



Every document reflects the historical context in which it was done and the geological map of 1968 is a clear example. The map is the result of a geological mapping project done in the central Pyrenees from the University of Leiden (Netherlands) just after the Second World War and continued until the 70's. More than a hundred Dutch geologists participate on that project and the final editing result was 10 maps at 1:50.000. The quality of the work done and the accuracy of the cartography are still a reference for the earth scientist in the Pyrenees, referring as "the Dutch school of geology." In this mapping project the Principality of Andorra is split into two maps, the northern sector in sheet 6 and the southern sector in sheet 10, made by HJ Zwart and J.J.A Hartvelt respectively. The geological patterns of both maps are different, because the lithological characteristics of the areas mapped are also different, however the two authors agreed to synthesize the two maps in a single one, with the idea of publishing it in the Principality of Andorra. The idea was frustrated by the lack of institutional interest and the map has been unpublished for almost 40 years in Holland. The efforts of the Marcel Chevalier Foundation and the National Archives of Andorra have made it possible to recover the map for its study. This map is a key map to understand the lithology of the Principality of Andorra as a whole, is an original manuscript with a remarkable scientific value for the Pyrenees. Therefore this presentation should be considered as a tribute to the authors of the map, as well as to the whole Dutch school for its scientific guidance, which in the case of Andorra is especially useful because "the geology seems to fall you over."

Andorra la Vella 7 february 2008



Valentí TURU i MICHELS
Fundació Marcel Chevalier



Govern d'Andorra

El ministre Portaveu del Govern, de Desenvolupament Econòmic, Turisme, Cultura i Universitats

Juli Minoves Triquell

es complau a convidar-vos a la conferència

“El mapa geològic d'Andorra de 1968-2008: un projecte amb història”

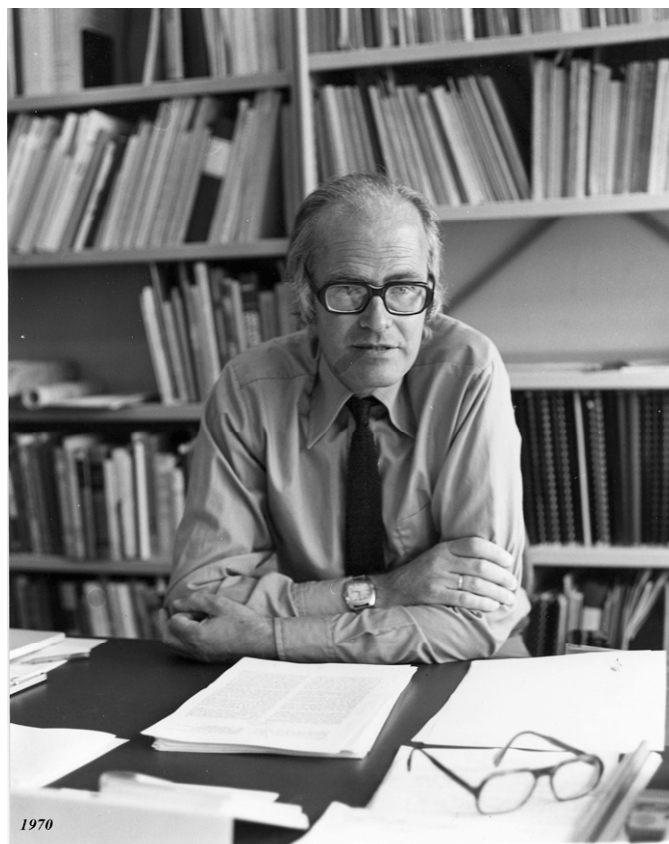
a càrrec del Sr. Valentí Turu de la Fundació Marcel Chevalier per a l'Estudi de les Ciències Naturals amb la participació del Dr. Jordi Carreras, professor de geologia a la Universitat Autònoma de Barcelona; el Sr. Peter Nagtegaal, doctor en geologia per la Universitat de Leiden, i la Dra. Montse Mases del Centre d'Estudis de la Neu i de la Muntanya d'Andorra de l'Institut d'Estudis Andorrans.

L'acte tindrà lloc el dijous 28 de febrer del 2008, a les 19.30 h, a la Biblioteca Nacional Casa Bauró.

Us preguem que confirmeu la vostra assistència al telèfon 829 456, abans del dimecres 27 de febrer.

The Pyrenean mapping project, Geology Department Leiden University

H.J.Zwart



The mapping project in the Pyrenees started in 1948, but to understand the reason for this project one has to know something about the history of the Leiden geology department. Before world war II it was quite small with one professor, one extraordinary professor and two lecturers and few students. L.U. De Sitter was one of these staff members responsible for a field mapping program in the Bergamask Alps in Italy. Most students took part in this program for one or more field seasons. The project came to an end in 1939 due to the war when the university was closed for five years. In 1945 the geology department opened again to be confronted with a large number of new students. For this reason de staff expanded with new professors and more lecturers. De Sitter was appointed professor of structural geology and became again charged with the field program. After some minor projects in Sweden and Algeria he tried to get a foothold in the French Pyrenees. This was not as simple as it looks, because in France most geology departments claimed ownership of certain regions. For the French part of the Pyrenees professor M. Casteras from Toulouse was the boss had to be consulted to get a permission. Somewhat reluctantly he agreed that De Sitter could study the Arize Massif consisting of Paleozoic and crystalline rocks. Casteras himself was mainly interested in the Mesozoic and Cenozoic rocks and did not much care about the Paleozoic. So in the summer of 1948 De Sitter went with 25 undergraduate students to the Arize Massif for a first look into the Paleozoic. I myself did not participate in this field exercise because I went to a Precambrian area in southern Sweden together wit a few class mates.

Back in the geology institute in the fall of that year De Sitter asked me to become his assistant, under the condition that I should map an area in the Pyrenees for a M.Sc. degree. So in 1949 I went to the Saint Barthelémy Massif where I was supposed to map the Paleozoic rocks of its eastern portion. De Sitter warned me to restrict to Paleozoic sediments only, because he told me that he had not much experience with metamorphic rocks. However my base camp was in the talcum quarry of Trimouns lying on the boundary between sedimentary rocks on the eastside and metamorphic rocks to the west. Although I had no particular knowledge about such rocks I was tempted to take a look at micaschists and migmatites. Another graduate field geologist, Jan Keizer remapped the Arize massif. His map and description were published. Also in 1949 a group of about 20 undergraduate students participated in a mapping course in the remainder of the Barthelémy Massif.

In 1950 De Sitter decided to continue mapping in the Pyrenees and now choose to start in the axial zone with again a group of undergraduate students in the valley of the Salat river. Also a graduate student, Jan Allaart studied the sedimentary cover of the Aston Massif. The next year a new group of undergraduates mapped in the Lez valley south of Castillon. In 1952 work was extended further west in the French part of the Garonne around St. Béat. Finally in 1953 the mapping course went to Spain, to work in the Vall d'Aran. As all students in those mapping courses were inexperienced their work had to be considered as preliminary. To get better and more reliable information graduate students working towards a M.Sc. degree, each one of them got an area within the region already surveyed in the mapping course. This started in 1949 in the Arize and Saint Barthelémy massif and the northern border of the Aston massif (at that time usually called Ax-Montcalm massif). From then on many students spending two or three seasons in the field concluded their study with a M.Sc. thesis. Some of this work was published in the "Leidse Geologische Mededelingen". Altogether about 100 students were involved in this project. Their names are mentioned in the legends of the map sheets. In addition some of these students went on for a Ph.D. degree which involved usually about two or three more fieldseasons. Jan Allaart planned to do a Ph.D on the Aston massif, but two French geologists, Raguin and Destonbes claimed that area and simply told Allaart that he was not welcome. So Allaart did the Trois Seigneurs Massif. I finished my thesis on the Saint Barthelémy massif in 1954, which dealt besides the structure of the Paleozoic cover a study of the metamorphic core with amphibolite en granulite facies rocks. An investigation of the Variscan metamorphic history was also done by J. Allaart who mapped a large part of the Trois Seigneurs massif. His Ph.D. thesis was published in 1959. Another thesis by H. Zandvliet concerned a huge area with Devonian and Cambro-Ordovician rocks both in France and Spain.

In the meantime a number of geological maps had been published starting in 1954 with the Arize massif, the Saint Barthelémy massif, Ariège valley and a preliminary map of the northern part of the central Pyrenees. All these maps were on a different scale and in 1958 De Sitter decided to publish a series of maps on a scale of 1:50.000 of the region between Ax-les-Thermes in the east and Bagnières de Luchon in the west. In total ten maps should cover the whole area and each sheet was to be named after a river. The first sheet, nr. 3 Ariège, was published in 1959, the last one, nr. 10, in 1969. For the color scheme De Sitter also took his own way. He did not like the internationally accepted colours because for the Paleozoic he found those not bright enough and he proposed the now well known colours.

After the first reconnaissance in the Valle d'Aran work continued in the southern part of the axial zone, in the Valira, Flamisell, Pallaresa, Ribagorzana and Esera valleys. The lithostratigraphy of the Devonian in this region was elucidated by P. Mey, who published sheet 8 for his Ph.D. degree. Also J. Hartevelt started as a M.Sc. student and continued for a Ph.D., publishing sheet 10. He was a meticulous field geologist who spent many seasons in the field from 1961 to 1967.

The whole project lasted 20 years from 1948 to 1968. A few more Ph. D. publications resulted from this project as special investigations. One by J. Oele examined the structure of the Cambro-Ordovician in the region between the Aston massif and the Salat-Pallaresa anticlinorium (1966). D. Boschma did some structural work in various areas (1963). H. Avé Lallemant studied the ultramafic rocks of Étang de Lhers (1969). C. Passchier examined mylonitic structures in the Saint Barthelémy massif (1982). Moreover new stratigraphic and sedimentologic work was carried out by members of the stratigraphic group of the Leiden department.

In 1970 the Dutch government thought that there were too many geology departments in the Netherlands and plans were made to close two or three such institutes. This resulted in a decision that the departments of the universities of Leiden, Amsterdam and Groningen should be sacrificed and amalgamated with the University of Utrecht and the free university of Amsterdam. For that reason most Leiden staff members joined the Utrecht department where I was appointed in 1979. This did not mean that geological work in the Pyrenees was ended after 1968. In the seventies I had several students working on special problems or remapping critical areas. In addition the whole of the Lys-Caillaouas massif was mapped again, but unfortunately there were no funds to publish it. In addition B. van den Eeckhout did a Ph.D. On the easternmost part of the Aston massif and A. Speksnijder on faulting in the southern Pyrenees; both theses appeared in 1986. Work by the Utrecht structural group is at present going on the lherzolites in the northern Pyrenees.

Now some remarks about mapping in Andorra. After I finished work in Saint Barthelémy massif I went on studying Hercynian metamorphism. Firstly by mapping the Aston and Hospitalet massifs, and doing microstructural work in the Vall d'Aran and around El Serrat in Andorra. I spent about 8 field season in those areas from 1956 to 1964 doing detailed mapping besides supervising students. To map the Hospitalet massif I had been working in the northern part of Andorra, whereas at the same time J. Hartevelt started his work in the Valira valley. Together we made a geological map of the whole of Andorra with the hope that it could be published, As far as I remember we contacted the Andorran tourist bureau but it did not lead to anything and then we gave up on this project. My work in the Pyrenees was interrupted twice, in 1954 and 1955 when I studied in the U.S., and in 1961 when I was visiting professor in Illinois.

After so many years in the Pyrenees I decided to go elsewhere, so from 1964 to 1968 I did fieldwork in the Swiss Alps, combining it with visits to the Pyrenees. In 1966 I became professor in Aarhus, Denmark, where I started a field project in the Scandinavian Caledonides. In 1969 I was appointed full professor in Leiden as successor to De Sitter who had retired a few years before. I continued to work in Scandinavia, but made occasional trips to the Pyrenees, mostly as excursions with students. In 1988 I retired from my position.

Leersum, 27 October 2007

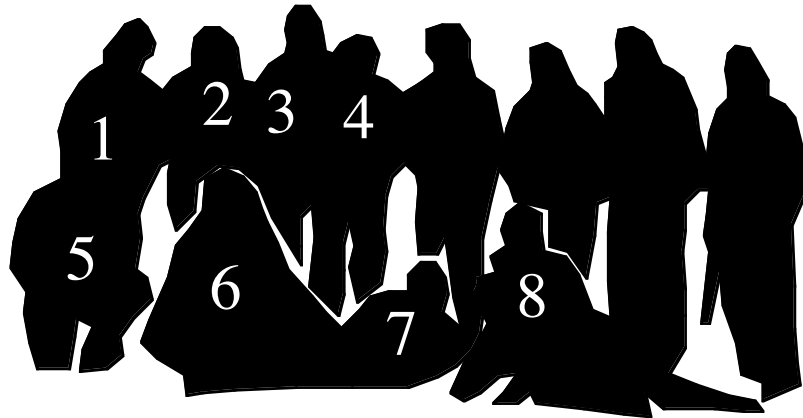
P.D.

18 august 2006: Dear Valenti, you asked me a lot of questions to be answered. It will take some time to answer these. I shall write a review of the history of our Pyrenean mapping project, which started in 1948 and was mostly concluded in 1980. In this review most of your questions will be answered. Some, however are difficult to answer. Don't forget that my active career ended about fifteen years ago and I cannot remember everything about the early years. However you will get my review some time this fall.

Of course Jaap and I have no problem when you publish the Andorran map; in fact we like the idea very much. As you wrote it is a good idea to add your new material to the map. Please keep me informed

With best wishes,
Henk Zwart.

Field excursion in the Pyrenees 1989



1: Mrs. Zwart, 2: Mrs. Oele, 3: Karel Roberti, 4: Peter Mey, 5: Jaap Liezenberg, 6: Jan Oele, 7: Arie Speksnijder, 8: Henk Zwart