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The Second International Geological Congress, Bologna, 1881

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The world geological community owes the 2nd International Geological Congress (IGC) Bologna 1881 (i) the establishment of a common disciplinary language; (ii) agreement on the basic chronostratigraphical and chronological classification and nomenclature; (iii) agreement on the basic principles for naming the fossil organisms following the binomial nomenclature and the priority rule starting with Linnaeus' Systema Naturae (1776 edition); (iv) the establishment of permanent international bodies like the International Commission on Nomenclature, which evolved into the present International Commission on Stratigraphy (ICS), and the Committee for the Geological Map of Europe, evolved to the present Commission for the Geological Map of the World (CGMW); (v) the introduction of a Geological Exhibition (the present Geoexpo) intimately related to the IGC; (vi) the first organization of post-Congress field trips related to the Congress activity; (vii) the free distribution of publications and maps specially prepared for the Congress members. Italy owes the Bologna IGC the foundation of the Società Geologica Italiana which obtained on site immediate international subscription. Bologna owes its IGC to the opening of the large Geological Museum (later named after Giovanni Capellini, Chairman of the 2nd IGC) and the archaeological Museo Civico. Such an impressive series of results was possible through the "spirit of co-operation" seeded at the 1st Paris IGC, the timely and enthusiastic organizational efforts of Capellini, his extensive network of foreign correspondents, and his smooth chairmanship of the sessions, ably assisted by Quintino Sella, Thomas Sterry Hunt, Eugène Renevier, François Fontannes, Auguste Daubrée and James Hall. Paradoxically, the success and future prosperity of the IGCs, both before and after the establishment of the International Union of Geological Sciences (IUGS), were enhanced by the limited goals, mostly focused on the establishment of formal conventions. It is argued that the IGC must maintain its identity as long as the advancement of geological sciences will require an international forum to look for agreement on the establishment and updating of general procedures and terminology. The IGC also provides visibility to IUGS if the two institutions are more closely integrated while maintaining their autonomy and independence.

Introduction

Shortly before the Centennial of the International Geological Congress (IGC) in Paris, 1980, François Ellenberger (1978) published a brief, informative review of "The first International Geological Congress, Paris, 1878". In anticipation of the opening of the 32nd IGC, Florence, 2004 — the second to be held in Italy in the long history of these congresses — it is timely to examine the circumstances surrounding the second IGC, that was held in Bologna in 1881, and to provide a critical evaluation of its accomplishments.

The origin of the IGC was summarized by Ellenberger (1978) and, in terms of its taking place in North America, also by Vai (2002), who drew attention to an error in the date of founding of the Congress, as reported in the Proceedings of the IGC after Pretoria, 1929. The less well known elements of the founding story explain why, after the first IGC was assigned to Paris by the same resolution that set up the Congress's 'Philadelphia Founding Committee,' the second IGC was unanimously assigned to Bologna, as proposed by Thomas Sterry Hunt, the distinguished Canadian member of the Founding Committee (Vai, 2002).

Results of the Paris IGC 1878

Attracting 310 members to the first Congress in Paris, a mere two years after the founding of the IGC, was certainly no mean accomplishment, and it made the event a success in terms of promoting awareness of the Congress and giving it visibility (that visibility also being enhanced by its taking place in the more general context of the Paris *Exposition Universelle*). In terms of the challenge to that Congress to answer a pressing need "for the settling of obscure points relating to geological classification and nomenclature," however, the first Congress was not a success, and this task was left totally to subsequent IGCs. This emerges clearly from comments by Edmond Hébert, who was President of the original Paris Congress, at the Bologna Congress in 1881, to the effect that, while the Paris Congress had been able to convince members of the need for major international effort to reach agreement on the standardization of nomenclature and procedures, thereby planting an important seed in the fertile ground of international deliberation, the successful germination of that seed and the subsequent growth and harvesting of the plant, required appropriate preparation and was best left to future Congresses.

The main resolutions considered and approved at the first Paris IGC (Anonymous, 1880, p. 271-277; Capellini, 1882, p. 8-12) (Figure 1a), were to the effect that:

1 Continuity of the International Geological Congresses be ensured by holding the next IGC within three years, preferably in 1881 in Bologna, following an invitation by Quintino Sella [Finance Minister] and Giovanni Capellini, with Sella as Honorary President and Capellini as President of the Organizing Committee, which Committee should comprise nine Italian geologists.

2 The Paris Congress Bureau retain power until the opening of the Bologna Congress, and the Secretary General remain in charge of correspondence.



Figure 1a Giovanni Capellini, President of the Second International Geological Congress.

3 The questions placed before the Paris Congress be reported on at the Bologna Congress, having been studied in the interim by two international Commissions, one for the unification of geological symbols (A.R.C. Selwyn, President; E. Renevier, Secretary), the other for the unification of the geological nomenclature (E. Hébert, President; G. Dewalque, Secretary). Members representing the participating countries be named to the Commissions, and that this membership be augmented by representatives of countries not present at the Paris Congress, and the country-members designated set up a local Committee to report to the international Commissions. The reports prepared by the two

Commissions, together with those of the local Committees, reach the Organizing Committee by January 1st, 1881, so as to be printed and distributed before the opening of the Bologna Congress.

4 A [French] Commission be established to study the question of common rules for establishing the nomenclature of species in both palaeontology and mineralogy. (Translated by the present writer).

Ellenberger (1978) acknowledged these same outcomes of the Paris Congress, adding critically that the Congress had failed

as a mechanism for methodologically confronting the work and problems then facing the geological community of the world. No international geological exhibition was assembled, the times allotted for papers and discussions were far too limiting, national representation was very much out of proportion, the themes proposed were often hardly touched upon and were at times replaced by widely disparate presentations of variable scientific interest (p. 24).

An additional remark that “several of the major contemporary areas of dispute were not covered” (Ellenberger, 1978, p. 24) seems excessively harsh, or even unjustified, criticism because the stated aim of the first IGC was “the settling of many obscure points relating to geological classification and nomenclature,” as requested by the Philadelphia Founding Committee (Mendenhall, 1877, p. 355; Vai, 2002).

The speeches given in Paris by James Hall and Joachim Barande, the two leading palaeontologists attending the Congress, are worthy of mention. Hall, Capellini’s good friend since 1863, lucidly expressed his view on the comparative correlation method in stratigraphy, which was based on a number of principles, including priority, that are still hold to be valid. Hall’s remarks, therefore, were fully in keeping with the objectives of both the Founding Committee and the Congress itself (Anonymous, 1880, p. 60-67). Barrande, praising the American stratigrapher, criticized “our teachers Murchison and Sedgwick,” who “had neglected palaeontology.” He emphasized the value of his own major faunal units, and pronounced the “discussions on nomenclature to be completely useless” (Anonymous, 1880, p.101-106). This view anticipated the approach of the bio-ortho-chronological German school that still has some supporters and strongly contrasts with the pragmatic stratigraphic approach introduced at the Bologna IGC and followed subsequently by the majority of stratigraphers. In any case, it is not true to say that Murchison and Sedgwick (and especially Murchison) “neglected



Figure 1b Felice Giordano, Secretary General, and Giuseppe Scarabelli, Treasurer, 2nd IGC Bologna 1881.

palaeontology”, though this was appropriate of Sedgwick’s early work in rocks that contained few easily found fossils.

Organization of the Second International Geological Congress, Bologna, 1881

Thomas Sterry Hunt, who played a major role in both the Philadelphia Founding Committee and the 1st IGC, Paris, 1878, suggested that the 2nd IGC be held in Bologna under the presidency of Capellini. His suggestion was unanimously accepted by the Bureau and the Council and acclaimed by the General Assembly on September 4, 1878 (Anonymous, 1880, 1882). Hunt knew very well that Capellini, being in agreement with the aims of the Founding Committee, was the man best able to mediate and succeed in the difficult task of establishing a common terminology for geology and geological mapping (Vai, 2002). Capellini, in turn, having contributed significantly to the adoption of the Paris resolutions, started work immediately. He completed the composition of the Organizing Committee (OC) (Figure 1b) by adding new members to the ten appointed at the Paris Congress and obtaining the ‘High Patronage’ of King Umberto I of Italy, who, as a prince, had already attended in person the 5th International Congress of Anthropology and pre-Historical Archaeology, organized in Bologna by Capellini in 1871.

Following Capellini’s proposals, the OC decided that a *Geological-Palaeontological Exhibition* should be held during the Congress in the Geological Institute of Bologna University; that a volume containing a *Geological and Palaeontological Bibliography of Italy* be printed (Figure 2) and distributed to the attending members; and a logo for the IGC be adopted, with the Latin inscriptions *Geologorum Conventus* and *Mente et Malleo* inserted in a circle with two crossing hammers in the centre (Figure 3). The logo was accompanied by an emblem, distributed also as a badge and medal, showing the number, date, and venue of the Congress, with the coat of arms of the Kingdom of Italy and of the city of Bologna (Figure 4). Both were published as a frontispiece to the Bologna *Proceedings* volume (Anonymous, 1882). An exciting account of how the logo was conceived is to be found in Capellini (1914, v. 2, p. 266-268). An estimated cost for the Congress was set at “50,000 *lire*” (about 158,000 euros, the Italian lira being equivalent to the French franc at the time). Financial contributions came from the Italian Government, the King, and the City of Bologna and its Province, with Marco Minghetti and Quintino Sella (both future Prime Ministers of Italy) helping considerably (Capellini, 1914, v. 2, p. 266).

The First Circular of the Congress was issued on April 30, 1879, more than two years before the convention was to open. The registration fee was set at 12 French francs, being equal to 3.86 g of gold according to Ellenberger (1978) or 12 *lire* for Italian registrants being equal to about 38 euros. This was the level that had prevailed for the Paris Congress three years prior, and it proved adequate to supply each member with a copy of the *Proceedings* volume *gratis* and with other publications of the Congress.

One year later the King of Italy granted the OC the sum of 6,000 French francs (about 19,000 euros) to encourage



Figure 2 Frontispiece of the *Bibliographie Geologique et Palaeontologique de l'Italie* offered to the Congress members (Capellini Museum).



Figure 3 General logo for the IGCs designed by Capellini (Anonymous, 1882).



Figure 4 Emblem used for badge and medal of the 2nd IGC (Anonymous, 1882).

geological studies. Capellini and the OC immediately decided to establish a fund to underwrite the costs of internationally evaluating geological symbols to be used on maps, as a practical means of arriving at an acceptable global standard (Anonymous, 1882, p. 18–19; Capellini, 1914, v. 2, p. 255).

The Second Circular was issued on June 1, 1880. Although in keeping with the letter of the Paris resolutions, this circular was clearly innovative in its proposed procedure for organizing the IGC. The circular reaffirmed the resolutions adopted in Paris in 1878, “to obtain more certainly a practical result from the Bologna session” (Anonymous, 1882, p. 20). Hence, the focus of the Bologna Congress was on achieving two primary goals: (a) standardizing geological symbols; and (b) standardizing geological nomenclature. It was considered important to have a “well defined program” for the second IGC.

Factors such as distance between the home bases of the members of the two Commissions, together with experience gained during a meeting of some members of the Commissions with the IGC Council in Paris, from 1 to 3 April, 1880, revealed, nonetheless, the difficulty of reaching agreement, especially on the issue of standardized geological symbols for maps (with emphasis initially on small-scale maps). It was for this reason, therefore, that Capellini and his OC proposed the further international evaluation of the symbols issue based on practical solutions to be advanced by individual private geologists. The deadline for submitting written proposals to President Capellini, for consideration by the international evaluative panel was set as the end of May, 1881.

The OC updated the by-laws of the Paris IGC introducing, among other things, the distinction between *effective* and *adhering* Congress members and the conditions required for registration of both domestic (more restricted) and foreign (more open) registrants. This was ratified by the IGC Council at a meeting in Paris on April 2, 1880. Reports prepared by the two international Commissions for the standardization of nomenclature and symbols and that by the Commission for species nomenclature in palaeontology were printed in a 144-page volume (Figure 5) that was sent to registered Congress members, the geological societies, and the majority of individual geologists worldwide, together with the short Third Circular for the Bologna Congress, dated June 15, 1881. The deadline for submitting proposed presentations was set as the end of August, 1881.

The General Program prepared for the Bologna Congress was scientifically well delimited, and it had a good balance among formal sessions, business, and other more informal meetings, and social activities, the entire program of events running from September 25 to October 5, 1881. Sunday, September 25, was devoted to the Council Meeting, an inaugural (re)-opening of the archaeological *Museo Civico* of Bologna, and the ‘ice-breaker’ party in the ancient building of the Bologna University, the *Palazzo dell’Archiginnasio* (Figure 6). The next day, Monday the 26th, was left to the official opening of the Congress and the Geological Exhibition, with essentially the full-day made available to visit the latter. Two middle-of-the-day sessions (from noon to about 4 p.m.) were scheduled on September 27 and 28 for the standardization of geological nomenclature, and two ensuing, separate sessions, on September 29 to 30, for the standardization of geological symbols. Saturday October 1, was given over to a session on the rules for species nomenclature. The following Sunday, October 2, allowed



Figure 5 Frontispiece of the *Rappports* by the Commissions circulated to the registrants three months before the Congress (Capellini Museum).

for a trip to the city of Imola to visit the Natural History Museum assembled by Giuseppe Scarbelli (Congress Treasurer) and to examine his map of the Quaternary geology of the nearby Monte Castellaccio where a Bronze-age settlement was under excavation. October 3 and 4 were devoted to two additional scientific sessions, and the official closing session of the Congress



Figure 6 Inner court of Palazzo dell’Archiginnasio, site of the ice-breaker party opening the 2nd IGC Bologna 1881.

was held on October 5, 1881. Post-Congress field trips and excursions included ones to the cities of Porretta (in the core of the Bolognese Apennines), Florence, Pisa, and Carrara (in the Apuane Alps).

For the entire duration of the Congress, the *Museo Civico*, the City libraries, and the Natural History Museums of the University were open to participants without charge. Free transportation was offered for the trip to the Carrara marble quarries, and a reduced-cost ticket was provided for the journey back to home.

The Second IGC Meets

Everything was ready on September 25th to welcome the distinguished guests from 22 countries outside Italy. Registered members totalled 421, attending members 216. The sessions were held in the *ad hoc* restored building of the musical *Liceo Rossini* (Figure 7), the first Geological Exhibition in the halls of the Geological Institute and Museum. The two places were both within walking distance of the main University buildings. The large Concert Hall (now *Sala Bossi*), site of the Congress plenary sessions, was dominated by the flags of the USA, France, and Italy to signify the roots and history of the IGC. Additional rooms were available for the Council, the Congress Secretaries, the press, and special gatherings. Each registered member found at the welcoming desk his ticket with name, the elegant badge of the Congress, a City map, and the following publications: (1) *Geological and palaeontological bibliography of Italy* (630 p.), (2) *History of the Academy of Sciences of the Bologna Institute* (280 p.), (3) *Statistics of the domestic mineral industry (1860-1880)*, (4) *Geological Map of Italy (1:1,111,111) in two sheets*, (5) *Geological Maps of the surroundings of Bologna and the Leghorn Mountains (1:100,000)*, and (6) *the Surrounding of la Spezia (1:50,000)*, (7) *Catalogue of the Bologna Geological Museum*, (7) *Catalogue of the Geological Exhibition* (Anonymous, 1882).

On Sunday, the 25th, the members were invited to the inaugural opening of the renewed *Museo Civico* with its famous archaeological collections, especially that of the Umbrian and Etruscan necropolis recently excavated in the surroundings of Bologna. For the entire duration of the Congress, the city offered members free evening meeting rooms in the ancient halls of the *Archiginnasio* palace. On September 29, the municipality offered a concert by its famous *Teatro Comunale* Orchestra. A delightful farewell party (with buffet, music, and fireworks) was thrown by Capellini and his wife, Lady Beatrice Niccolini, in the large Italian-type garden at the back of the Geological Institute and Capellini’s house. This event was held under favourable weather conditions in an otherwise raining Congress.

The solemn opening session on Monday, the 26th was chaired by the



Figure 7 Ancient portal of the musical *Liceo Rossini*, session site of the 2nd IGC Bologna 1881.

Minister of Agriculture, Industry, and Trade, Domenico Berti, assisted by the Honorary President, Sella, the Past-President, Hébert, the President of the Organizing Committee, Capellini, and the members of the Bureau of the Paris IGC who were present in Bologna, *viz.*, Daubrée, Hall, Sterry Hunt, Val. Moeller, Gregory Stefanesco, Jozsef Szabo, Otto Torell, Juan Vilanova, and Alexis Delaire. The Presiding Council of the Congress was composed according to the statute (50 members, including 15 from Italy) and the Board of the Congress was elected (32 members, including 9 from Italy).



Figure 8 Quintino Sella, Honorary President of the 2nd IGC Bologna 1881 (courtesy Fondazione Sella, Biella).

Sella (Figure 8) suggested the official (yet not exclusive) use of the French as the language understood by most guest members. Proud to be able to speak also as President of the Italian Academy of Sciences (*Lincei*), he advocated a positive, interdisciplinary approach by geologists to their science and to all other sciences, and in turn asked the biological and material sciences to trust geology to solve some of the major issues facing mankind. Expressing his gratitude to both the IGC for having voted for an Italian venue and his friend Capellini for the excellent organization of the Congress, he paid tribute to the role played by Bologna in teaching and contributing to the advancement of science. In so doing, he quoted Sterry Hunt's speech at the closing session of the Paris IGC in which he referred

to the practical benefits accruing from pioneering geological studies conducted by the ancient Italian scientists of the Bologna University. The support of the City and its Province was promptly forthcoming, Sella pointed out, because, for both of these, there was already wide recognition of the practical applications that could result from informed observations on local rocks. The cult of science in Bologna was so deep that local trade unions, with many workers, came to honour the significant contributions geologists had made to the material and intellectual progress of mankind. The Italian Government had obtained from Parliament a substantial financial contribution to ensure the quality and success of the Congress, Sella explained, and the Government had also provided 92,000 French francs (about 285,000 euros) for the large-scale Geological Map of Italy (see also Corsi, 2003), a first annual contribution that, while perhaps not to be compared to the ca. 900,000 francs (about 2.7 million euros) made available to the Geological Survey in England, it was, nonetheless, a notable contribution when set in context of the current financial problems facing Italy. On the key, declared objectives of the Bologna Congress, Sella had this to say:

The history of the Earth is controlled by both discontinuous and continuous sedimentary and biologic processes. If nature is operating continuously, establishing artificial subdivisions is very hard. Your talent and your presence here makes me feel that the Bologna Congress will reach some agreements on geological nomenclature and symbols or set the basis for reaching it in the near future.

Sella's appeal for interdisciplinarity anticipated an approach that did not surface widely until after the Plate Tectonic Revolution in the 1967–1970. His wide acceptance of the obvious links between academic geology and practical (economic) geological applications was sensible and could have been used as a model, instead of allowing the rift between academic and economic geology of the twentieth century to develop as it did in so many universities in Europe and North America, to the detriment of both "states of the geological realm." By the same token, Sella's clear recognition of continuity and inter-systemic involvement in natural processes and natural materials with the resultant artificiality of man-made classification (a mere convenience for reasons of communication) is well worth noting.

Hébert emphasized the superb organization and the size and importance of both the new Capellini Museum and the Geological Exhibition in terms of the aims of the Congress. The scientific engagement of the new Italian Kingdom had found in Bologna the leading centre where the cult for science had never been abandoned.

Capellini's speech captured the audience by its international flavour. Geology, "after a first fabulous age and a second heroic age", had, only in the last century started its new modern age with the foundation of the Geological Society of London in 1807 and William Smith's pioneer mapping on topographical sheets of the bedrock surface of England. Thus, geology was no longer ancillary to mineralogy, nor was it any longer the simple geognosy of the rocks of the past. The founding of the scientific congresses in Switzerland (1815) and Germany (1823) were important steps in propelling science and geology into a more liberal, open, and international environment. The founding of the *Société Géologique de France* (1830), the British Association for the Advancement of Sciences (1831), and the *Congresso degli Scienziati Italiani* (1839) were means of encouraging geologists all over Europe to meet with one another and associate with other scientists. The same was now happening even faster in the USA, where geological studies had been absent at the beginning of the century. Stimulating as these changes were, there could be no diminution in their prosecution, Capellini implied, because it would take decades before such national scientific meetings, however open, became truly international congresses. Capellini had already enjoyed the opportunity to found the International Congress of Anthropology and pre-Historical Archaeology in 1865 at La Spezia. Many other sciences were soon to follow the same path. After giving a brief outline of the origin of IGC, the Paris Congress, and the preparations for the Bologna Congress, Capellini concluded by listing the credentials of the Bologna school in geology, mentioning the names of Aldrovandi, Cospi, Marsigli, Monti, Beccari, and others from the 16th to the 18th century. Summarizing the important draft resolutions agreed among the members of the Commissions as a basis for discussion during the Congress, his final call was: go forward!

Out of the six memoirs presented in the international juried competition for standardization of geological symbols, three were considered worthy of prize (Albert Heim, 2,000 francs; Alexander Karpinsky, 1,200 francs; M. Maillard, 800 francs). None, however, was found entirely to satisfy the conditions required by the competition. After reading the memoirs (Anonymous, 1882, p. 281–411), one has to agree that this decision was correct. Heim's contribution was scientifically well based and technically exhaustive. However, Heim was not aware that the stratigraphic subdivisions that could be agreed upon most easily were those established artificially or by convention and not those based on "natural" boundaries in the rocks themselves (Anonymous, 1882, p. 290). The two other contributions were less outstanding.

Scientific Program and Working Reports

The basic questions placed before the Bologna IGC called for finding solutions to the problems of standardizing,

- (1) the geological nomenclature concerning stratigraphical division of the Earth's rocks;
- (2) the geological symbols of maps and profiles; and
- (3) the rules for naming species in both palaeontology and mineralogy.

The official reports of the two *ad hoc* international Commissions and the French Commission set up in 1878 at the Paris IGC had been printed in a 144-page booklet that was widely circulated in June, 1881. The reports had been compiled and discussed after the receipt of reports prepared by the National Committees of Austria, Belgium, Spain and Portugal, France, Great Britain and Ireland, Hungary, Italy, Russia, and Switzerland (the reports from Australia, Canada, and the USA were submitted only at the opening of the Congress, after the deadline). Over 150 specialists were consulted by the National Committees, and all had reported on time. Remarkably, no fewer than 64 contributions arrived to the British-Irish Committee. Among those specialists were the most prominent stratigraphers and structural geologists of the time, as for example, Theodor Fuchs, Franz Hauer, Eduard Suess, Franz Toula; Laurent De Koninck;

Albert Auguste De Lapparent, Charle Barrois; Archibald Geikie, Charles Lapworth, Joseph Prestwich, Whitaker; Gaetano Gemmelaro, Giuseppe Meneghini; Val. Moeller, Alexander Karpinsky; Charles Mayer-Eymar). Additionally, the individual memoirs submitted to the international juried competition (see above) were made available for discussion.

Congress activity

Two-day sessions were devoted to each of items 1 and 2 (above); a one-day session was left to item 3. Preliminary discussion of item 1 started on the use of words like *rock* and *formation*. Should the term *rock* be restricted to the lithic masses (e.g. eruptive rocks), as claimed by a minority of French specialists, or should it be applicable also to loose sedimentary deposits, as suggested by the Commission (and enthusiastically supported from the floor by the Italian delegation)? The view of the Commission prevailed. As for the word *formation*, a certain disagreement between the French and British, as to whether the term should carry also a chronological implication, was solved by accepting the proposal of the Commission to restrict the term to lithology and mode of origin only.

Debate proceeded at a high conceptual and scientific level point by point through paragraph by paragraph, steady progress being punctuated only by some hardening of positions on choices arising from the use of different terms in different countries for the same high-rank stratigraphic unit, as for example, *group* and *terrain*. Hard-fought debate prompted the Commission to suggest the informal use of one of the competing terms in the plural, for example, “secondary *terrains*”. The Congress, however, voted for the specific use of the term *group* (later replaced by *erathem*). It was suggested that the terms favoured should be readily translated into different languages, and hence, as suggested by the Commission, the term system was adopted to replace *terrain*, for such divisions as the *Devonian System*.

Hébert, Past-President of the IGC, and Renevier, Secretary of the Commission to address the problem of common symbols for geological maps and profiles, suggested alternative use of the terms rejected by the voted decisions, with a view to favouring mutual concession in instances of contrast on first-order terms. Despite Renevier’s efforts, however, these contrasts remained sharp and positions taken from the floor hardened, especially between the French and German delegates and between old and young. Additional problems arose from paragraphs already approved, which changed some of the names suggested by the Commission for stratigraphical divisions of the geological column and carried implications for further changes of names in the paragraphs still being, or to be, discussed. The leading role played by Renevier to assure adoption of all paragraphs prepared by the Commission, after incorporating such changes as were agreed to by a majority of the Congress, is evident from the minutes of the sessions (Delaire and Fontannes, 1882, p. 57-195). Renevier (Figure 9) showed great skill by supporting views coming from the floor that were designed to promote convenience, and by opposing motions calling for delays of decisions or for the excision of paragraphs that had raised conflicting views. By such procedures was the term *series* also adopted after a written review that revealed clear signs of irritation on the part of prominent members of the German and Russian delegations. This first written scrutiny revealed the relatively high number of Italian voting members. The point was duly noted by Sella — a fair-minded politician with a finely honed sense of propriety — in the course of seeking compromise not only for use of the term *series* but also, more generally, on reliable procedures for the future smooth working of the Congress. As a consequence, therefore, the



Figure 9 Eugène Renevier played a leading role in the 2nd IGC Bologna 1881.

paragraph just passed following written scrutiny was left to further consideration by the Council. Discussion and voting turned to the ensuing paragraphs, with the term *stage* being rapidly adopted. At the opening of the second session, the Assembly adopted the conclusion of the Council, to the effect that the term *series* should be retained as adopted, but with the rider that its synonyms in the main languages be listed with it.

The compromise reached and accepted for the single case of *series* gave rise to further dissenting views, unexpectedly supported, and even interpreted, by an active Past-President. Motions were presented to reopen discussion on decisions already made. A few Italian members, trying to mediate, moved for a change in the procedures that were followed in the first-day discussion. Capellini, breaking for the first time his vow of self-imposed discretion, claimed that such procedural motions should have been placed with the Council earlier, and called for continuing discussion and adoption of the international report. Sella seconded Capellini’s view in an effort to obviate the possibility of failure of the Congress.

The remarks made and courses of action adopted seemed to have had a positive impact for further paragraphs were adopted without significant alteration. Dissent, however, was revived again when discussion moved to the chronological divisions of the geological column to correspond to the [chrono]stratigraphic divisions already adopted.

Two parties began to emerge from the discussions: (1) an *international* party, which was concerned about freedom of choice and the advancement of geology, seeking to assure the adoption of common procedures and a common language emanating from the Commission reports; and (2) a *national* party, which was open to some agreement, but was concerned mainly with maintaining the independence, and defending the interests, of the major countries, including the prominence accruing to them from international acceptance of their practices and terminology. The first party included Capellini, Renevier, Fontannes, Daubrée, Sterry Hunt, Blanford, Vilanova, and Sella, and was supported by most Italian members. The second party included Hébert, Beyrich, Moeller, Stefanescu, Zittel, and most of the German, Austrian, and Russian members. Although very active in discussion, the national party rarely succeeded because of the frequent disagreements between French and German members. So, despite being “a house divided,” 22 paragraphs of Report 1 were adopted by the assembly in original or modified form.

The 1881 IGC, alas, had to face still more difficult questions. To avoid further risk of impairing the declared objectives of the Bologna Congress, at the opening of the third-day session, Daubrée, the distinguished French Vice-President of the Congress and a close friend of Capellini, suggested that Capellini take the chair for the remaining three sessions to ensure accomplishment of the Congress’s agenda. For the two previous sessions, Capellini had chosen to relinquish the chair to different vice-presidents. Capellini accepted Daubrée’s proposal with alacrity and opened discussion on item (2).

The Commission for the Geological Map of Europe, set up during preparations for the Bologna IGC and chaired by Capellini (Anonymous, 1882, p. 131), had recommended: (i) that Berlin be selected as the place where the map should be prepared, and (ii) that a controlling committee be put in place, with members from Germany, Austria-Hungary, France, Great Britain, and Russia. Replacement of the German by an Italian member, and the *ex-officio* addition of the Secretary of Commission 2 was suggested. The Commission 2 report, however, had suggested establishment of an International Geological Bureau to oversee not only the content of the map but also its preparation (Renevier, 1881, p.104–109). Hence, conflicting national vs international schools of thought arose again, with Renevier as the astute and proud defender of the international forces, which were pitted against the German and other nationalist forces. Capellini played the role of mediator, striving in a thoroughly pragmatic way to maintain the maximum possible degree of international co-operation, sufficient certainly to retain the commitment of all major countries to accomplishing the project’s objectives. What happened then in a sense foreshadowed the kinds of decisions reached today in a quest for unity within the European Community. It was

agreed to entrust to Germany the preparation of the Geological Map of Europe at a scale 1:1,500,000 and to set up an International Committee of five plus two members to exercise permanent scientific control over the undertaking. As soon as the Committee was appointed, it was charged with the responsibility for addressing issues of nomenclature and cartographic symbolism not yet decided upon, or unlikely to be resolved easily, by the Congress. This Committee was the original seed from which sprang the subsequent Commission for the Geological Map of the World.

Later discussion concentrated on the map's symbols and especially the standard colours to be used for the principal geological divisions. Lively exchanges took place on both the physical attributes and aesthetics of the colours. Comparable discussions surrounded also the other recommendations of Commission 2. It became increasingly relevant the role of Renevier (Figure 10) to lead these discussions in the direction of adopting the suggestions of the Commission or of reaching a reasonable compromise, and in this challenge he was supported by the judicious chairmanship of Capellini. As a consequence and in final analysis, only one recommendation made by Commission 2 was left to the International Committee, with addition of the colours to be used for the post-Tertiary terrains. On the latter point, however, it was already clear that most speakers favoured separating the Quaternary from both the Cenozoic and the Tertiary (Anonymous, 1882, p. 156).

The last session of the Congress was devoted to the report of Commission 3. The basic principles for naming organisms were agreed upon: (i) binomial nomenclature; (ii) Latin names for genera and species; and (iii) priority rule. Be that as it may, great differences in practice, however, were recognized between botanists and zoologists. There was debate as to whether the Linnaeus' *Systema Naturae* (1776 edition) should be taken as the starting point for priority in palaeontological nomenclature, or if it would have been appropriate to go back to Aldrovandi or, even earlier, to Pliny, as the Commission had suggested. Various national botanical societies warned the Bologna IGC to conform to their 1867 resolutions. There was discussion about the need to follow binomial nomenclature and yet at the same time distinguish variability within species attributable to both geographical spread ("varieties") and chronological change ("mutations"). Another matter for debate was the theoretical and practical importance of maintaining the name of the author of a species independent from that of the genus to which was assigned. President Capellini skilfully won adoption of all the clauses presented for discussion in the report of Commission 3, winning over conflicting groups by incorporating relevant minority views and, in opposition to the Commission's recommendation, by limiting priority to Linnaeus' *Systema Naturae* (1776 edition).

Thus, after five days of session, the Bologna IGC succeeded in reaching consensus on about 95% of the issues examined by the *ad hoc* Commissions established following the first IGC in Paris. The number of Italian voting members contributed to this result because they were predisposed so to do, or were quickly persuaded to respect the careful preparatory work and skillful chairmanship of Capellini. With the exception of Sella and Meneghini, only a minority of the Italians took part in the discussions, but often making irrelevant, if not actually disruptive, remarks. The most active discussants were the French, Germans, and Russians, with the crucial role in reconciling their commonly discrepant views played continuously by Renevier (Switzerland) and partly by Fontannes. In contrast, James Hall was silent after his major speech in favour of a common geological language at the Paris IGC (Anonymous 1880, p. 60-67), and

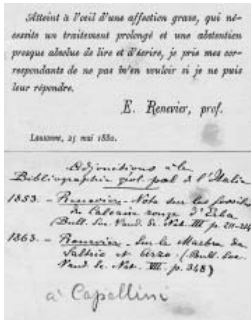


Figure 10 Renevier's card to Capellini apologizing for some eyes illness and adding contributions to the Bibliographie volume (Figure 2) (Capellini Museum).

Moissisovics maintained his sceptic's role already declared at the Paris Congress.

An average of 100 voting members attended the plenary sessions at the Bologna IGC. These were not the only sessions, however, that contributed to the successful outcome of the second Congress: additional work as performed during informal morning meetings and during afternoon and evening visits to the First Geological Exhibition and to museums and other institutions. The Austrian National Committee's submission of the proposal to the Bologna Organizing Committee to construct a Geological Map of Europe was a further important contribution to the success of the Bologna IGC.

At the brief but solemn closing ceremony on October 2, 1881, additional accomplishments of the Council were to ensure both implementation of the resolutions adopted and completion of others not yet fully resolved, as soon as possible, and the setting up of a new International Commission on Nomenclature (forerunner of the future International Commission on Stratigraphy). Whereas the official reason advanced for the establishment of this new Commission was the great amount of work still to be done, one may guess that it was set up also to counterbalance the powers assigned to the Committee for the Geological Map of Europe. In fact, the Commission, comprising one representative from each of the 16 countries present at the Congress, was foreseen by Congress leadership to work at a level of importance higher than the Committee. As it transpired, however, both bodies were to meet at least twice before the following Congress — in 1882 with the *Société Géologique de France* and in 1883 with the *Société Helvétique de Sciences naturelles*.

As for the nomenclature applied to palaeontological species, beyond the resolutions adopted at the Congress, the Council (Figure 11) called for a common agreement on nomenclatorial practices with the Botanical and Zoological Societies.

Other accomplishment of the 2nd IGC in Bologna, 1881, should not be overlooked, even though they must be judged of lesser importance by virtue of not being the subjects of preparatory work by Commissions prior to the event itself. Thus, for example, igneous petrology, in the form of general questions bearing on the origins of serpentinite and trachyte, was addressed in special conferences. An accomplishment of an utterly contrasted type was the foundation of the *Società Geologica Italiana*, for which the Congress provided a favourable environment, including that for the immediate collection of subscriptions from many future foreign members.

The Council expressed its gratitude to the OC for the interest and usefulness of the Geological Exhibition, requesting each ensuing IGC to follow the example given by Bologna. The great advancement made by the Congress in reconciling international views on the standardization of stratigraphical and palaeontological nomenclature also gave vent to recommendations for future IGCs, with the suggestion that they could well reach beyond the problems of finding a common international geological language and seek comparable reconciliation on key issues in pure science of common interest.

Among the numerous official speeches, greetings, and comments made during discussion, it is notable that: (1) Hébert, in mentioning the ongoing Bologna Congress, referred to "un premier congrès" (Anonymous, 1882, p. 98) or "ce premier congrès" (p. 116), indicating that he himself considered the Bologna IGC to be the first Congress, following upon the launching of such events in Paris in



Figure 11 Fifty-six Council members gathering around Capellini (sixth from left in the front row sitting) at the 2nd IGC Bologna 1881 (Capellini Museum).

1878, to record accomplishments of truly international geological significance; and that (2) the most intriguing closing speech in Bologna was that by Sterry Hunt, as it had been in Paris three years earlier. Hunt explained the reasons why he had suggested the 2nd IGC be held in Bologna. It was a duty, Hunt argued, to select Italy, because Capellini had actually published a suggestion to convene such a congress in Italy before even the Philadelphia Founding Committee had been put in place. As for the venue, the Eternal City could have been suggested had it been a religious or political congress, Florence had it been in the fields of the arts and literature, Venice or Genoa had it been directed towards trade or geography, but given that the Congress was designed to advance science, there was no doubt as to where it should be held. Italy's Bologna had no realistic competition. This tribute to the role played by Bologna in science was mirrored by the "surprising welcome offered to the Congress by the Bolognese workers and unions, not comparable for open-mindedness and fair play with America's, France's, and England's working class in those years."

Well aware of the great success of the Bologna Congress, Capellini left the authorship of the detailed minutes of the sessions to his French secretaries (Delaire and Fontannes, 1882), but he was proud to personally sign the report listing the resolutions on nomenclature, colours, and symbols adopted by the Congress in three concise pages of the Proceedings volume (Capellini, 1882b, p. 196–198).

Field trips and the first "Geoexpo"

The Council agreed to shorten the Congress from nine days to seven because some of the distinguished members could not stay for a second week. As a consequence, the field trips to Imola and Porretta were cancelled, and other trips were rearranged, including that to the most successful of Capellini's study areas — maritime Tuscany. Thus, following upon the official closing of the Congress, 100 members took part in the official field program, from 3 to 6 October, 1881, with excursions to (1) Florence, with its renowned collections, (2) Pisa, with its great scientific institutions, and (3) Carrara in the Apuane Alps, famous for its marble quarries.

Florence offered to the Congress a superb welcome. A. Stoppani gave the most distinguished, culturally ambitious, and humorous speech of the entire Congress, in keeping with traditional Tuscan anti-Diluvianism. Unfortunately, the following speaker, who provided the official welcome, undid much of Stoppani's good work by rapidly bringing the audience down to a much lower, parochial level. After a long visit to the old and new collections of geology, palaeontology (Tertiary and Quaternary vertebrates), and mineralogy, the highlight of the trip was the visit to the Steno's tomb in the crypt of the Basilica di San Lorenzo (Figure 12). The Danish-Tuscan founding father of geology was celebrated by the placing of a marble inscription in the garden of the Laurentian library. This commemorative act followed a dinner offered by Capellini, who asked the Congress members for a subscription that was later to be extended to over a thousand geologists from all over the world.

Pisa rivalled Florence in capturing the visitors' interest and admiration, not only for its monuments but also for its collections on comparative anatomy. After a superb banquet, Sterry Hunt gave another memorable address, stimulating James Hall, the oldest and most distinguished Congress member, also to speak at the convention for the first time. He acknowledged the quality and richness of the Italian natural history collections, and congratulated the Italian leaders present on the success of the Bologna Congress, not only for setting standards but



Figure 12 The Basilica di San Lorenzo in Florence hosting Steno's tomb.

also for improving the exchange of experiences and opinions among the internationally based delegates.

The trip to the mining area of the Apuane Alps, with its well-known marble quarries, had been well prepared and was led by some of the finest mapping geologists and palaeontologists of the *Servizio Geologico* (Lotti, Mattiolo, Zaccagna and Canavari). The visitors were greatly impressed by the magnificent landscape, and the geology and its industrial importance. The final banquet offered by the City of Carrara and the Marble Company marked the effective close of the 2nd IGC and stimulated a final, magisterial address by the 70 year-old James Hall (Delaire and Fontannes, 1882, p.264-65):

Coming from the silent halls of the New York State Museum to take part in the discussion of scientific and technical resolutions that now have been adopted, my colleagues and I have not only done that but found new scientific brothers and friends. The Congress has been like a triumphal procession, reminiscent of the ultimate realization of a fairy tale. I believe that I had a role in starting the International Geological Congress, but "proposing" and "accomplishing" are two quite different tasks. Had our European friends failed to support our proposal, then our first Congress in Paris would not have occurred. It was reserved for Italy, and the presidency of professor Capellini, however, to crown these works with happy success. Today the IGC is a reality, firmly established, and we here are now confident of its perpetuity. Assuring agreement in scientific terminology will produce concordance in understanding, and these will promote friendship among scientists of all nations.... I have less hope of being able to attend another Congress, but the Congress will live!

Given such prophetic words, I must disagree with those who now seek to merely "merge" the IGC into IUGS, thereby running the risk of bringing about the demise of the IGC.

Dulcis in fundo..., on Friday, October 7, a small group of thirteen distinguished members of the Congress, representing ten European countries, enjoyed a special trip to the hills surrounding Leghorn and the small town of Gabbro, an area specially studied by Capellini, who led the trip. The purpose of the excursion was to explain the basis for correlation of the Tertiary basins of Europe. The report on this trip, signed by M. Fontannes (Anonymous, 1882, p. 266-280), was the most detailed of many such reports, and was written as a review of the works by Capellini and others on correlation of the Tertiary rocks. This report provides an example of the level of detail considered in issues of pure science in order to satisfy the aims of the Bologna Congress.

The need for a geological exhibition was already foreshadowed at the Paris IGC (Ellenberger, 1978). So, the first 'Geoexpo' was carefully organized by Capellini at the Bologna IGC. He had already assembled an Archaeological Exhibition at the 5th International Congress of pre-Historical Archaeology in Bologna 1871. Maps, sections, models, and sample collections were placed on display. Capellini was well placed to exhibit such materials because he had already recovered the old geological specimens that had been preserved in the museums of Aldrovandi, Cospi, Marsili, and Monti, which dated to the 16th to 18th centuries. These old materials served as a nucleus for the collections of the Capellini museum, which grew rapidly in the two decades before the Congress (Anonymous, 1882, p. 201-10; Vai & Cavazza, 2003), that growth being spurred by Capellini's dream that one day there would be an International Geological Congress in Italy (Vai, 2002, p. 252). In the garden of his new Geological Museum and Institute, Capellini had planted a group of trees that included the types most suitable for the study of Tertiary fossil plants.

The OC obtained maps, publications, comparative samples, and even entire collections for display that were designed to elucidate and illustrate the discussions on stratigraphical nomenclature and cartographical symbols. After the Congress, most of the illustrated materials were left in Bologna and donated to the Capellini Museum and Library. The scope and size of the 'Geoexpo' displays is indicated by the fact that they occupied about 1000 square metres and were contributed by some 36 institutions from 12 different countries. Among the materials donated to the Congress were 266 publications,

of which 48 were geological maps, and 20,000 samples of rocks, fossils, and minerals. Most of the latter came from the collections of the Capellini Museum, but 574 rock samples and 42 large fossiliferous thin-sections came from the USA (J. Hall), 300 from Russia, 114 special preparations of nummulites from Hungary (Hantken), and 900 ophiolite samples, with 750 large, and 1800 small, thin sections from the *Corpo delle Miniere*. The most impressive publications on display were volumes 1 (1847), 2 (1852), and 5 (1879) of James Hall's *Palaeontology of New York*, which were donated to Capellini. A few hundred small-scale geological maps and cross-sections covering much of the countries attending the Congress were also on display. A small *Guide de l'Exposition* was prepared by Canavari and Mattiolo (1881) (Figure 13).

The success of the 'Geo-expo' was so great that members expressed the solemn desire for similar exhibitions always to be part of IGCs (Anonymous, 1882, p. 201–10).



Figure 13 Additional publications available to the Bologna Congress members (Capellini Museum).

Conclusions

Substantial results were obtained at the 2nd IGC in Bologna, 1881, and the main lines of future Congresses were established. The main accomplishments of the Bologna Congress were (1) to assemble together official institutions, research and teaching centres, academies, and distinguished scientists from all countries active in the pursuit of geology, and to contact all of them well in advance with a view to preparing a commonly agreed-upon agenda; (2) to succeed in securing agreement for the adoption of common terminology and procedures; (3) to set up a network of national disciplinary institutions reporting to internationally accepted, non-governmental, thematic commissions anchored to the flexible, rotating authority of the Congress; (4) to enable nations, groups, and individuals to use the Congress as a global show-case for advancements in whatever aspects of geology they might choose, for stimulating exchanges, training, and competition (mainly through the 'Geoexpo'), and for settling by agreement scientific questions of relevance to the language and procedures of the science.

From time to time, as happened in Paris and Bologna, it is claimed that pure scientific or academic discussions should find more space in the program of the IGCs, although this was not the principal reason for the IGC being founded. It should be stressed, however, that such issues turned out to be effectively addressed only if instrumental to the preparation of agreements on specific points of the congress agenda. Excellent up-to-date reviews and major syntheses were in fact presented at the Bologna Congress and others followed in subsequent IGCs on topics of general interest as, for example, stratigraphic correlations, chronometric dating, principles and criteria for classifying rocks and subdividing the geologic time.

Although a careful and thoroughly historical evaluation of the IGCs is still to come, as a matter of fact the IGCs never played a major role in stimulating new ideas or findings in their more than a century of history. Unlike Ellenberger (1978, p. 24), this fact should not be viewed as a problem, rather as an opportunity for aiming at different achievements. Instead, IGCs have succeeded in making visible and workable the effects of new ideas and techniques.

Thus, the IGC starting with the Bologna Congress was a body manifesting the cultural entity represented by the dispersed geological community and enabling geology to obtain its autonomy and identity as a science through a common language, long before a permanent trans-national institution, the IUGS, was founded.

The IGC developed a special structure in view of its unique function of maintaining and improving the cultural identity of the geological sciences and their advancement. Thus, the IGC should not compete with the common scientific, specialized, thematic, and disciplinary congresses. Instead, it should favour the integration of their results and prevent the fragmentation and dispersal as a product of the overspecialization. Such a role, although not very easy to update continuously, is perhaps the reason for its long survival and increasing importance, role, and visibility.

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