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# The scientific thought of Salvador Reguant

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It is always complex to grasp the many different aspects that, in all their richness and subtlety, make up a person. It is even more difficult if that person is one whose character is as prolific as that of our friend Salvador Reguant. For this reason I whole-heartedly praise the decision that this work should contain contributions of people who differ widely both in their personalities and their professional fields. At the same time, it is also important to acknowledge that analysing separately the different dimensions of Doctor Reguant's character creates real difficulties. The different facets of a crystal can not be studied in isolation since the nature of each one, its shape and size, are determined by the characteristics of all the other facets that make up the whole. The same thing happens with a human being. It is impossible to speak of Salvador Reguant the university teacher without referring to his research activity, an aspect that is influenced by his theological thought, which in turn is undoubtedly shaped by his training as a geologist.

For all these reasons to participate in this book is both fascinating and, at the same time, difficult and even rash of me; thus I am truly grateful that the organisers of this thoroughly deserved tribute have asked me to collaborate.

I first met Salvador Reguant when he was a student in Barcelona at the then recently created Faculty of Geology, where I was an Associate Lecturer. In the 1950's, students of Geology were few, which allowed for an intense and enriching human and scientific exchange between students and teachers.

In 1963, I left Barcelona to take up the Chair of Stratigraphy at Oviedo University, but our relationship continued as Reguant had begun to work on his Ph.D. thesis on the Stratigraphy of the Marine Eocene in the Vic area, under my supervision. At the time he initiated his work

there was no Chair of Stratigraphy anywhere in Spain nor was it acknowledged as a specialist field. However, both Dr Oriol Riba and myself had presented our theses on Stratigraphy some years earlier, albeit working within a Department of Physical Geography. As usual, bureaucratic change was slow to adapt to changing circumstances.

Despite my residing in Oviedo, it was easy to direct Reguant's work since his initiative and maturity meant that little actual supervision was necessary. In 1966, I had the satisfaction of seeing his thesis presented at Oviedo University. It was qualified "Excellent Cum Laude" and awarded a special prize for what was considered a magnificent piece of research and a valuable contribution to the field. As a result, in 1967 it was published by the *Instituto Geológico y Minero de España*.

How much I learnt directing this thesis! I discovered the geological wealth of the Vic Plain and its surrounding mountains and learnt much about Eocene Stratigraphy, but above all I came to appreciate the rigour and wealth of Salvador Reguant's thinking and scientific methodology. And this is the subject that I wish to develop in the following lines.

The third stage of our scientific relationship, which continues to the present day, is that of being colleagues. He being Assistant Professor from 1972, and from 1983, Professor of Stratigraphy and Historical Geology at Barcelona University, while I occupied the same Chair at the Universidad Complutense in Madrid.

For years we have exchanged programmes, notes, course outlines, papers and books, even to a greater extent than while he was working on his thesis. I have admired the organised structure of his ideas and his vision, anchored firmly in the diversity of the real world, and yet

capable of projecting itself beyond the concrete reality to the formulation of an all-embracing theory. Besides, I have always valued his ability for organising the diverse data gathered during his experimental work into a single coherent whole, without any of the results losing their richness or individual significance. It would be possible to analyse many aspects of Salvador Reguant's scientific thought but, to be concise, I will take just four:

The first one refers to the element of his thesis that I considered to be the most innovative and original at the time it was presented – that is sequential analysis.

The second and third refer to questions of fundamental importance for Stratigraphy and Historical Geology. One of the earliest preoccupations of Reguant was with nomenclature and stratigraphic classification. Another, that appeared slightly later, is his reflection on the nature of geological time and its representation in the stratigraphic series.

The fourth and final aspect flows almost parallel to the two previous ones, but it is formulated in more philosophical articles that are not, in general, intended for the geological community, though their insights impregnate many of his technical writings. I am referring to a series of reflections on humanity and our physical surroundings, on the role of science and technology in the future of mankind.

Although his first scientific paper was published in 1957 (*Cursos y conferencias del Instituto Lucas Mallada*), his thesis was not published until ten years later, but some preliminary conclusions from his research began to appear in print from 1963 on. My intention is not to make an analysis of all these papers, rather I wish to refer only to the conclusions of Chapter IV, 'Lithostratigraphy', which I believe reveal his scientific methodology.

In the introduction to the work he sets forth his main aim: to bring together "enough data to allow a detailed knowledge of the area" in order to produce a subsequent structured synthesis based on the "varied and multiple results of the diverse methods used".

Chapter IV deals basically with precise studies of the successions of material. Taking as a basis some one hundred detailed stratigraphic series that span some fifty kilometres, Reguant draws four columns of synthetic information. From these columns, various characteristics of the materials that make them up are analysed, such as the content of clays and calcareous material, the size and shape of the quartz grains etc., and these data are presented in logs that show the vertical variation. The comparison of these graphs allows him 'to order diversity'. The analogy of the curves makes it possible to group materials of different

characteristics into a series of units that, taken together, represent the whole of the Vic Eocene throughout the vertical dimension (time) and the horizontal dimension (space).

Perhaps for those who are not geologists this explanation is not very illuminating – geologists will undoubtedly find it too simple – and perhaps the results will not seem particularly important. However, they were of key significance to subsequent work on the Marine Eocene of a large part of the Ebro Basin, and the methodology used predated the sequential and cyclical studies that in later years would become basic in stratigraphic analysis.

Shortly afterwards, to these studies which we might term 'regional' were added others of a more general character: in 1971, "The Concept of Facies in Stratigraphy" (*Acta Geologica Hispanica*, 6 (4), pp. 97-101); in 1975, "On the content of Biostratigraphy" (*Geology*, 35, p. 231), and many others in the following years. All this production, and in large part his thesis, would not have been possible without his training (we might more accurately say his specialisation) in two different though complementary disciplines, Stratigraphy and Palaeontology, something extremely unusual in today's researchers. In these works, Salvador Reguant went further into the methodological aspects he had begun to explore in his thesis. His desire to order diversity led him to develop an understanding of coexistence, and the absolute necessity that language and scientific terminology be common to, and shared by, the whole scientific community. In 1970, he published, in a more strictly pedagogical line, his "Chronostratigraphic Nomenclature", which was reprinted a few years later by the Association of Spanish Geologists and was widely read.

It was in these years that he undertook his first work with the International Commission on Stratigraphic Nomenclature, a connection that time made wider and deeper. Professor Amos Salvador has studied this aspect of Salvador Reguant's scientific work more widely than I have. I mention it here for I believe that it reflects one of the fundamental aspects of his work as a scientist and, above all, as a teacher (*Geologia Històrica*. Ins. Cat. Hist. Natural. Mem. 2. Ed. Ketres, 1986).

To his reflection on the internal ordering of the materials that make up the Earth's crust, Reguant soon added a reflection on the causes, the meaning of the ordering, of the succession. Geology is a strange science, working as it does in four dimensions, since the vertical dimension has a double significance – spatial and temporal, the time taken to form the materials that have a given thickness. This conception is common to all those who work in Stratigraphy. Without an awareness of the temporal dimension of the processes, Stratigraphy could not exist, yet it is not easy to formulate this conception. Salvador

Reguant does so in a masterly way in his book *Geologia Històrica*, previously cited, as well as in a series of articles of both stratigraphic and palaeontological flavour that he produced periodically. One of the most fascinating and entertaining seems to me to be *El Temps en Geologia* (Time in Geology), published by the Department of Culture of the Generalitat de Catalunya in *Itineraris pel Sabers: trobada d'Humanistes i Científics* (Routes to Knowledge: an encounter between Humanists and Scientists). Sitges, June 1992.

The fourth and final group of publications I would like to refer to are those that contain philosophical reflections on the temporal meaning of phenomena, and on the continuing and changing processes that affect the natural environment. They deal also with the role we humans play in these processes, on the direction these changes are leading in, and the projection into the near future of the consequences of these man-made modifications to the natural world. They are philosophical papers in which the geological specialisation of Reguant interacts with his theological training, a question that I do not intend to explore here. Underlying all these articles, which appeared in different publications, including *Qüestions de Vida Cristiana* (Questions of Christian Life), Abadia de Montserrat, there lies a profound reflection regarding the aims and meaning of science and technology, in both the present and future of mankind.

Being a good scientist, he is an optimist: “only the means afforded by science and technology can make the immediate future bearable to humans” (*Entorn al futur immediat de la humanitat*, Regarding the Future of Humanity, *Q.V.C.* N° 77, 1975). As a responsible human

being, responsible not only to his colleagues and fellow humans but also to A Greater Being, he believes that the bias and partiality of our western culture should be denounced. This culture, he believes, addresses almost exclusively the external, superficial, human reality, and makes no attempt to develop the inner spiritual man. In addition, “profound reflection and critical discussion” is necessary “as is a constant broadening of our perspective, dangerously limited at present, with regard to the dominant scientific-technological mentality” (*Q.V.C.* N° 156, 1991).

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