

European Science Foundation
Standing Committee for Life, Earth and Environmental Sciences (LESC)
Standing Committee for the Humanities (SCH)

ESF LESC-SCH EXPLORATORY WORKSHOP

**The First Big Science -
European Geological Maps, 1800-2000**

SCIENTIFIC REPORT



Paris, France, 17-20 November 2005

Cité des sciences et de l'industrie
Université Paris 1, Panthéon-Sorbonne

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Introduction

The Exploratory Workshop was held in Paris, on November 18 and 19, and was attended by 18 scholars from 10 European countries and Brazil. We felt it essential that papers were read at the Workshop, in order to offer a coordinated overview of the work undertaken throughout Europe. Long discussions followed, and a section was devoted to assessing the potential of Internet technologies for the field, by discussing websites already on the net.

Historiographic context

Traditionally, the history of science has been by a large extent concerned with monitoring and investigating major advances in the mathematical and physical sciences, from the scientific revolution to today's achievements. Attention has also been devoted to a number of issues in the history of chemistry and of biology, though studies on the chemical revolution led by Lavoisier, or the Darwinian revolution, have usually prevailed. The history of earth sciences has been on the whole neglected, in spite of its intrinsic scientific interest, and crucial relevance to the history of modern and contemporary civilization, the modern State in particular.

Over the last two decades, much has changed in the history of science as a scholarly and institutional endeavour. A much wider problematic horizon has been taken into consideration, and growing attention is paid to the social, political and institutional dimension of modern and contemporary science. New awareness and concern for the environment, biological diversity, or climatic change, has spurred research into a rich texture of issues, covering a time span ranging from the XVIII century to today: naturalistic voyages and the birth of biogeography, the development of meteorological stations, the growth of collections and museums devoted to geology, palaeontology, and the history of our planet and of life in general.

The history of Geological Surveys and Geological mapping

The project we have evaluated and discussed in our workshop constitutes a further instance of the diversification of concerns within the history of science. Surprising as it might appear, the institution, development, and –in some notable cases at least – decline of Geological Surveys throughout Europe if not the whole planet since the early Nineteenth-Century is a domain of historical research still lacking systematic exploration and assessment. Moreover, as it will be stated below, the institutional problems now facing several Geological Surveys is threatening the very existence of important archival material, indeed, of entire archives and museums. Far from being felt by historians alone, this concern is shared by field geologists, palaeontologists, cartographers and State agencies, all well aware of the relevance and importance of records of careful fieldwork undertaken in the past for today's assessments of the structure – peculiarities and risks included - of a region.

Furthermore, the constitution and functioning of State agencies devoted to geological cartography in the early and mid decades of the Nineteenth Century represented one of the first examples of “big science” established in the western world, one that was exported to several colonial settings such as British India or Dutch Indonesia. The surveying, drawing and publishing of a geological map covering the whole of a country required a sustained effort

lasting for over fifty years on average; continuing Parliamentary and public opinion support proved vital when many of these ventures faced crucial crisis and damaging criticism (as it was the case in Italy during the 1880s and the 1920s, in France during the 1860s, or in Belgium during the 1870s), or when it was pointed out that none of the major economic returns emphatically promised by supporters of State geological maps had never materialized. Geological maps involved the work of scores of geologists, collectors, draughtsmen, printers; the constitution of collections, schools and museums; the solution of litigations between state agencies and institutions, concerning for instance the right to access private property or border regions under military administration.

The comparative dimension

The adoption of a comparative dimension for our exploratory workshop answered several needs. Firstly, the history of national Geological Surveys has been undertaken with unequal determination and success throughout Europe and the Western World. Whereas British, American, and Portuguese colleagues have done important groundwork and produced excellent studies, colleagues working in other countries readily acknowledge that their field of interest has not been as well served, or is undergoing right now a fast growth. Thus, preliminary investigations on Italy, Spain, Belgium, Sweden Austria; Germany or Brazil have greatly profited from comparing their research agenda with those developed by similar, more advanced research projects.

Secondly, European Geological Surveys – just to restrict our comment to our Continent- constantly took inspiration the one from the other, on the positive as well as on the negative side. The British and French model (a centralized office, such as the Geological Survey, or the Cartes Departamentales project) were discussed as two possible ways to follow, though by mid-century it became increasingly clear that the choice of local governments carrying on the survey proved marred with difficulty and ineffectual. The Portuguese model of a Geological Committee supervising field work by mining engineers was also referred to when the Italian Geological Survey started in 1867. In between, the efficient Austrian Geological Institute attracted admiring comments, and countries entering the field adopted and adapted various combinations of the models already in existence.

Thirdly, national Geological Surveys relied on formal and informal networks of communication and exchange at Continental and Intercontinental level, the International Geological Congresses, started in Paris in 1876, being the major in stance of an attempt to coordinate nomenclatures, chromatic scales, and symbols to be used in the printed maps. Moreover, the Berlin-based project of a geological map of Europe also played a major and at times problematic role in the time consuming negotiations between different and powerful national geological schools and cartographic traditions. Moreover, scientific personnel travelled frequently and extensively throughout the continent, giving a personal touch to a rich network of correspondences, exchange of maps and publications. Several State Geological Surveys relied on sister institution for the training of their personnel. Thus, for instance, Italian mining engineers were trained at the Ecole de Mines in Paris and Liège, and spent time in fieldwork at the UK geological Survey.

The comparative dimension thus constitutes an inevitable choice if we wish to gain a better understanding of this still neglected and important domain of historical research.

Preliminary results achieved

It was for all of us a very enriching experience to be able to compare our notes and research experience. We ended our two days – and evenings – of long and passionate discussion with the conviction that the field is mature enough to produce important, collective and wide-ranging results: This is particularly true, as we shall argue below, as far as the salvaging and enhancing of the important heritage of detailed knowledge of the European territory produced by the National Geological Survey is concerned.

Most of us were known to each other through their individual contribution to the history of the Geological Survey of their country or region. Yet, none of us had expected that the sharing of our results was going to produce an entire set of new questions to address to our own work, the solution of which depended on the answer our colleagues were going to provide as far as their countries were concerned. To take a major instance, the comparative assessment of the institutional chronology pertaining to individual State Geological Surveys – the inevitable ups and down, the moments of crisis or the new lease of life that intervened here and there during the Nineteenth and the Twentieth Century – has indicated that a common thread did at times unite events occurring in Portugal and Italy, Austria and the United Kingdom. In other words, the crisis of the 1890s was common to several Geological Surveys, even though each of us has been capable to provide explanations in terms of seemingly exclusive local reasons. It is suggested that issues like the hygiene and sanitation movement, the question of water supplies and regulation, coupled with the growth of successful mining ventures in the United States or the colonies, put new pressure on the Geological Surveys across Europe. Equally, the growth of earth sciences after II World War, the growing institutional predominance of geophysics over field geology, affected several national Geological Surveys, to the point of bringing several to the brink on closure. With the downfall of classic geological surveying traditions, in countries like Italy, Portugal and Austria the entire museum, library, and record patrimony collected over almost 150 years has been severely jeopardized, threatened, at times simply destroyed or dispersed.

A Checklist of Further Issues

We have collectively decided to provide new versions of the position papers each of us produced to nurture the discussion, following, whenever possible and relevant, a checklist summing up issues that emerged from the exploratory workshop:

1. Comparative chronology:

Almost all the papers referred in some detail to the ups and downs of the national geological survey they were dealing with (institutional uncertainties, disputes over field or cartographic work, dramatically fluctuating financing, repeated administrative or political threat to closing everything down, and so on). Are these vicissitudes only determined by local political and social factors, or do they reflect wider trends at European level? It appears clear that the relatively recent development of “Earth Sciences” has weakened already weak geological surveys in countries like France, Portugal or Italy, but not in Sweden ... Towards the 1890s, a certain fatigue was felt with respect to international geological gatherings, seen by the Italian administration, for instance, as producing little with a great expense. Increased concentration on immediate, concrete problems such as water supplies to growing towns (the public hygiene and sanitary movement being a cause and a consequence at the same time) or to agriculture

made geological surveys appear endless undertakings one could perhaps dispense with. Trivial synoptic tables of major or minor events marking the life and dramas of single national surveys might perhaps help to catch a first glance at the problem.

2. How did they work?

Recruitment, training, personnel, career patterns, salaries. These features of the internal working of geological surveys are not a mere function of financing: the large or small amounts of money allotted to surveys were partitioned in different ways, following more or less strong views of what geology and geological surveys ought to be. In Italy the little money there was, was very reluctantly allotted to finance precarious part-time jobs for a single palaeontologist, mining engineers and mineralogists being considered the chief protagonists of the surveying work. Thus the following question:

3. The politics of budgets:

Who decided (Parliaments, Ministers, Directors General at the relevant ministries) the amount to be allocated to the geological survey, and who decided staffing and budget distribution within the survey? Were budgets negotiated year after year, or was there an overall estimation of the cost of producing a geological map? Were there, once again, changes over the decades concerning the modalities (and quantities) of budget allocation at State level? As Simon Knell pointed out, this was the key problem with the British Geological Survey. Same for Italy and France, Portugal and?

4. Legislation:

Was there a legal status accorded to the geological surveys allowing (for instance) their personnel to enter properties or border regions under military administration? In France surveying personnel could benefit from the mining legislation declaring the richness of the underground open to State inspection and evaluation. Elsewhere this was not the case. With what consequence? Mineral ores discovered by surveying personnel in a given region belonged to whom? Was there any benefit or partial compensation accorded to surveying personnel? In other words, State legislation defining the field of competence of the administration with respect to private citizens and their property, the organization of State intervention in the economy (motivated by crisis, or a state of war) constituted a framework for geological surveys action, and at times a limitation.

5. Theoretical allegiances:

There has perhaps been an over-reaction against mere “theoretical”, “history of ideas like” histories of geology predominant up to the 1980s. No way to go back, things are much more fun now and we are finally getting a better grasp at geological practices in their complex social stratigraphy, as Simon’s book had brilliantly shown. Yet, different people clearly had views on what geology was, and how the earth surface was shaped. We do not propose to go back to Lyell and Lyell again, rather, which were the beliefs that prompted structural and operational choices? Which body of knowledge, or disciplinary tradition, shaped and determined action? After all, people do think, from time to time After all, theoretical views were often used to defend or to attack geological surveys: the long-standing competition between university geologists and surveying personnel found in many countries vociferous expression in debates calling in question the reliability of the theoretical framework adopted by the one or the other community. Were research traditions or new theoretical trends created by, or within GS? The training of personnel contemplated the use of manuals: if so, which ones? Were there regional theoretical allegiances (Franco-German uplifting proclivities, how far did they reach, and for how long? How did surveys react to new

geological theories emerging at the end of the 19th century, and during the first 30 years of the 20th?

6. Relationship with rival scientific bodies, provincial or national:

Which, if any, the relationship – personal and/or institutional – between geological surveys and other scientific bodies: Geological or Geographical Societies, Natural History Societies, Hydrological or Hydrographical departments within the State administration, and so on. More particularly, in several countries geological surveys were at time outflanked by local amateurs, provincial societies, or State departments producing maps directly or only tangentially geological (agricultural surveys and podological maps, geological maps produced in Italy by the Magistrato alle Acque (Water authority), geological maps proudly produced in France by local amateurs or learned societies, as Pierre Savaton has shown.

7. The technology and politics of printing a map:

Several geological surveys had to face the serious problem of printing satisfactory maps. The presence or absence of local specialized printing facilities, the ways through which the State administration could deal with complex jobs like going through the printing of a sheet in several colours, the negotiations to find a printer outside national borders, thereby acknowledging a sort of national shortcoming These and many others appear issues we should consider, or ask experts on the history of map printing to look at.

The crafts involved in preparing a map for printing: drawing has always accompanied research and printing in several branches of natural history. Yet, a geological map was always the result of teamwork and often of dissent among various factions within the survey or the geological community at large. Thus, drawing and printing had also a “political” dimension the technical articulation of the printing process had to take into account. Corrections proved expensive and difficult to justify to the Administration; new editions were also at the centre of disputes, since the cost of undertaking a new print could be regarded as excessive by financial controllers or Parliament.

8. Interest groups and State interest:

Agricultural societies or venture capital mining societies rarely shared the same kind of interest towards geological surveys. Where they influential in bending priorities to their advantage, and, if so, for how long and how? Military geographical surveys were at times at the origin of, or preceded geological mapping ventures. This feature also deserves to be mentioned in our published papers, to pursue our comparative effort.

State interest took several forms:

National, colonial, imperial. At the national level, the power structure within the State did probably condition the priorities of geological surveys, though in different ways in different countries. Where agricultural interests were predominant, they could impose an agenda to the survey, or in any case the survey leadership had to adopt a language and a rhetorical strategy likely to gain the favour of Parliament and the State administration. Colonial geological surveys should also claim a share of our attention, even though this field is less developed than research on national metropolitan surveys. Colleagues in other countries and fields (colonial sciences, for instance) could be solicited to provide guidance and information. The Imperial dimension of geological surveys was not limited to action within overseas colonies: the British, Austrian or the Russia Empires had to deal with exploitation of potential resources within territories under their direct administration, or in any case enjoying the status of metropolitan provinces, not of colonies. Was there a difference between colonial and imperial surveys? How did countries that freed themselves from foreign administrations (the countries

composing the Austrian empire, for instance) structure the goals of their surveys : a practical as well as symbolic recovery of the national soil through the survey, like in Poland, or with marked indifference to the problem, as it was the case with the Italian provinces formerly under Austria?

9. The international dimension:

Throughout at least the first three quarters of the nineteenth century, the international dimension played a significant role in the structuring and financing of early geological surveys/offices/bureaus. The centuries-long competition between England and France, for instance, was certainly played upon by shrewd or just plainly convinced actors to argue the case of national honour being involved/compromised in staying behind. The British, the French and the Austrian models were much talked about as examples to be followed or to be avoided – this became particularly true of the French system unsuccessfully outsourcing regional mapping to local authorities. In general, the example of what was happening abroad in geological surveys was almost regularly called upon to exhort, convince, and spur Governments to action. The argument of geological surveys being the sign of the modernity of a State helped to get extra money to take part in international congresses, in funding the international congresses of geology in particular. The success of world fairs and exhibitions allowed interest groups (archaeologists, geographers, historians) to successfully propose similar worldwide meetings: geologists followed suit. The International geological congresses and the involvement of personnel from the national geological surveys in their organisation and politics should also be considered. For instance, during the first and second International geological congress (Paris 1878, Bologna 1881) a complex political action was displayed by leading geologists to reward eminent colleagues with medals and honours, in order to enhance the public recognition of geology and geological surveys.

10. Networks:

The issue of networks has loomed large in our discussion. Almost invariably, names came up, from Sweden to Portugal, from Italy to the British Isles that played a continental and at times intercontinental role within geological surveys worldwide. Marcou, for instance, or Capellini and Torrel, Dewalque or Hauchecorne, Delgado ... Several geological survey archives store rich treasures of correspondences, likely to be of use to historians of the geological survey a particular correspondent belonged to. Correspondences so far investigated reveal that chief protagonists of national geological surveys often relied on the help of colleagues abroad to exercise pressure, or to draw arguments in favour of their institutions. Specimens, maps, books and pamphlets, journals and minerals travelled in earnest throughout Europe and the world. Often, as it was the case with the Italian Ufficio Geologico, a journal was set up with the expressed intent to make one's work known, but more importantly to get expensive journals from abroad through a policy of exchange. The cost of printing a journal turned out to be a relatively small investment if compared to the economic return represented by the literally hundreds publications coming in for free thanks to institutional and personal networking.

Back to networks: this truly European, if not worldwide dimension of geological surveys needs all the attention we can provide. Networks of correspondence and exchange were essential to the pursuit of surveying work, to the updating of information (scientific and cartographic), to the political strategies deployed by survey personnel in time of crisis. Thus, for instance, Felice Giordano, the energetic and pugnacious head of the Italian geological survey from 1878 through 1892, kept abreast of what was going on in geological surveys worldwide, solicited letters and memoranda from colleagues illustrating the advantages or

shortcomings of organisational models implemented here and there, to be used to brief Chief Whips in the House, or MPs he could mobilize against MPs speaking on behalf of critics of the Italian Survey. A good international network proved at times as good as insurance.

Suggestions for Action

1. Archives and Collections.

Over and over, our discussions turned to consider the state of archives, museums, collections relating to national geological surveys. In many countries, this is a heritage in serious danger. Not that everything could and should be preserved, but choices will have to be made, information preserved, archives evaluated in order to avoid indiscriminate destruction. It has often been pointed out that much of the survey field notes, specimens or manuscript maps are still of value today. They should therefore be preserved and studied.

2. An electronic calendar of correspondences could be easily put on foot, coupled with a prosopographic database. This could be done at two levels. Firstly, following the example of the British Public Record Office dealing with “British Scientists, 1600-2000”, a simple calendar of correspondences/correspondents present in a given collection: i.e., 5 letters from Delgado to Giordano, National Archives, Rome, call mark XYZ, and a prosopographic database indicating who Delgado and Giordano were, and all letters from and to them so far recorded. This can be regularly updated, and will constitute an invaluable store of information. At a more sophisticated level, scannerized letters might be put on line, because of their crucial importance, because of their rarity, because of the danger of destruction threatening them. A summary in English could be provided for each or part of the letters thus made available, with, when possible, the translation in English of significant passages also available in the original language. We could, in other words, bring networks back to life, thus providing each of us with research material we would have to travel months if not years to gather, and creating at the same time a model for research cooperation at continental as well as intercontinental level.

3. Maps on line.

Following the example of what is currently being achieved by the E-Geo project at the University of Siena, led by Professor Carmignani (almost all historical and contemporary geological maps of Italy are available on line at the address <http://www.egeo.unisi.it/>), systematic investigation of the cartographic heritage produced in different countries, by Geological Surveys, other Agencies or individuals, could lead to the creation of a database monitoring the different stages through which our understanding of the territory of Europe has been developed.

4. Histmap: the creation of a disciplinary space on the net.

Internet technologies make it possible to envisage the creation of an open disciplinary space devoted to the history and present state of geological cartography in Europe (though the ambition might be potentially planetary). Historians and geologists, archivists and librarians, could exchange information and research results, evaluate collections items or the dating of individual maps (not a simple problem, due to the huge time-gap intervening at times between the field work, the drawing of a map, and its final printing). More importantly, together with the publication of collective or individual essays in print, the disciplinary space could offer a quick access to the state of the historiographic art concerning the historic geological cartography of a given country, region or our Continent. In other words, attention should be

paid to the drafting of texts to the benefit of the general public, today very attentive to the issue of risk, and the protection and preservation of the environment. The study of earthquakes and volcanic phenomena, of landslides and marine erosion loomed largely in the work of several Geological Surveys: to document the development of our understanding of the territory where we live can be of use in the classroom and of interest to the educated public. The flexibility of the electronic medium will thus allow the pursuit of a multi-level strategy, ranging from the preservation and enhancement of a scientific heritage, the publications of texts, maps and studies, and the realisation of pedagogical pathways capable of answering a variety of questions relating to a given country, region, geographic area. The website www.histmap.net represents a preliminary model of the kind of action we would like to undertake, calling upon colleagues of all European countries and beyond. So far, thanks to the exploratory workshop, colleagues from Canada, Mexico and Brazil have sent their work on the Geological Surveys of their countries. Colleagues from Norway, India, Greece and Holland have expressed their willingness to take part in this collective work.

FINAL PROGRAMME

Thursday 17 November 2005

Evening *Arrival*
 Dinner

Friday 18 November 2005

Cité des sciences et de l'industrie, Salle Painlevé

Chair: **Gabriel Gohau**, COFHIGEO, Paris

09.00 **P. Corsi**, Université Paris 1, **Opening remarks**

Presentation of the European Science Foundation (ESF)
Demir Altiner (Standing Committee for the Life, Earth and Environmental Sciences)

09.30 **Session 1: England and France**

09.30 - 10.15 **Simon Knell**, University of Leicester, "*The Geological Survey of Great Britain: Adapting to Survive*"

10.15 - 11.00 **Isabelle Laboulais Lesage**, Université Marc Bloch, Strasbourg, "*Des esquisses à la publication: la genèse de l'Essai de carte géologique de d'Omalius d'Halloy et Coquebert de Montbret (1810-1823).*"

11.00 - 11.30 *Coffee break*

11.30 – 12.15 **Pierre Savaton**, Université de Caen, France: "*From geologicals maps to the geological map: the birth of a national cartography in France*"

12.15 – 12.45 **Discussion**

13.00 – 14.30 *Lunch break*

Session 2: Italy and Belgium

Chair: **Ezio Vaccari**, Università dell'Insubria, Varese

14.30 – 15.15 **Pietro Corsi** "*The Map of the Kingdom: a story that never ended*"

15.15 - 16.00 **Alice Ingold** E.H.E.S.S., "*Who made the Carta Idrografica d'Italia (1876 1920)?*"

16.00 – 16.30 *Coffee break*

16.30 - 17.15 **Eric Groessens** et **Marie-Claire Groessens-Van Dyck**, Service Géologique de la Belgique, "*De d'Omalius d'Halloy à la régionalisation de la Belgique. Deux cents ans de cartographie géologique.*"

17.15 - 18.00 **Presentation of** www.histmap.net, www.egeo.unisi.it, <http://campus.fct.unl.pt/prmpedra/>, **etc.**

18.00 – 18.30 **Discussion**
Evening *Dinner*

Saturday 19 November 2005

Université Paris 1, Panthéon-Sorbonne, 9 rue Malher, 75004, Salle 309

Session 3: Case Studies

Chair: **Silvia Figueroa**, Campinas University, Brasil

09.15 – 10.00 **Ana Carneiro** and **Teresa Salomé Mota**, Lisbon University, Portugal, "*The Geological Survey of Portugal (1857-1948), an Overview*"

10.00 – 10.45 **Christer Nordlund**, Umea University, "*The Swedish Geological Survey, an overview: 1858 to 1914*"

10.45 - 11.30 **Ezio Vaccari**, University of Insubria, Varese, "*An Italian-Austrian network: geological surveying and mapping in northern Italy at the middle of the 19th century.*"

11.30 – 11.45 *Coffee break*

11.45 – 12.30 **Bernhard Fritschau**, University of Munich, Germany "*The geological survey of Alsace-Lorraine and the making of the German Empire in the 1870s and 1880s.*"

12.30 - 13.00 **Jesús-Ignacio Catalá-Gorgues**, Universidad Cardenal Herrera-CEU, Valencia, "*Preliminary Views on the Spanish case*"

13.00 - 14.30 *Lunch*

Session 4: New and old Nations: Brasil and Poland

Chair: **Pietro Corsi**

14.30 – 15.15 **Joanna Kacprzak**, Polish Geological Institute, "*The geological maps of Polish territories in the XIX century*"

15.15 – 16.00 **Silvia Figueroa**, Campinas University, Brasil: "*Geological surveys in the tropics: the Brazilian experience (1875-1934)*"

16.00 – 16.20 *Coffee break*

16.20 – 18.00 **General discussion**

Sunday 20 November 2005

Morning *Departure*

List of Participants

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Statistical Information

Age groups of Participants

The youngest, Dr. Candela, was born in 1979; the oldest participant, M. Gohau, President of the French Committee for the History of Geology, in 1938.

The Age distribution was as follows:

1938, 1	1963, 1
1944, 1	1964, 1
1948, 1	1965, 2
1954, 1	1969, 1
1956, 2	1970, 2
1958, 1	1975, 1
1959, 1	1979, 1
1962, 1	

Thus, the large majority of participants was born after 1954, and 10 out of 18 after 1960.

Countries of work

Austria, 1
Belgium, 1
Brazil, 1
France 5
Germany, 1
Italy, 4
Poland, 1
Portugal, 1
Spain, 1
Sweden, 1
UK, 1