leipzig, principal town of Saxony which, like Bavaria, retained a nominal independence under the German Empire, into the early 20th century.⁹ No two of these German academies were alike in constitution or concerns. Their desire to strengthen their own intellectual capacity plays a very important part in the history of the origins of the predecessors of ICSU.

In other parts of Europe, academies were as scattered as the national remnants of the consequences of the Congress of Vienna. We are not concerned here with earlier 19th-century international politics except when it is needed to identify divisions in the world of learning. One later political change needs comment: the opening up of Japan following the Meiji Restoration of 1868. The changes in Japan were rapid and militar-

ily astonishing. In the wider field of academic science its day was yet to come, but in one field it made a virtue of misfortune: its many earthquakes. An Englishman (J J Milne) was able to stimulate the interest of Japanese scientists in work they were to encourage and develop.¹⁰ This led to another strand in international scientific co-operation, namely in seismology which finds its phenomena in many parts of the world. The Japan Academy was founded in 1879.

Another more recent creation in a leading nation was that of the United States National Academy of Sciences (1863). The distinguished American Philosophical Society in Philadelphia had already been in existence as a private body for a century, and its influence was very great. Thomas Jefferson, third President of the United States seems to have been prouder of his Presidency of that body than of the Presidency of his nation.¹¹ But the United States government, becoming conscious of its role on the world scene, decided that the lead, at least nominally, in American science should be in the hands of a national body, so in 1863 the National Academy of Sciences was founded.¹²

The earlier societies had embraced men of science of all interests, modern distinctions between personal commitments and the compartmentalisation of science not yet being a feature of the scientific scene. Even the terminology of science had not taken on its modern form. The English word *scientist* was itself popularised by the Englishman William Whewell, replacing 'natural philosopher' as a name for someone interested in reflection and research on the condition of the material world. Even now it does not have an exact equivalent in French or German.¹³ But specialism in subject-matter and in commitment grew rapidly in the first half of the 19th century, so that national societies with specific fields of interest began to be formed, like the several Chemical Societies.¹⁴ It even began to be seen that there was bound to be specialisation within such distinct areas of science¹⁵ and that a threatened fragmentation of science needed to be countered by a contrary influence: a mutual appreciation engendered by organisations whose object would be the gathering together of men united by common feeling rather than by common technique.

The expanding literature of science¹⁶ and an expanding scientific instrument industry¹⁷ provided for a large degree of sharing of techniques, but the habit of talking together was irrepressible and, indeed, irreplaceable. An example of the union of theory and experimental technique is seen in the Loan Collection of Scientific Instruments of 1876, a unique and original assemblage of a large variety of current instruments held in London. Associated with it was a series of 'Science Conferences': lectures by devisers and users of many of the instruments exhibited, in which the interpretation of results was made all the more profound and intelligible by each speaker being able to draw attention immediately to the means by which he had attained them.

Some societies did grow out of concentration on a limited subject interest. One of the earliest was the Magnetische Verein¹⁸ set up by Gauss¹⁹ and Weber.²⁰ A great many magnetic observatories already existed, but the work of these two men brought them together rather closely, so that there could be extensive publication. This body had a limited life mainly because of personal and political difficulties, but it stands as an early

example of an attempt at a global observation system. It was concerned, that is to say, not only with exchange of information, but also with co-operation in observation, and the merging of individual sets of observations. These two factors are central to the growth of international scientific bodies from that time onwards.

Organisation and organisations

Most academies were concerned with bringing scholars together, regardless of their main personal interests. Other kinds of organisation grew up which brought together specialists in particular sciences. Sometimes the subject demanded international collaboration.

A prime example of such a fundamental issue is to be found in geodesy, a science of which the root concern is the figure of the earth, globally and locally. It had presented questions since ancient times, and had become a distinct study from the time of Columbus and the first great circumnavigations. Advanced mathematics was applied to observations in the 18th century, and became an essential part of the science in the 19th (e.g. Bessel functions).²¹ In 1862, following a Prussian Army initiative, some of the German states developed a Central European Geodetic Association (Mitteleuropäische Gradmessung) at the first general conference of which 13 countries were represented. Many were German states, reflecting the academic autonomy they still enjoyed. The growing European character is reflected in the change of title in 1867 to European Geodetic Association. In 1883 a world character was assumed with invitations to Great Britain and the United States of America, and discussion of a common prime meridian and an international time system. In 1886 the name was changed again to International Geodetic Association. (In many such international bodies one often observes the strong influence of some one institution or person, in this case F R Helmert²² of the Prussian Geodetic Institute). The last General Assembly was in Hamburg in 1912. The geodesists continued to play a prominent part in international science.

Bit by bit there developed the habit of scientific conferences, some being regular meetings of groups to review progress in some particular field, some specifically to examine an outstanding problem, such as the Karlsruhe Chemical Conference of 1860, which had as its aftermath the clarification of the system of atomic weights, a development which had a profound influence on the whole of chemical science.²³ The botanists were already holding International Congresses.

There is another side to this: one could multiply examples of the birth of organisations. No two would be alike. Consider two astronomical examples. The first International Astronomical Congress was held in Heidelberg in 1863. In 1887 the first International Conference on Astronomical Photography was held in Paris, marking the way in which advance in experimental or observational technique can so change the profile of a field of study that new institutions are needed to support the new studies they generate.

We can see another example of the concentrating effect of novel techniques in the work of Etienne-Jules Marey, who became devoted to quite new types of study of physiology and most notably to the use of repetitive photographic techniques for the study of animal movement. In 1898 he succeeded in obtaining support, not only from French sources but also from the Royal Society and other foreign academies, for a new physiological institute eventually named after him²⁴

The common observational and computational services had more than an abstract scientific significance. Navigation and cartography had been major practical problems since the 15th century. The international work in geodesy led to collaboration in the determination of latitude and longitude and later, through the Bureau International de l'Heure, in setting standards of time. Many of the bodies created were related by inter-governmental diplomatic conventions, which were adequate so long as good relations existed. Many of these earlier conferences and international contacts were sporadic and individualist, although there were some notable long-lasting series, such as the Geographical Congresses.²⁵

There were also some more specific endeavours. One was the inspiration of a man who died before his vision came to fruition: Karl Leyprecht. He conceived the idea of an International Polar Year, in which observers from many countries would work together, all exercising their own special skills and resources, but pooling results to reveal more than could be found from any one study on its own. Leyprecht never saw the International Polar Year of 1882–3, but in many senses it was his year, and the changes that were to come about owed much to his initiatives, and the demonstration that collaboration could be achieved on a grand scale. His vision had not faded 70 years later (see Chap 12 on IGY).

Then there began, in the last decade of the century, a movement to establish some wider unity of action. It becomes apparent first between a few of the leading German academic institutions. There were many German bodies, some set up by governments, some associated with universities, but they found it easy to seek common ends, partly because of a common language, but also because of recognisably common cultural roots. They gave adequate individual support to some kinds of scientific work, but the need for collaboration in the common needs of scholarly study stimulated a few of the most distinguished academies to create an organisation with limited but important aims, a 'Cartel'. The Cartel concept was very influential in the German states at this time, playing an important part in the development of industry and trade. Just like the members of an industrial Cartel, the members of this new, very limited, academic organisation looked inwards to its German community needs. However, they also looked out, and became conscious of the limitations of their perspective.

Membership of these German academies reflected German history and the persistence of local commitments. You could be a full member of an academy only if you resided in its home territory. The Cartel had its first meeting in 1893. Its membership was narrow: the Academies of Göttingen, Leipzig, Vienna and Munich. The Berlin Academy (Königlich Preussische Akademie der Wissenschaften) remained aloof. There were, however, guests from abroad, including Fellows of the Royal Society.

Conversations began, in the corridors, about extending the Cartel, in fact or in concept. The detail of what was said did not find its way into the archives, but over the next few years the idea began to grow and to change.

The archives and formal reports of the Royal Society, as well as later recollections²⁶ show that there was a good deal of correspondence and personal contact. Among the names that appear are those of Wilhelm His²⁷ who later wrote an account of these events. In a lecture²⁸ given at the Royal Institution in 1906 Schuster referred to the influence of the aged Mommsen,²⁹ the grand old man of German humanities, a reminder in this present history of a scientific organisation that at the turn of the century scholarship was not yet quite as divided as it seems to be now. Be that as it may, there was needed some new initiative if something more comprehensive than the Cartel were to be created.

An invitation to progress

If we are put a date to the inception of the modern pattern of international collaboration and identify one year we might perhaps put it at 1897, and take note of an invitation offered by Eduard Suess.³⁰ He was President of the Austrian Academy of Sciences, a notable geologist. He had been developing with colleagues the extension of the idea of a Cartel, nothing less than the creation of an Association of Academies. This association would draw academies of other nations into closer connection with the Cartel Academies (Göttingen, Leipzig, Vienna, and Munich). The Berlin Academy remained aloof. Although he does not later play a large part in this story, we should remark that Suess was typical of the kind of man we find taking an interest in international developments: academically distinguished, widely travelled, possessing an exceptional command of languages (he had been born in London and learned his first English there, where his father had for a time been in business), of wide political and administrative experience. Men like him turn up again and again. On behalf of his colleagues he wrote to the Secretary of the Royal Society inviting it to send representatives to attend a meeting of representatives of the Cartel in Leipzig in 1897. The invitation was quite formal. Although Schuster later described his attendance as private, perhaps meaning that they were there as observers, not yet considering any Royal Society involvement, it was not long before that involvement developed.

Other correspondence followed, a larger Royal Society representation (Michael Foster, Rücker, Armstrong, Schuster) attended a further meeting in Göttingen, where, no doubt, the beneficent influence of Gauss was still felt. This was still only a Cartel meeting. However it did begin a sequence of international activity which, although interrupted by two World Wars, and transformed in many ways, continues to the present day.

It must be emphasised that the intention was not at first international in the present-day sense.³¹ Suess's 1897 invitation to the Royal Society was to that body alone. The Royal Society's response, to the 1898 invitation was positive but raised an important matter. The delegates were instructed how to react if any question of the adherence of

the Royal Society to the Association of Academies and Scientific Societies was brought up. They were to make it clear ‘that such adhesion must be contingent on the Association being rendered truly international by the adhesion of other nations, and more particularly of France’.³² Such a requirement enlarged the vision of the proposal far beyond the original Cartel concept. The Cartellists may have seen this international view as inevitable, but they had a German problem. The Franco-Prussian War still cast a shadow over relations between the French and the German communities. A direct approach from the Cartel to Paris was hard to contemplate. The Royal Society had no such inhibitions and could speak freely.

The meeting gave much time to productive discussion of the kind of question which had already become characteristic of international co-operation, the global issues of geodesy, the professional value of co-ordinated information (an International Catalogue of Scientific Literature),³³ pooling of information on nationally organised exploratory expeditions, as well as topics in the fields of literature, history, and archaeology. The most important question, however, was the limited objective of the extension of the Cartel. There seems to have been a deep feeling (that turns up again and again) that personal contact was the most important contribution any scientific organisation could make to the progress of science.

The terms of the resolutions which concluded the business foreshadowed issues which were to be debated ever after. Their scientific content was small compared with that of those which were to take place in the successor bodies, but these administrative matters were to go on playing their part in the evolution of the later bodies, the International Research Council and ICSU itself.

The Cartel (that is, the inviting body) resolved:

The Delegates of the Cartel will propose to their respective Academies to accept in principle the institution of an international association of important societies, and to empower the present local authority (Vorort) of the Cartel to communicate the result to the Royal Society.

The Delegates of the Royal Society are requested to submit to the Royal Society a similar proposal, and to communicate the decision of the Royal Society to the present local authority

It was further agreed that, should the principles of these resolutions be accepted, the best method of proceeding would be for the Royal Society to ascertain the views of the Académie des Sciences at Paris, of the Imperial Academy of Sciences at St Petersburg, and of the Lincei at Rome, the Cartel communicating with the Academy of Sciences at Berlin.³⁴ These proposals were approved by the individual members of the Cartel,³⁵ and informal movement towards expansion of the membership began.

In the light of what was to happen later, we must emphasise again that all the discussion of membership was expressed in terms of Academies as autonomous bodies, not in terms of governments or nations. This distinction is of considerable importance in appreciating the significance of several stages of development of IRC and of ICSU, as national membership and organisational membership developed side by side. If the

Royal Society appears to stand out in this account there is this good reason: the Royal Society was answerable only to itself. It was distinct in this important way. All the other academies had been set by governmental or royal authority. The Royal Society, in spite of its name, began as and remained a private body.

Attitudes towards the character of science change. At this stage the science being considered was, on the whole, purely academic. To illustrate this outlook: the Council of the Royal Society had other business at the same meeting as it received the report of its Secretary, Arthur Schuster, on the Academy proposal. Under one item it was resolved that it did not wish to appoint delegates to an International Congress of Applied Chemistry to be held in Vienna in 1898, because it was of 'too technical a nature'. The scope of international concern for science was to be changed by events in the 20th century. The boundaries between pure and applied became blurred.³⁶

Within a short time the Academies of Paris and of St Petersburg and the Accademia dei Lincei had said they were ready to join an international association, subject to their approving the detail of its Regulations.

The International Association of Academies (IAA)

The Conference envisaged in the original invitation (one to establish a formal constitution for a new Association) took place in the agreeable spa surroundings of Wiesbaden on 9 October 1899, and produced a substantial set of Proposed Statutes.³⁷

The original members were:

- (i) Königlich Preussische Akademie der Wissenschaften (Berlin)
- (ii) Königlische Gesellschaft der Wissenschaften (Göttingen)
- (iii) Königlich Sächsische Gesellschaft der Wissenschaften (Leipzig)
- (iv) Royal Society (London)
- (v) Königlich Bayerische Akademie der Wissenschaften (München)
- (vi) Académie des Sciences (Paris)
- (vii) Kaiserliche Akademie der Wissenschaften (St. Petersburg)
- (viii) Reale Accademia dei Lincei (Rome)
- (ix) Kaiserliche Akademie der Wissenschaften (Vienna)
- (x) National Academy of the USA (Washington)

Nine other academies were invited to join.³⁸

The Statutes proposed were mainly concerned with the administrative structure needed to establish and maintain an organisation of such a nature. For example, IV.10 states:

- IV.10 The business of the Association shall be conducted by means of –
 - (a) General Assemblies.
 - (b) A Council.

This simple, basic provision, of a gathering of representatives of all members, and a managing body drawn from them, survived all the changes of the next ninety years.