

The Science of Science

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Part 5: Last thought: *All* the science of science

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We would like to end this book with an invitation. We began by drawing an analogy between the recent data revolution in science and how instruments like the microscope or the telescope have transformed their disciplines. As we've discussed throughout, the science of science has advanced thanks to key contributions by researchers from a range of fields—from information and library sciences to the social, physical, and biological sciences to engineering and design—each employing distinct disciplinary models, skills, intuition, standards, and objectives to address and evaluate different aspects of the scientific enterprise.

Yet, unlike the microscope or telescope, this latest instrument has a fundamentally different characteristic. Indeed, the very nature of science of science suggests that it must be *of the sciences, by the sciences, and for the sciences*. This powerfully illustrates how a science of science that relies only on a few disciplines—the information sciences, social sciences, or engineering, let's say—will miss critical aspects of an enterprise that is growing larger, more complex, and more interconnected at an exponential rate. In other words, for science of science to succeed, it needs *all science*.

Indeed, in the next decade, the relationship between science and the science of science is expected to grow more intimate. Science of science will not just be about understanding how science is done. Instead, it will more deeply and creatively probe the question of how to do science better. This shift highlights the benefits for scientists from all disciplines to invest in science of science in order to improve their output by 1) identifying neglected yet important areas of inquiry, and 2) doing what they already do more efficiently—by, for example, reasoning across more of the literature than can be easily read and distilling mechanisms that will guide future investigation. A tighter integration between the creation of science and our understanding of it may also enable more rapid direct and indirect replication of research, promoting responsibility and confidence in the firmness of scientific claims.

While a broad swath of investigators can benefit from science of science research, which is consumed by all sciences, they contribute unequally. The success of science of science depends on us overcoming traditional disciplinary barriers. These include finding publication venues that are accessible to a broad audience and which can efficiently communicate results, methods, and insights; funding sources that support a range of disciplinary perspectives and conveying insight to specific disciplines so that institutions and systems can be fine-tuned accordingly.

Embracing the science of science in its entirety will surely benefit the community of researchers engaged in furthering the field. Indeed, although several key advances in the field concern the discovery of universals across science, substantial disciplinary differences in culture, habits, and preferences make some cross-domain insights difficult to appreciate within particular fields. That can make associated policies too generic, challenging to implement in specific areas. As science grows larger and more complex, insights from science of science that are oblivious to discipline-specific peculiarities will become increasingly inadequate.

All this means that science of science must draw upon the talents, traditions, and heuristics of every discipline if we want make science optimally beneficial for everyone. Therefore, please accept our sincere invitation—join us in this fascinating journey.