Biological and Geological Times

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EDITORIAL
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For somebody who is able to enjoy a summit view while skiing, it is very hard to believe that the landscape one is actually admiring is, in fact, in motion. Geologists tell us, for example, that the terrestrial surface behaves, over the course of many thousands of years, like the surface of a lake. Like waves, existing mountains get flattened and new ones are generated. Things only look solid because we observe them for a very brief period—brief, that is, compared to the scale of "geological time."

"Biological time" is measured by a much briefer scale. In fact, we might consider several parallel scales of biological time. Neglecting the process of evolution, the longest of these biological time scales is the duration of a human life. Indeed, the process of development and aging is much longer than the career of a single investigator. A somewhat shorter biological time scale applies to the pathophysiology of certain chronic diseases. As yet, no good models exist to study, for instance, the development of atherosclerosis or degenerative neural diseases, which develop over a period of years in humans. Moreover, apart from some epidemiological studies that focus on these problems, it would be difficult to obtain funding for a long-term experiment lasting several years.

Another set of time scales are what we might regard as "quasi-biological." An example is the one that pertains to the body of literature written by a particular generation of biologists. We tend to ignore the work of earlier generations because we did not personally know those who performed it or because the investigators had the misfortune of publishing it before the advent of computerized indexing—or even before the advent of electronic publication. Even if we are aware of older research, if it was published in a journal that does not have a complete "legacy collection," the work is no longer easily accessible . . . and for practical purposes no longer exists. Thus, especially in the case of systems biology, work is getting "re-invented," sometimes with less insight than has been obtained previously. In all of these cases, we are not really any better off than if we were observing on a geological time scale.

Many modern researchers in physiological science now focus on complex processes that are at the extremely short end of biological time scales, so short that they are challenging to observe. Examples are some cellular signals, such as calcium transients or short-lived radicals. And sometimes, it seems, these high biological speeds drive the clocks of their researchers as well. Some believe that it is more important to be the "first" or to publish many papers in a brief quasi-biological time scale than it is to assemble a reasonably complete story or one that includes carefully controlled results. Referees of submitted articles are often under extreme pressure to evaluate manuscripts in an extremely brief quasi-biological time scale, a practice that cannot improve the quality and longevity of publications. And perhaps this emphasis on the acceleration of quasi-biological time is one of the reasons that we must face, with complete bewilderment, spectacular cases of scientific fraud, especially in very new, rapidly evolving, and what we consider (or had considered?) promising scientific fields. Much of the blame lies with our very selves in our roles as reviewers of grants or judges of promotions. In these roles, we too often do not invest enough quasi-biological time to evaluate quality rather than quantity. Although I definitely do not plea for geological time scales here, I think it is perhaps necessary to stop and consider whether speed and the need for rapid success are the best methods for the development of creativity and sound research. Maybe we ought to set our clocks independently of the world spinning around us and convince ourselves that real innovation is not always simply a matter of speed. Otherwise, despite dealing with one of the biological time domains, we are no better off than the observers of the terrestrial surface—accepting things as "firm" because we look neither long enough nor thoroughly enough. ■