

## A NOTE ON THE HISTORY OF THE INTERNATIONAL ASSOCIATION OF GEODESY

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The International Association of Geodesy can trace its roots back to the early 19<sup>th</sup> century, a time of great progress in geodesy, when Bessel and Gauss made important contributions to the science. One of Bessel's pupils was J.J. Baeyer, who later became an officer of the Prussian General Staff. In 1861 General Baeyer wrote a report suggesting that the states of Europe should work together on the measurement of the size and shape of the earth and proposing methods to achieve this aim. The King of Prussia accepted the report and invited the countries concerned to subscribe to the plan.

By 1862 the following countries had agreed to participate : Denmark, Saxe-Gotha, the Netherlands, Russia (for Poland), Switzerland, Baden, Saxony, Italy, Austria, Sweden, Norway, Bavaria, Mecklenburg, Hanover and Belgium (15).

The first *International Geodetic Conference* met at Berlin in 1864. The conference set up a structure and made decisions whose influence is still to be seen in the I.A.G. statutes of today. The conference established two powerful bodies, the *Permanent Commission* and the *Central Bureau*. The Permanent Commission was to be the "supreme, standing scientific agency of the international geodetic association". The Central Bureau, the executive agency of the Permanent Commission, was to receive reports each year from member states on the results of the work as well as proposals for new projects, and to submit them to the Permanent Commission "for evaluation and approval". The Central Bureau was to compile the individual reports into a single general report, and to perform the work and conduct the negotiations to achieve uniformity in geodetic and astronomical measurements. The Conference also made a number of scientific recommendations, amongst others, measures to establish Bessel's toise as the fundamental length standard and to encourage measurement of levelling networks with properly determined datum points. A *Permanent Committee* of seven members was appointed.

The Central Bureau was set up in 1866 at the expense of the Prussian state, within the Geodetic Institute at Berlin. General Baeyer, Director of the Institute, was also appointed Director of the Bureau. In 1867, at the Second General Conference, the association's name, previously *Mitteleuropäische Gradmessung*, was changed to *Europäische Gradmessung*, with the acceptance of Spain and Portugal as members. This Conference also dealt with weights and measures, recommending the adoption of the metric system and the establishment of an international bureau of weights and measures. [General Baeyer's death in 1885 marked the end of an era. His successor was the geodesist Dr. F.R. Helmert. There had been many changes since 1862. The German states had come together under the German Empire, while in the association the expenses of the Central Bureau were constantly increasing and the number of member states was

growing. A new convention was drawn up, signed by 20 European states, to come into force for ten years from the beginning of 1887. The Central Bureau was to be supported by contributions from the member states. The convention conferred intergovernmental status on the association. ]

The Eleventh General Conference held in Berlin in 1895 drew up a new *International Geodetic Convention*. By this time other countries had joined, in particular the United States and Japan. Under the convention the Central Bureau was retained, still attached to the Geodetic Institute at Berlin, and the contributions for its support were increased. The Permanent Commission was abolished, replaced by a more representative *General Conference*. According to the convention the "supreme body of the Geodetic Association shall be the General Conference of the delegates of the Governments concerned."

The text of the convention was ratified by 21 member countries at the General Conference in Stuttgart in 1898. In 1907 it was extended for a further ten years. The 50th anniversary of the association was celebrated at the Seventeenth General Conference held in Hamburg in 1912. The scientific work of the association continued to be summarized in the reports of the Director of the Central Bureau. It is interesting to see the list of some of the topics reported on by Helmert in the report submitted to the 1912 conference.

- scientific research, theoretical (Helmert, Bruns, Villarceau).
- scientific publications including a bibliography of geodesy (Börsch).
- coordination of geodetic triangulation, particularly scientific arc measurements.
- coordinating determinations of the deviation of the vertical in Europe.
- variations in the axis of rotation of the earth, and the International Latitude Service.
- gravity measurements, the first world gravity network, and measurements at sea.

Only two years later, in 1914, World War I broke out and halted the scientific cooperation among geodesists. Of the signatories of the convention, only seven remained neutral. These were dark years for geodesy.

Although the convention extended to the end of 1916, war had been raging for eighteen months, by then, and scientific relations had been severed. Many officers of the association had died, including the President Général Bassot of France, in 1917; the Vice-President Sir George Darwin (Britain) in 1912 and his successor O. Backlund (Russia) in 1916; and Helmert, who had been Director of the Central Bureau since 1885, in 1917.

It is remarkable that the association managed to survive and it did so mainly through the efforts of two geodesists from neutral nations: R. Gautier of Switzerland and H.G. van de Sande Bakhuyzen of the Netherlands, who had been secretary of the association since 1900. After consultation between the seven neutral members, the *Reduced Geodetic Association among Neutral Nations* was established, with Gautier as President and van de Sande Bakhuyzen as Secretary.

The Reduced Association aimed to continue the work of the old association and to prepare for its reestablishment after the war. The permanent tasks such as the International Latitude Service were continued and some scientific work was pursued.

One of the arrangements of the Reduced Association was to keep up contact with the Central Bureau, still housed with the Geodetic Institute of Prussia, now in Potsdam. The Bureau continued to operate at a reduced level.

Some of the belligerents opposing Germany took exception to this arrangement, and set out, in 1918, to establish a new international geodetic association. C. Lallemand sent to the delegates of all countries of the Entente a draft convention for a new association, along with a letter complaining vehemently against the continued connection between the Reduced Association and the Central Bureau behind a "neutral façade". Gautier responded in reasoned fashion, arguing against the exclusion of Germany, Austria and their allies.

However at the conferences in 1918 and 1920 which led to the creation of International Scientific Unions, no one listened to Gautier, or even consulted the Reduced Geodetic Association. Severe obstacles were erected against the membership of Germany and her allies, that delayed their admission for many years.

The concept of closer international cooperation of scientific bodies had been discussed before World War I. Even before the war had ended a series of conferences was held, culminating in the Constitutive Assembly of the International Research Council in Brussels in 1919. This set up the Council and a number of constituent international scientific unions. Besides the *International Union of Geodesy and Geophysics* (IUGG) there were Unions covering astronomy, chemistry, physics, radio science, biology, mathematics and others. For each of these unions, every member country was to set up a National Committee.

In the IUGG, Geodesy was one of six sections. An interim Bureau was set up, to hold office until the first General Assembly, which was set for April 1922, in Rome. A seventh section, hydrology, was added at that Assembly. The Geodesy Section also made amends for the unjustified accusations made previously against the Reduced Association. Gautier was elected Vice-President and in this position was able successfully to transfer the assets and operations of the Reduced Association to the new Geodesy Section.

The initial statutes, adopted for the twelve years 1919-1931, had stipulated that only Allied and neutral nations could join the International Research Council or its Unions. In 1926 these membership restrictions were lifted, but serious damage had already been done : Germany only applied for admission to IUGG in 1937.

The new statutes which came into force after 1931 changed the name of the International Research Council to the *International Council of Scientific Unions* (ICSU). Within the IUGG, the sections became Associations. By 1936 the Association of Geodesy and others were commonly referred to as International Associations, but this was not formally ratified until new Union statutes were adopted in 1946. Since then our association has been, officially, the *International Association of Geodesy*, I.A.G. (Association Internationale de Géodésie, A.I.G.).

The structure of the Geodesy Section of the IUGG which emerged after the General Assembly in Rome in 1922, had many features similar to the I.A.G. structure of today. The Secretariat was instructed to prepare a set of statutes to present to the next General Assembly in Madrid in 1924. In the pre-war Geodetic Association, the scientific activities had centred on one agency, the Prussian Geodetic Institute, and on one person, its Director. The new organization, though its administration and coordination was handled by a central secretariat, was to have its scientific activities decentralized. The

Scientific Commissions were composed of delegates from member countries; they elected their own presidents.

The 1924 Statutes set up the following structure :

- the Bureau, comprising the President, Vice-President and Secretary (as at present).
- the Secretariat, responsible for the office administration, correspondence, arrangements for meetings.
- the Executive Committee, more or less in the form of the present Executive.
- the Scientific Commissions (now replaced by Special Study Groups and Commissions, whose functions are described below).
- the Permanent Commission comprising one delegate from each member country (in the present structure called the Council).
- the General Assembly, comprising all delegates from member countries; it was given important powers of voting on finance on elections, and on scientific activities.

During the General Assemblies there were three types of presentation : General Reports on matters of wide interest, which now would perhaps be covered by Commissions; National Reports, to be published later in the Travaux (Proceedings); and scientific papers by individuals.

The role of the Section, later the Association of Geodesy had changed from the pre-World War I period. The original concept was that of a central office directing and coordinating geodetic projects through a quasi-governmental association. Since 1922 the role has been to promote projects rather than direct them and to ensure good communications between geodesists of different nations.

Activities of the organization between 1922 and 1939 included publishing the *Bulletin Géodésique* regularly, as well as *General Reports*, *National Reports* and an *International Bibliography of Geodesy*. Important advances were made in the scientific sphere. Field work encouraged by the I.A.G. included geodetic connections between countries, and continental and intercontinental geodetic chains. Hayford's spheroid, the first international reference surface was adopted in Madrid in 1924. There were advances, theoretical and practical, in physical geodesy. Buchwaldt pointed out the importance of Stokes' theorem, enabling the shape of the earth to be determined from gravity. Methods for measuring gravity at sea were developed by Vening Meinesz, gravimeters made their appearance, and isostatic theory was developed. Simultaneously, de Graaff-Hunter and Vening Meinesz developed expressions for deflections of the vertical in terms of gravity anomalies.

All this activity was again interrupted by war. The I.A.G. was perhaps more fortunate this time, as the Seventh General Assembly of IUGG was convening in Washington when World War II broke out. Many of those attending had to return home in haste, but the Association was able to make one important decision, namely to extend the term of the President for the duration of the war. The Bureau members were F. Vening-Meinesz (Netherlands), President; W.D. Lambert (U.S.), Vice President; and G. Perrier (France), Secretary. Activity was restricted during the war, but publications, notably the *Bulletin Géodésique*, were continued.

After the war an Extraordinary General Assembly of the Union was called in July 1946, to consider new statutes and by-laws. These were ratified at the first full

General Assembly in Oslo in 1948. The IUGG and the I.A.G. have separate sets of Statutes and By-Laws, but they have always been consistent, and similar in structure. The statutes and by-laws were further amended at the General Assembly in Brussels in 1951. They set out the composition and functions of the *Bureau*, the *Executive Committee*, the *Council* (the new name by which the former Permanent Commission was to be known) and the *General Assembly*. A new provision was to limit the term of office-bearers to one period between Assemblies. Between 1920 and 1946 the Association had only two office-bearers in each of its main offices. There were only two presidents, for example : W. Bowie (U.S.) from 1920 to 1933 and F.A. Vening-Meinesz (Netherlands) from 1933-1946. Since 1948, the terms of presidents and other officers have been limited to one period of three or four years, from one General Assembly to the next.

There were some minor organizational changes :

- the name of the Secretariat was changed to the *Central Bureau*. This is an unfortunate name as it can be confused with the Bureau. The Central Bureau is the Secretariat, serving particularly the Bureau and the Executive Committee.
- the *Executive Committee* was enlarged and given greater responsibilities, relating to the organization and the scientific activities of the Association.
- the Permanent Commission was renamed the *Council*. This body still comprised one delegate per member country, and was given special tasks in relation to administrative and financial questions.
- the *General Assembly*, comprising all delegates from member countries, retained its important voting powers.

A major innovation of the By-Laws was to divide the scientific activities of the I.A.G. into five *Sections*. Each Section covered a defined part of geodesy. In 1952 the Section titles were : Triangulation, Precise levelling, Geodetic astronomy, Gravimetry and Study of the geoid. The aim was to focus on the main interests of geodesy and with the number of participating geodesists constantly on the increase, to bring together those who shared special interests. Each Section has a President and two or more Secretaries. The Section Presidents are members of the Executive and the Secretaries may attend the meetings "with voice but without vote."

Within a Section there are normally several Commissions and Special Study Groups (SSGs). Commissions are established to cover broad general topics, which will be the subject of activity for an extended period, while SSGs are formed to study specific scientific topics of current interest. They exist normally for only one or at most two four-year periods.

In 1971 at the General Assembly in Moscow, the statutes and by-laws were revised and new definitions of the Sections drawn up to reflect the changing scope of activities. Again, in 1983, the statutes and by-laws, after a long and careful review, were again modified.

The most significant change in 1983 was a shift in responsibility from the General Assembly to the Council, which now has important voting, elective and financial powers. This change stemmed from a desire to ensure that all countries have equitable voting rights on important issues. Under the earlier rules it was conceivable that the wishes of the majority of countries could be frustrated in the General Assembly by a large block of voters from a single country.

The I.A.G. has seen an ever-increasing volume of scientific activity and innovation in the years since 1945. Particularly since the advent of earth satellites the pace of progress has increased. This progress has been aided by the tremendous advances in technology and in computers. To give an example, satellites have yielded a model of the earth's gravity field of unprecedented precision and detail. The remarkable precision in position fixing has created a new relationship between geodesist and geophysicist, in which the geodetic observations are of prime importance in geodynamic interpretations. Theory has not been neglected and remarkable progress has been made in a number of theoretical areas such as mathematical methods, collocation, gravity field models and statistical methods.

In this brief note it is not possible to summarize the scientific achievements of modern geodesy. What is of significance is to note that the I.A.G. is aware of the tempo of progress and is constantly adapting to reflect the current needs. Mention has already been made of new statutes and by-laws in 1952, then 1971, then 1983. Provision has already been made for the next Cassinis Committee, named after the I.A.G. President of 1957-1960, to sit in 1987-1991 and to report on further changes in 1991. Not only this, but the SSGs, the "cutting edge of geodetic science", are reviewed and renewed every four years, so that they can fulfil precisely the current needs.

This historical note has been summarized from a more detailed account written by J.J. Levallois, who was Secretary General of the Association from 1960 to 1975. Readers are referred to this account, which is available in the *Geodesist's Handbook of 1980* (pp. 249-313). For details of the current structure and activities of the Association, readers are referred to the contents of this Handbook which includes lists of officers, as well as lists and descriptions of Sections, Commissions and Special Study Groups. It is over 120 years since the association of geodesy was first established. The association has known successes and setbacks in its time, but has always remained steadfast in its objectives of fostering the science of geodesy and the dissemination of information on geodesy. The key role of the I.A.G. is in bringing together geodesists from all countries, from east and west, from undeveloped and developed countries. The friendly atmosphere of a geodetic meeting, whether a full General Assembly or a small symposium, and the sharing scientific interests, lead to mutual respect and enduring friendship. These relationships and the fruitful exchanges of ideas which they create are powerful forces for progress in geodesy.