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## Sociedad Española de Mineralogía

### MINERALOGY AND RELATED SCIENCES IN THE 21<sup>st</sup> CENTURY

On June 11, 2008, the Mineralogical Society of Spain held a one-day seminar to discuss the future of teaching and scientific research in mineralogy in Spain. About thirty participants from all over the country attended the meeting, most of them actively involved in graduate and postgraduate courses and programs, including crystallography, mineralogy, petrology, and geochemistry.

Professors Sol López Andrés (Complutense University of Madrid), Salvador Morales Ruano (University of Granada), and Fernando Rull Pérez (University of Valladolid) gave three talks covering topics like the impact of the European Space for Higher Education on scientific research in mineralogy and related disciplines; the need for academics to adapt to an apparently new teaching paradigm: skill development via a student learning-based approach; and how to include new concepts and techniques in modern, university-level teaching of mineralogy. To discuss in greater detail the issues emerging from the talks, an open debate followed each presentation.

Many interesting questions were raised in the discussions. Worth noting were thoughts on the perception the practitioners of mineralogy have with respect to their own contribution to geosciences and collateral fields (engineering, materials science, biomedicine, historical science, law, climate change, etc.) and on the question of whether their work is adequately acknowledged by the scientific community and society. Interesting reflections were also made on the fading-out tendency of classical, Earth science-based mineralogy and on how in past decades the environmental and technological applications of mineralogy have taken off. Although the participants generally agreed that this is a global tendency, not much agreement was found regarding the causes: Is this the normal evolution of a mature scientific field that is spontaneously merging with neighbor disciplines? Are we suffering pressure from other productive and expanding fields (chemistry, physics, biology), which may be widening the frontiers of their knowledge at our expense? As scientists, should we accept the situation and carry on, facing the challenges and opportunities provided, or should we try to strengthen our position within the rest of science?

The translation of the previous discussion to the practical arena was centered on the two main topics of the seminar: funds for research and the elaboration of new academic curricula. With respect to project funding, the participants observed that, in Spain, it is true that funds available for scientific research or for the acquisition of costly equipment have greatly increased in past decades. However, the funds addressed specifically to geoscientific fields, including mineralogy, have clearly declined, and it is perceived that there is a tendency toward their complete disappearance. For instance, in the present National R&D Program (2008–2011), our government has identified research needs in food, farming and fisheries; environment and eco-innovation; energy; security and defense; construction and cultural heritage; tourism; aerospace; infrastructures and transport; pharmacy; and industry. It also provides for strategic actions in human health, bio- and nanotech-



Professor Fernando Rull, from the University of Valladolid, giving his talk on modern concepts and techniques applied to teaching mineralogy.

nology, nanoscience, energy and climate change, telecommunications, and new materials. A similar situation can be found in the case of the 7<sup>th</sup> European Framework Programme. Thus, although there is money available to work, a great deal of imagination is needed to fit many geoscientific proposals into the present funding system. To the participants in the seminar, this may reflect the lack of influence of our scientific realm compared with the dominant positions of other disciplines, which are favored by science metrics and the higher social impact of their research. A more worrying concern was the perception of the prevalence of certain interests, not strictly scientific or academic, associated with lobbies and pressure groups. A great deal of effort is necessary to improve our communication skills and to highlight past, present, and future achievements.

Another key battleground is the adaptation of academic curricula in accordance with the Bologna converging process. European experts say that new graduate programs must stress the development of key qualifications, like communication and team work. In fact, that means the reduction of lectures in favor of more time for students to develop given skills (or competencies). Like many other titles in Spain, our future geologists will enter the labor market after completing a four-year degree (now five), including instruction in crystallography and significantly shorter inputs from mineralogy, petrology, and geochemistry. However, the problem deepens because in Spain, since the nineties, geology is not taught at pre-university levels.

Some of the participants called attention to the leadership role that scientific institutions, like the Mineralogical Society of Spain (SEM), should play in order to face these challenges. In any case, we cannot expect that any short-term action will dramatically improve the present situation. It is necessary, however, to construct a long-term strategy based on the coordination of groups and activities, information dissemination (talks, educational materials, etc.), and public communication (mass media). Within the context of university education, SEM should help to assess the minimum background levels required in crystallography, mineralogy, petrology, and geochemistry for geoscientists, as well as to identify key content in related disciplines (chemistry, physics, engineering, etc.). On the other hand, in order to foster research in mineralogy, SEM should be present in the corresponding scientific policymaking scenarios. Most of these actions should be taken within a transnational context because it is acknowledged that a similar situation has developed in other countries.

The meeting was convened by Drs. Lurdes Fernández Díaz and José Fernández Barrenechea, both in the Crystallography and Mineralogy Department of the Complutense University of Madrid. As an outcome of the seminar, a summary report is being coordinated by Dr. Salvador Morales Ruano (University of Granada). The full report will be included in the next regular issue of *Macla* (i.e. the SEM's magazine) and distributed to departments, universities, and accreditation agencies, as well as to local and national educational administrations.

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