Boris Castel, Sergio Sismondo
The Art of Science
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When philosophers and physicists join forces, the results are usually quite exciting. Born from the collaboration between a nuclear physicist and a philosopher of science, *The Art of Science* is no exception. Boris Castel and Sergio Sismondo present an engaging discussion on the art of scientific inquiry, unravelling its most human aspects and dispelling a few widespread myths.

The book revolves around two commonsense assumptions, which still seem to inform many accounts of scientific investigation: a view of the scientist as a computer and one of the scientist as a genius. These two assumptions ultimately explain science either as the product of a cold and impeccable logic, which warrants the rationality of the scientific pursuit, or as the mysterious creation of the mind of "geniuses", whose workings remain unexplainable.

Castel and Sismondo show that the computer and the genius embody popular conceptions of ideal qualities often attributed to scientists, and as all ideals they are extremely difficult to live up to. Without entirely rejecting them, the authors contextualise these two images and prove that they offer a key to understand particular scientific characters and their place within specific episodes in the history of science.

The myth of the genius, for instance, often seems to permeate accounts of the collapse of classical physics, which is discussed in chapter 2. Here the authors use the case of 20th century representations of the atom as a particularly illustrative example of the reconceptualisation that shook the world of physics – and of culture at large – at the beginning of the past century. The chapter is aptly entitled "Painting the Invisible", as it shows that, just like scientists, artists at the beginning of the century embarked on an enquiry into ways of representing the unseen. Due to their revolutionary nature, the parallel histories of early 20th century art and science often appear inhabited by extraordinary geniuses – Cézanne, Rutherford, Duchamp, Bohr, Mondrian, Heisenberg – but Castel and Sismondo emphasise that this only happens when we strip their stories out of context. Both art and science in Europe in the 20th century were intensely social activities – and it is this social dimension that defines what comes to be accepted as a "revolutionary" reconceptualisation.

Examples of the myth of the scientist as a computer are discussed in chapter 3, which deals with the process of scientific reasoning. The truth in the myth, Castel and Sismondo argue, is that patterns of reasoning, once consolidated, tend to become more and more rigid, thus

resembling computations. This happens only with time, however. Scientific reasoning is an art that requires learning and practice. It develops through time and it is constantly affected by controversies about the validity of scientific data and their interpretations. Drawing on the case of the early resistance to natural selection, the authors contextualise the place of logic in science as "the work needed to develop and expand specific reasoning skills" (p. 74). As the history of science clearly shows, logic alone rarely provides the final verdict on a particular theory or experimental result.

Scientific inquiry, conceived as an "art", requires a renewed emphasis on the social dimension of the scientific enterprise as a whole. Revolutionary reconceptualisations require acceptance within a community, effective forms of reasoning never emerge in isolation, but are learned and developed within a social context. Scientific controversies are a good ground to test the art of science in action, and it is to this aspect of scientific inquiry that Castel and Sismondo turn their attention in chapter 4. The slogan of the chapter, which is also the title of the opening section, is "Science as a Social Art". The aim of the chapter is to unravel and highlight the role of communities, and their disagreements, in scientific practice. One of the advantages of examining controversies, both from a philosophical and from a historical point of view, is that they give full visibility to aspects of scientific practice that would remain otherwise hidden. During controversies scientists dissect each other's theories in the effort of finding possible flaws in their opponents' arguments, they openly question the validity of each other's evidence and at the same time come up with sophisticated strategies to prove their points. The emerging picture is one in which conflict and disagreements are central to the growth of knowledge and to the development of new strategies of reasoning within scientific communities. Through an insightful examination of the argumentative strategies used in the controversy around the case of Mitochondrial Eve, Castel and Sismondo show how controversies unravel scientists' values, and their passions, in ways which would otherwise remain hidden behind the objective and factual style of the average scientific paper.

Such a view of science as a social art is extended to the context of experimentation in chapter 5. The chapter capitalises on historians and philosophers' revival of interest in the role of experimentation and its relation to theories. Ian Hacking's work immediately springs to mind as a key reference to the section entitled "Experiments Have Lives of Their Own" (p. 111), but the authors go further than that. Through a variety of examples ranging from contemporary microscopy to Wilson and Simberloff's experiments testing the predictions of the equilibrium theory of the distribution of species in isolated regions, the authors stress that the value of experimental

knowledge resides in its ability to disclose potential avenues for further investigation. This feature of experimental knowledge very much depends on its ambiguous nature. Philosophers and scientists alike have been wrestling with the question of which experimental results truly count as "natural", and which ones are explicitly "artifactual" – the products of the experimenter's manipulations. As Castel and Sismondo show, this distinction is itself in part misleading when taken out of a particular social context. In this sense, the artificial products of experimentation, and their practical effects, can eventually offer a glimpse of the potential of certain experimental practices, thus offering a basis for further theorising.

Chapter 6, entitled "Doing Science in the Real World" explores the social dimension of science in connection with its growingly institutional character. The chapter is broad in scope and touches a number of pressing contemporary issues. These range from women's place in science, and the hidden disadvantages and subtle forms of discrimination that still prevent their full participation in the scientific enterprise, to the effects that publication pressure has on the directions of scientific research, and finally to the meaning and consequences of "big science". Interestingly, the parallel with art comes back in this chapter in a particularly forceful way. Drawing on the example of the "Wrapped Reichstag" by artists Christo and Jeanne Claude, the authors show how the move toward "big science" is now paralleled by a move toward "big art". The Wrapped Reichstag – the German Reichstag in Berlin entirely covered in fabric, which was produced entirely for the purpose of the installation – required an enormous amount of organization and institutional support. A picture very different indeed from that of the artist in his studio, which still pervades our common idea of what counts as artistic practice.

Castel and Sismondo's narrative guides the reader toward the final chapter, aptly framed as a question: "The End of Science?". By that point, the reader will have all the tools to formulate an answer. The very idea that the pursuit of scientific investigation is very close to be completed is yet another myth – one which might hold only if we fully subscribe to a view of scientists as computers or as geniuses. But the very social dimension of science, the authors suggest, implies the possibility of continuously redefining questions in an endless cycle of new controversies and reconceptualisations. This is also why reductionist programmes, and their promise of successfully reducing various levels of explanation to fundamental laws, are only yet another ideal that scientists will never be able to live up to.

Focusing from the start on "activity" rather than "results", *The Art of Science* offers an engaging and refreshing perspective on the pursuit of science as an inherently human enterprise. The book ends on a

hopeful note: "Indeed, perhaps science has only just begun" (p. 178) – a powerful reminder of the importance of keeping an open mind even when the achievements of science seem to give us final answers. Castel and Sismondo's discussion will certainly please all philosophers, sociologists and historians with an interest in scientific practice, while the broad range of case studies and illustrations in each chapter will take students and general readers on a wonderful journey of discovery.

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Adele E. Clarke, Laura Mamo, Jennifer Ruth Fosket, Jennifer R. Fishman, Janet K. Shim (eds)

Biomedicalization. Technoscience, Health, and Illness in the U.S.

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The anthology edited by Clarke, Mamo, Fosket, Fishman and Shim, called "the gang of five" by Virginia Olesen because of their constant "shoulder to shoulder" academic work, proposes to face, within an innovative theoretical perspective accompanied by the discussion of several case studies, the tendencies assumed by biomedicine in the postmodern society. In the last decades, indeed, the technological innovation in the health care field has laid the groundwork for a consistent development of the biomedical knowledge, considerably moving the medical intervention limit on the human body, till to interweave life's and human experience's aspects that otherwise would be considered "natural" (Kaufman and Morgan, 2005). In particular, the emergence of new substantive areas of the life sciences such as genomics, molecular biology, genetic medicine and pharmacogenetics, accompanied by complex diagnostic and information technologies, provides just some examples of the changes that have affected the modality of production and circulation of the medical knowledge. For this reason the Social Sciences, and in particular way the Science and Technology Studies (STS), in the last years have devoted a constantly increasing attention to the intersection between biology, medicine and life sciences in general, focusing the analysis on the emergent biomedical technologies (Hogle 2008).

The works composing the anthology proposed by Adele Clarke and her colleagues present, on the whole, the most innovative STS features. In doing so, treating the relation between medicine and society, the editors introduce an approach to social studies that is different from the classical one constituted by the medicalization