

## A note from the 1960s: science communication as a solution to complex science

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What was the problem to which science communication was the solution? A brief return to the 1960s to look at a key argument articulating both the problem of the complexity of science and its posited solution in “simple communication” revisits and revises one of the fundamental assumptions behind 50 years of effort to develop a field of science communication.

One of the most fraught questions concerning science at the end of the twentieth century was that scientific information and analyses were being generated at such a pace that no one could possibly “keep up.” This was seen by many scientific institutions as especially problematic for a range of publics who need up-to-date scientific information to make decisions, to confront controversial applications of science and technology, and to live on a bedrock of evidence (Broks, 2006). The apogee of this mode of argument is the 1985 Bodmer report for the Royal Society of London that also posited the solution to this excess of information—improved science communication. In fact, this solution was seen as a natural progression from arguments made after WWII that were developed in the 1960s. The reason, then, for returning to the 1960s is not that the decade marks the beginning of science communication. The beginnings of science communication, as we would now recognise it, go back to the Victorian era, where popularisers were

doing public demonstrations and celebrating the remarkable spectacles of electricity and magnetism (Knight, 2006). However, what happens in the 1960s is that the general scientific community starts to develop a theory about science communication and begins institutional means for directing it. As I shall argue here, using the example of Derek de Solla Price’s canonical *Big Science, Little Science* (1963), a core part of that idea posits that complexity is the problem with science and science communication is a potential solution to that complexity—for scientists as well as non-scientific audiences.

The beginning of Complex Systems Theory in the 1960s turns out to be a landmark moment for science communication as well. One of the first systems that Complex Systems Theory wanted to study was science itself. Derek de Solla Price, a scientist and historian, wrote a canonical analysis of the state of science in *Little Science, Big Science*. We also credit him with popularising the idea that there is emerging a new kind of science—Big Science. De Solla Price remarks, “Because the science we have now so vastly exceeds all that’s gone before, we have entered a new age swept clean of the old traditions. It’s so complex that many of us have begun to worry about the sheer mass of the monster we have created.” After developing a picture of the enormity and complexity of science as an institution, de Solla Price

comes to a somewhat glum conclusion. The institution of science is running up against its own capacities.

### **Crisis of Complexity**

The worry that de Solla Price presents is that science itself has become so complex that it's no longer going to function along the norms and ideals that it sets for itself. He speculates about the way in which systems work when they come up against a growth ceiling and suggests that science has hit its growth ceiling. His second basic law of the analysis of science, turning science on science: "All the apparently exponential laws of growth must ultimately be logistic and this implies a period of crisis on either side of the date of midpoint for about a generation. The outcome of the battle at the point of no return is complete reorganisation or violent fluctuation or death of the variable. I would suggest that at some point during the 1940s or 50s, we passed through the mid-period in general growth of science's body politic." And, thus, science must change its ways of working or enter crisis.

Of course, in the 1960s, there was another theorist of crises, probably one of the most famous of the 20th Century, Thomas Kuhn. In the *The Structure of Scientific Revolutions* (1962) Kuhn posited that science infrequently is in crisis but it is an unsettling experience for individual scientists even if it results in "scientific progress". So, what do you do in the face of this crisis?

One of the things that emerges is a contemporary notion of science whereby scientists communicate their way out of crises. First, scientists need to revisit their modes of communication with their professional peers. Then, there is a need to communicate across disciplines that are increasingly narrow. Finally, scientists must appeal to larger and

more diverse audiences, usually labeled as "the public". So, from worries about crisis in science, an idea about communication and how scientists organise their communication with one another emerges.

Given that science communication is posited at a solution to the complexity of the scientific system, the idea that science communication itself is prone to difficulties is yet another problem in the scientific system. De Solla Price indicates that professional communication is becoming more complex: it too has to change. Two pieces of evidence are marshaled in support of this view, the first, a prescient observation of scientific publishing, and the second, a somewhat damning indictment of scientific reading habits. Writes de Solla Price, "scientific communication by way of the published paper is, and always has been, a means of settling priority conflicts. It's claim-staking rather than avoiding them by giving information. Scientists have a strong urge to write papers but a mild one to read them. Scientists must aim to establish and secure the prestige and priority they desire by means more efficient than the traditional device of journal publication." De Solla Price thought that improved professional communication could go a number of ways: there might be other outlets in which scientists could engage in claim-making, such as collective archives and pre-prints. Given long journal lead times and de Solla Price's observation in 1962 that "less than 10% of the available serials were sufficient to meet 80% of the demand [of readers]" (p. 75), de Solla Price is quite prescient about the emerging dire state of academic publishing in science, where more recent estimates suggest that only 50% of publications are ever read by anyone other than the author and editor (Evans 2008).

### **Proliferation of popularization**

The 1960s responses to complexity are driven by a worry that complexity in science is going to have a negative impact on both scientists and knowledge. In addition, there is growing awareness that those outside of science are increasingly unaware of scientific work. In 1963, a collection of the Australian science comic, *Frontiers of Science*, was introduced by Stuart Butler and Robert Raymond repeating de Solla Price's observation, "such is the pace of the expansion of knowledge and the need for specialization that even scientists themselves confess a growing sense of helplessness. The necessity of concentrating ever more closely on their own field prevents them from keeping up with parallel developments in other fields, even those quite closely related to their own." But, then, they add, "If this is so for scientists, how much more baffling had the world become for the non-scientists, the readers of the newspapers, who wonder each day what new headlines will face them?" A collection of science comic strips, then, becomes an attempt to face the rapid pace of the expansion of knowledge—the complexity of the scientific system—with another form of communication, the comic. As Bauer (2009) notes, the number of popular science articles in the mainstream media seems to have peaked in the 1960s. But in addition to popular science "articles", the 1960s also seems to have proliferated forms of science popularization—the comic, "scientific advertising", science theatre, science fiction based on scientific research, and others. Much of this seems to have been generated by this founding anxiety that science had just gotten too complex and the need for new modes of communication was urgent.

But even if science had gotten too complex in the 1960s, it does not necessarily follow that popular communication was any simpler in form or even in function. Much like de Solla Price's earlier observation that the complexity of the scientific system was producing too much scientific communication, and quite possibly in the wrong format, it is worth considering this thesis in relation to popular science of the period. Scholars of science communication have largely focused on science journalism in print media as an indicator of the state of science communication in any one period (Broks 2006). By this indicator, the 1960s was a high point for popularization: there was a proliferation of popular science magazines, major news outlets like the *New York Times* began publishing more science (culminating in a stand-alone science section in 1978). But what of the move of scientists themselves to communicate more publicly—for example in the scientific comics introduced above? In 1961, Alvin Weinberg was worried enough to write about what he saw as the three dangers of big science—"journalitis, moneyitis and administratits" (Caphsew and Radder 1972). While he criticizes the proliferation of science journalism for muddying the waters between serious science and popular science, his biggest concern seems to be that of de Solla Price, "...the enormous proliferation of scientific writing, which largely remains unread in its original form and therefore must be predigested, one cannot escape the conclusion that the line between journalism and science has become blurred." Weinberg's worry is not only that an undiscerning public (or politician) misunderstands the lines between journalism and science, but, rather, given the complexity and enormity of

the scientific enterprise, scientists themselves need popular forms to “pre-digest” unread scientific papers.

This take on complexity in science is a bit different than other narratives of the rise of science communication (see for example, Logan 2001) and focuses on how some scientists, at least represented by de Solla Price and Weinberg, were starting to think of the scientific enterprise in the 1960s. At least one answer to growing complexity was better science communication. It seems that this led to a so-called “golden age” of science journalism as well as an experimental period where scientists themselves felt able to popularize science. The focus on print journalism in many studies of science communication eclipses the historical motivation for more and better science communication and assumes that scientists themselves were bystanders to a largely media-driven phenomenon. The suggestion here is that scientists recognized the increasing complexity of the scientific system, saw it as a problem, and saw better science communication as a way forward for professional science communication and popular science. The “problem”, as defined by the 1960s was less of a problem of the “public” but one of the complexity of science.

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