REPEATED INDEPENDENT DISCOVERY AND ‘OBJECTIVE EVIDENCE’ IN SCIENCE: AN EXAMPLE FROM GEOLOGY

Out yonder there was this huge world, which exists independently of us human beings and which stands before us like a great, eternal riddle, at least partially accessible to our inspection and thinking. The contemplation of this world beckoned like a liberation, and I soon noticed that many a man whom I had learned to esteem and to admire had found inner freedom and security in devoted occupation with it. The mental grasp of this extrapersonal world within the frame of the given possibilities swam as the highest aim half consciously and half unconsciously before my mind’s eye. Similarly motivated men of the present and of the past, as well as the insights which they had achieved, were the friends which could not be lost. The road to this paradise was not as comfortable and as alluring as the road to religious paradise; but it has proved itself as trustworthy, and I have never regretted having chosen it.

Albert EINSTEIN, 1949

1. INTRODUCTION

The purpose of this paper is to show, from the viewpoint of a geologist interested in the history and philosophy of his subject and on an example from the history of geology, that evidence matters in science and that without evidence there can be no science. In this paper I summarize the history of a discovery repeated four times, independently of one another, at different times and in different places, within different theoretical contexts, during the twentieth century. It is the history of the discovery and rediscovery again and again of mélanges, a chaotically mixed group of rocks indicating an environment of intense shear deformation. This summary is taken from a larger paper on the same topic, in which the details of the geological arguments are given (Şengör, 2003), which are largely omitted here. The discoverers of mélanges have worked in cultural environments different from one another at different times in history and, at least one, in a completely different theoretical context from the rest. Two of the heroes of the story even come from two different non-western cultures: One is Turkish and the other is Chinese.

The history related below is embedded within the context of European science. I here make no attempt to compare European science with what has been called...
science in other cultures (mostly by students who grew up within a European social and scientific context!). The sole purpose of the present contribution is to show that a dialogue between man and Nature outside him is possible and constitutes the essence of science.

2. ON THE POSSIBILITY OF OBJECTIVE EVIDENCE

Before I summarize the historical data, I wish to say a few words about objectivity, as it is the possibility of objective evidence that is denied by those who think that science is just a social construct. In its shortest and most comprehensive definition, objectivity is independence of individual whim (Popper, 1935, p. 16; 1980, p. 44; 1994, p. 18). In view of the human incapability of gathering perfect data concerning the world outside us, because of a variety of factors such as the imperfection of our sense organs to reproduce a faithful picture of the stimulants, or the in-built or acquired biases, distorting whatever message our sense organs give us, the claim that we can acquire knowledge independent of our imperfections must, at first, be thought surprising. The first step in understanding how objectivity is achieved is to realize that no one person can possibly be objective. The knowledge an individual acquires is beset with all sorts of distortions. These distortions, however, are different for different persons owing to the different kinds and/or degrees of their imperfections, and the differences in their biases, in processing information. When such a group of ‘imperfect individuals’ with diverse biases regards an object or evaluates a statement, there is always a large margin of disagreement as to what is being regarded or being evaluated. However, there is usually also a significant area of overlap. Science, indeed all rational life, takes its departure from this very area of overlap. Contestants disagreeing on the margins of the area of overlap seek to remedy their imperfections with a view to enlarging the area of the overlap on the basis of what is contained in it.

Microscope, for instance, is built on principles constituting an area of overlap amongst many people. But it helps to enlarge another area of overlap on the nature of microscopic objects, which, otherwise, would have been only much more indirectly perceived and most likely differently conceived by different individuals. Similarly, on the basis of the common understanding of physics, forming an area of overlap, even the fiercest critics of scientific objectivity do not step out of windows on the top floor of the Empire State Building in New York or go on expensive safaris with the hope of enjoying views of live dinosaurs.

This appreciation of the nature of objectivity (Popper 1957, p. 155-156; 1966, esp. p. 217-219; also see 1935, pp. 16-19; 1980, p. 44-48, esp. note *1 on p. 44; 1983, p. 48; 1994, pp. 18-21 and esp. note *1) emphasizes the indispensability of the evidence and the importance of the presence of a scientific community, amongst the members of which an area of overlap of agreement on data can be achieved. There can indeed be a one-man science, if that man had perfect sense organs and were moreover perfectly rational: but even then it would progress very much more slowly than if it were in a community. However, there can be no science of monads unable to communicate with their surroundings.