TITLE: How to preserve the original mission of research in the omics era?

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Biomedical research is at a crossroad between molecular biology versus analysis of whole organisms or ecosystems, or high-throughput data generation versus single experiments, all of which is spurred on by the growing demand of society for new technologies and applications in health, industry, energy and agriculture. High-throughput omics technologies and bioinformatics are being used on an increasing scale to collect, integrate, model and verify molecular, clinical and population data to understand, predict and prevent diseases [1, 2]. But the widespread popularity of these molecular and computational research strategies has led to a shortage of funding for organismic and evolutionary biology as grant agencies tend to support molecular approaches with more immediate practical value [3]. Indeed, public-interest groups and the pharmaceutical/biotechnology industry can influence public perception and thereby funding decisions, shifting the focus from more fundamental research towards the generation of knowledge with practical implications [4]. For this and other reasons, the five grand challenges of "classical" organismic biology discussed by Mykles et al. [4] and Schwenk et al. [5] remain mostly unsolved: understanding the organism's role in its natural environment; understanding the functional diversity of organisms; integrating living and physical systems analysis; understanding how genomes produce organisms; and understanding how organisms walk the tightrope between stability and change.

The question is how to proceed with biomedically-oriented research and, at the same time, appreciate the value of knowledge of the living world. Of course, the easiest and most effective way to promote basic research is to convince decision-makers to change policies and increase funding for such projects. Nevertheless, as this is not likely to happen soon, some other steps can be taken. In essence, these are normative solutions that, in my opinion, would invoke a systematic shift in reasoning, perception and even decision-making concerning the value of science. Such a value-based re-conceptualization of scientific research goes beyond the confines of science and delves deep into general axiology.

The works that science produces are, in some ways, similar to the works of art: they have some intrinsic value, but also a theoretical value of explaining the world. The reexamination of the nature of science thus brings us back to one vital and now often forgotten valuation of knowledge as practical and non-practical or purely intrinsic. The value of knowing more about the world, which manifests itself through describing, explaining, predicting and intervening with it, is as old as humanity's attempt to explain their existence [6]. Although this distinction seems trivial at first glance, it is supported by rational philosophical narratives that date back at least to the writings of Plato and Aristotle. The normative appreciation of knowledge later finds its place, among others, in Kant's normative conception of philosophy [7] and in Anglo-Saxon philosophy, such as the Laudan's philosophy of science [8]. Even today, the distinction between the practical and intrinsic value of scientific knowledge is the focus of profound philosophical concern [9].

However, another point is more important here. The value and significance of research should not be measured solely by its translational potential but also by its contribution to a better understanding of the fundamental principles and mechanisms underlying the evolution and maintenance of biodiversity. At a minimum, this value-related internalization of the epistemic goals of biology is necessary for correcting and supplementating the existing biomedical knowledge. Otherwise, if stakeholders start to define the goals that scientists should pursue, then, in my opinion, an optimistic future of science as the most reliable source of knowledge is not guaranteed. Life scientists with either a fundamental or applied perspective should broaden their appreciation of life and consider the value of knowledge per se for their own research. This would increase the likelihood that scientists, even in predominantly practical research, view the context of their research as a broader contribution to fundamental biology.

Many roads lead to the revitalization of fundamental research to understand complex biological systems and to preserve the essence of basic science. Not all of them require much more funding, but, above all, a change in the value system of science and scientists themselves.

CONFLICT OF INTEREST

The author declares that he has no conflict of interest.

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