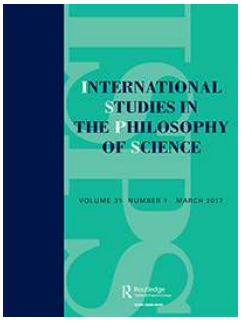

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# The Rightful Place of Science: Science on the Verge

Deepanwita Dasgupta

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**The Rightful Place of Science: Science on the Verge**, by Alice Benessia, Silvio Funtowicz, Mario Giampietro, Ângela Guimarães Pereira, Jerome R. Ravetz, Andrea Saltelli, Roger Strand, and Jeroen P. van der Sluijs, Tempe, AZ, Consortium for Science, Policy, & Outcomes, 2016, viii + 215 pp., ISBN 9780692596388, US$9.99 (paperback)

Sometime in the 1960s Robert K. Merton informed us that there is in science such a thing called the Matthew Effect—that in science as well as in life the rich get richer and the poor get poorer. Later, in the 1990s, Philip Kitcher wrote another well-known assessment of science, which told us that rather than being a uniform group of knowledge-makers, all driven by similar sorts of rational goals, scientific communities actually function on the principle of division of labour. This means that they divide themselves and their practices into numerous sub-communities, each of which then holds very differential levels of trust and authority. The whole practice thereafter functions within an epistemologically sullied and very asymmetric environment, where some hold more and some much less power, the practice being dominated overall by priority rules etc. Generally speaking, however, these observations and their implications remain nicely hidden behind the glittering façade of a rational exterior, and all the official theories of science proceed with this manifest account of rationality. Yet, it finally seems that in the post-war, big-business, and heavily industrialised science this underbelly of science—which generally remains so well hidden from view, and only occasionally shows itself in the colonial and the post-colonial contexts—is now becoming its chief face. Through the cracks that appear on this rational façade, we increasingly perceive a whole host of pathological factors at work—problems of reproducibility, frequency of retractions of research papers, numbers running wild in the shape of mathematical models of questionable pedigree being pressed into policy-making, as well as failures of quality control in the shape of fraudulent peer reviews—all these and some more are examples of what is breaking down the rational fabric of science. The Enlightenment dream and its glorious ideal of constant progress are slowly crumbling as problems beset it on all sides, just like the barbarians tearing down the gates of Rome.

Behind all these lurk even deeper ideological problems—science's rigid fascination with mathematical models that allow it the illusion of management, prediction and control. Models thus proliferate everywhere but often this makes a whole universe of discourse unavailable simply by its sheer framing, the toolbox of evidence-based policy often turns into policy-based evidence-gathering, and finally (in the last essay of this book), there appears the unscientific belief in science that robs the world of all other kinds of viable practices and generally robs science of all humility. The story that this book tells us is thus not just of a number of ordinary changes, accumulated over time, but that of a pathological change leading to a complete collapse.

What can possibly be going wrong with the great Enlightenment institution called science, on which we have all come to depend for our knowledge of the physical—as well as the mental—world, and which is supposed to lead us all to progress?

A few key concepts used in the book are crucial for this analysis, and I provide a quick sketch of them below. The first two chapters, by Andrea Saltelli, Jerome Ravetz, and Silvio Funtowicz, and by Andrea Saltelli and Mario Giampietro, introduce the notions of a crisis in science plus failures in evidence-based policy-making. In chapter 3, by Alice Benessia and Silvio Funtowicz, we come across three important concepts that underpin the great shift that is taking science on the very verge of collapse—these are called *separation*, *hybridization*, and *substitution*. Separation is that ideal division between facts present in the world and values implicit in policy-making, hybridisation is the switch to big industrialised science from the nineteenth-century small bench-top science (think of Michael Faraday's experiments, for example), and substitution means increasingly replacing natural resources with technoscientific materials and artefacts, thus

wedding science comprehensively with technology. This narrative, however, is naturally self-escalating, for the constant promise of such artefacts and new materials and their constant innovation (and production) via a market system promise us of a false future of complete security where there will be a constant supply of happiness and no more uncertainty. Contrary to our expectations, then, this very promise of 'progress' finally generates a crisis.

On the face it, such anguish might seem rather exaggerated, for should not the checks and balances present in science, such as group-wide deliberation, formal peer review, even informal communications among scientists help to keep such factors in check? The authors (collectively) inform us that this is no longer possible. In six chapters, thick with numerical and other policy details, a whole host of authors (the book's cover lists eight) paint for us the picture of a swiftly escalating crisis and the failure of the key institutions of science, each chapter building on the dismal news presented in the previous one. All collectively outline the story of a Baconian science that is finally beginning to implode under its own weight—the weight of the dream of prediction, of mathematical modelling, of controlling everything via a set of numbers. The message that the book sends out is sombre indeed—the splintering and the gradual breakdown of one of the great social institutions of the Enlightenment, a cherished dream finally turned into a nightmare. What is truly striking is that this post-normal phase of science has almost the contrary properties of the classical Enlightenment science. These are cases of what is called trans-science (80)—problems that transcend science, and yet originate from it, breaking down the cherished fact-value barrier.

Historically speaking, of course, the notion of a radical change in itself cannot be a complete surprise. That which today we call modern science is a child of the seventeenth-century natural philosophy, in itself a thousand-year-old preoccupation, which was decorated very hopefully with the ideals of progress, objectivity, a law-governed universe and constant progress towards something called truth. The framework that was produced from this mixture sometime around the seventeenth and eighteenth centuries was supposed to last forever. Yet, just as natural philosophy changed into modern science, modern science could conceivably be turning into something else, marked with sets of very different properties and different social institutions. What turns this into a nightmare is that with the collapse of science we will now have nothing replace a common authority in secular and pluralistic societies. If science indeed is collapsing, how are we going to manage the task of governance and policy-making, and what will we put in its place? How shall we conduct the task of training a new group of knowledge-makers, and how could we preserve the stock of knowledge that we have already gained from the practice of science?

Here, underneath all the dismal news, the book does offer something of a positive message, and the vision of a new practice, that message appearing mainly in the last three chapters (but also scattered throughout the book). In recounting all the possible woes of contemporary science, the authors' goal is to have a diagnosis and a treatment plan on hand, and thus to steer things in a new direction. The book thus aims to follow something like a medical model. We see frequent appeals to an alternative vision of what science should be. For example, in chapter 2 there is an appeal to build 'robust knowledge' that is filtered through the lenses of varieties of stakeholders and their various normative requirements. There is also the message of enlarging the scientific communities by bringing into it new sets of practitioners, for example, citizen science. More specifically, in chapter 4, by Ângela Guimarães Pereira and Andrea Saltelli, we hear of the idea of creating a new set of boundary institutions—the European Commission's Joint Research Centre being an example. Such institutions will then operate at the intersection of science and policy, and will thus incorporate into their functioning all the doubts and precautions appropriate to their models. Such institutions, being less fascinated with the practice of rigorous mathematical modelling and its attendant disasters, may counteract the decreasing public trust in science. Finally, in the last

chapter, by Roger Strand, there occurs the suggestion of various kinds of life philosophies (the Norwegian concept of *livssyn*), which will perhaps provide us with a rich new context for this suitably revised and extended vision of science.

Another antidote for such pathologies might be to look at the different peripheries of science and the groups that contribute to science from these peripheries, whether they are the newly incorporated self-taught members of a scientific community or different kinds of non-traditional and indigenous knowledge-makers who often decide to join science with various agendas of their own. Often such people are capable of setting up new kinds of conversations and asking new questions. Historically, such things have happened only accidentally, but they could be turned into practices and policies and could thus be consciously cultivated to form new knowledge partnerships. Hence, perhaps what we have in this book is the first glimpse of a new kind of epistemic culture. In short, the practice of science and all its protocols and institutions can be on the verge, but since crisis can also be an opportunity, a crisis like this might just provide that turning point through which a new kind of practice might be ushered into existence, its name yet to be decided.

Deepanwita Dasgupta
*Department of Philosophy, University of Texas at El Paso*
ddasgupta@utep.edu


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## **Environmental Ethics: From Theory to Practice**, by Marion Hourdequin, London, Bloomsbury, 2015, x + 240 pp., ISBN 9781472508089, £90.00, US$122.00 (hardback), ISBN 9781472510983, £21.99, US$29.95 (paperback)

The author of this comprehensive introduction to *Environmental Ethics: From Theory to Practice*, Marion Hourdequin, is associate professor of philosophy at Colorado College. This invaluable book explores most of the important philosophical questions raised by the current global environmental crisis. On the face of it, it appears to be just another environmental ethics book, and some scholars may ask why on earth try to reinvent the wheel when there is a number of texts in the field already. Its importance, however, lies in the fact that it does not repeat what others have done, but brings a new angle into the environmental discourse. The book has two major aims. First, to encourage reflection on popular arguments among environmental ethicists that

> human flourishing depends … on the development of our full potential as reflective and compassionate beings, and particularly on our ability to live well not only with respect to other human beings, as members of the social world, but also with respect to other living things as members of the natural world. (4)

The book aims to 'consider how it might be realized' (4). It suggests that the realisation of how to live a happy life and at the same time respect the natural world is crucial in achieving sustainable economic livelihoods as well as dealing with the environmental crisis that we face today and will for years to come.

The second aim of the book is to confirm the importance of ethical 'reflection on the need and possibilities for change in our views about and our relation to animals, plants, ecosystems, and the environment, more broadly' (27). This important concern seems to be lacking in the contemporary environmental discourse. The book then addresses this concern by dispelling