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Editorial

Rethinking science as an area of concern

Summary Science has played an influential role in framing public policy in many areas of concern. But in recent years, science itself has become an area of concern. This is partly because scientific theories can be difficult to understand and because the evidence that supports them is rarely as definitive as we might hope. But it is also because scientific inquiry is increasingly influenced by a variety of factors that many people regard as non-scientific. We are currently straddling several different concepts regarding what science is and what its primary goals are. The idea that science aims at the preservation and enhancement of our economic welfare is just one example. It is difficult to know whether we are witnessing a distortion of science or its evolution. But the time has come to begin a discussion aimed at rethinking science as an area of concern. This discussion should explore, develop, and describe each of our several contrasting concepts of science, together with their possible consequences. The purpose of the discussion is not to decide what science is, or even what it ought to be. It is to illuminate the different possible concepts of science and their likely consequences as clearly as we can so that we can see more clearly what science might become — and so that we will be in a better position to choose how we should think about science, and about how it should interact with public policy in democratic open societies with market economies like our own. We should discuss our different concepts of science not so much with an eye toward determining whether they are accurate as descriptions or attractive as ideals, as with an eye toward understanding what our future science, scientists, scientific research, and scientific knowledge might become under their influence. It is only by rethinking science in this way that we will knowingly be able to choose which way we want to go.

Science has played an influential role in framing public policy at least since World War II. But much of its influence is due to the idea that scientists are objective critical thinkers who can 'speak truth to power' and transform their basic research into useful applications. The Manhattan Project is a good example of how the relationship is supposed to work. Concerned physicists informed government about the potentially devastating consequences of fundamental discoveries regarding the atom, and government provided them with the resources to build an atomic bomb. The success of the Manhattan Project enhanced public appreciation of science and scientists, with the result that we have appealed to scientists and scientific knowledge ever since to inform public policy decisions in a wide variety of areas that concern us.

But in recent years, science itself has become an area of concern. This is partly because scientific theories can be difficult to understand; partly because the evidence that supports them can be difficult to interpret; partly because science cannot show that a theory is true in any absolute or final way; and partly because citizens and policy makers are thus often called upon to trust scientists about matters that they do not really understand. But it is also because scientific inquiry sometimes seems to be influenced by a variety of factors that many people regard as non-scientific.

It is difficult to know whether we are witnessing a distortion of science or its evolution. But this much seems clear: the culture, the practice, and the self-image of science have all changed in the last 60 years — along with the traditional distinction between basic and applied research, the funding of scientific research, and the public perception of science and scientific knowledge. So it is important that we ask ourselves this question about

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science — whether we are witnessing its distortion or its evolution — if only so that we can rethink how we should think about it.

There are many things that may affect the direction and conduct of scientific research. But it's a safe guess that many of the changes that we have seen have something to do with the large sums of money that government and industry have spent on science — and with the expectation that those large sums will yield even larger returns.

The United States currently spends over 300 billion dollars a year on scientific research and development, over 100 billion of which is provided in public funds. This is by far more than any other country in the world. But most of its private funding is spent upon applied research. And while the National Science Foundation has traditionally supported basic research, there is a sharp debate today about whether and to what extent public funds should be spent upon projects that offer no foreseeable benefit to the public — and a growing tendency to evaluate grant proposals for basic research in terms of its likely applications.

Scientists say that they are concerned about the decline of basic research. But they have nonetheless become more entrepreneurial, more commercialized, and more economized with each passing year — and this has clearly influenced their choice of research projects and their conduct of research.

Where the aim of science was once construed as the accurate description and explanation of natural phenomena, it is now often construed as the preservation and enhancement of our economic welfare — where 'our economic welfare' sometimes means the economic welfare of nations; sometimes the economic welfare of corporations, including universities and research institutes; sometimes the economic welfare of individual scientists; and sometimes the economic welfare of science itself.

Some people say that these changes are more prevalent in biology and medicine than in other fields. Others say that science as a whole has become economized. Some bemoan the rise of Big Science. Others praise it as a healthy development. But all of the signs seem to indicate that the trend may be here to stay.

Our theories, problems, values, interests, and ambitions have all changed, along with our capabilities and research instruments, and the upshot is that we can no longer do science on the cheap as Newton and Einstein once did. This is my primary reason for saying that it's difficult to know whether what we are witnessing is a distortion of science or its evolution. But these developments raise concerns regarding the extent to which science is still able and willing to 'speak truth to power'.

Today, scientists regularly testify before legislative bodies and in courts of law about the use and safety of new technologies. But many scientists are employed by government and corporations. And universities, research institutes, and individual scientists are increasingly becoming financial partners in commercial ventures that involve the very research that we want them to evaluate. The upshot is that it is becoming increasingly difficult to find competent scientists who do not have a financial stake in the issues that we ask them to address. And the fact that so many scientists, universities, and businesses stand to profit from the applications of their work has led many people to question whether and to what extent we can continue to trust its integrity. We are, for these reasons, now engaged in heated discussions regarding the interaction between science and pubic policy, the impact that they should have upon each other, whether and to what extent public funds should be used to support basic research, and whether and to what extent government should regulate the potential conflicts of interest that might arise.

All of this suggests that the time has come to once again think about how we might think about science.

Is science a body of knowledge? Or a method of inquiry? A rational attitude? Or a social community? An attempt to predict the future? Or an attempt to explain what we do not understand? How, if it is any or all of these things, does it differ from philosophy and religion? What is its aim? And what can it actually achieve? Is it still concerned with truth? Does scientific truth differ from other kinds of truth? Or does truth play no role in it at all? Are there questions that science should not deal with? How is science related to technology? Is it still useful to distinguish between pure and applied research? How do the financial relationships between science, industry, business, government, and education affect the direction and conduct of inquiry? Is science a self-directed autonomous institution? Or has it now become a handmaiden to government, industry, and business? And what, in any event, does 'scientific objectivity' mean in an era in which most scientists are employed by public and private institutions that collectively spend hundreds of billions of dollars upon science each year?

Answers to these questions and to questions like these mark major divisions within the philosophy of science. And they have led philosophers to distinguish between prescriptive and descriptive accounts of science. It is one thing to say what science should be, they tell us, and another to say what it is. And this, no doubt, is true. But

distinguishing between prescriptive and descriptive theories of science will not take us very far toward resolving our disagreements concerning what science is and ought to be. And my own sense is that the real question that we have to discuss is not so much what science is or ought to be, as what it might become.

There's an old Woody Allen film in which a religious man tells his family that he would, if necessary, always choose God over truth. The statement is stunning, if only because God is so often identified with truth. But things have changed. Science grew out of a religious tradition that claimed to know the truth, and it separated itself from that tradition because it chose the quest for truth over deference to religious authority. Today, science may well be evolving to a point where it may knowingly choose the preservation of economic welfare over truth as its aim. It does not quite follow that we now believe that the economy is God. But it may be true nonetheless.

What if the primary goal of science is no longer true explanation or prediction, but the preservation and enhancement of our economic welfare? In that case, decisions regarding the direction of research and the acceptance of theories might justifiably be made with an eye more toward the profitability of its applications than the cogency of its explanations. And in that case, economic welfare might take precedence over truth, and scientists might justifiably ignore the evidence if and when they thought that doing so might enhance our economic welfare.

Would this be a distortion of science or its evolution? It is, as I have said, difficult to know. Science and religion were once concerned with truth because they thought that knowing it could enhance the material welfare of our bodies and the spiritual welfare of our souls. This may or may not be true. But this much, at least, seems clear. Public policy today often proceeds from the premise that what benefits the body or the soul may not always benefit the economy.

But if we are going to choose economic welfare over truth as the aim of science, then we should do so with our eyes wide open to its consequences. And if we are going to open our eyes wide to its consequences, then we need to embark upon a discussion of what those consequences might be. Instead of trying to describe what science is or to prescribe what it ought to be, a more useful discussion might begin with the exploration and development of a wide range of contrasting concepts of science, and an equally wide ranging exploration of the different possible consequences that might flow from them — including the different ways in which those concepts can be implemented, the influence that each of them might have upon scientific research, and the effects that they might have upon individuals, groups, institutions, and society at large.

The story that I have been telling about the economization of science is just one of many reasons why science has become an area of concern. There are many other stories that I could tell, including the one about the politicization of science and the effects that science and politics are having upon each other. We can, in telling these stories, ask whether we are witnessing a distortion of science or its evolution. And it is useful to ask this question, since the way that we think about science today has consequences for what science might do tomorrow. But if any one of these stories rings true — and different stories will no doubt ring true to different people — then the time has come to once again think about how we should think about science. And if what I have been saying rings true, then we should begin a discussion aimed at exploring, developing, and describing each of our many different concepts of science, together with their possible consequences. We should discuss these concepts of science not so much with an eye toward determining whether they are accurate descriptions or attractive ideals, as with an eye toward understanding what our future science, scientists, scientific research, and scientific knowledge might become under their influence. For the point of this discussion is not to decide what science is, or even what it ought to be. It is to illuminate the different possible concepts of science and their likely consequences as clearly as we can so that we can see more clearly what science might become, and so that we will be in a better position to choose how we should think about science, and about how science and public policy should interact in democratic open societies with market economies like our own.

It is only by rethinking science in this way that we will knowingly be able to choose which way we want to go.

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