Science and complexity

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Introduction

It is easy to get caught up in the excitement surrounding the study of complexity and how our new learning might be applied to the problems we face today. We often feel like pioneers in a new land, making new discoveries. For those involved in charting such a course, it is easy to lose historical perspective and the path already taken by others. It is to these earlier pioneers that the Classical Papers Section is dedicated. Such a side trip to the archives can quickly bring the reader a dose of reality, that some “new” ideas are really only “rediscovered.” Similarly, our view of the future can gain some perspective when reading about earlier predictions of the future, what we now call the present.

Reaching back almost 60 years, *E:CO* readers are invited to read a classic article by Warren Weaver (1894-1978). For historical setting, this article was published shortly after World War II and is influenced by operations research and the first computers developed for the war effort. During the war, Weaver headed the Applied Mathematics Panel (AAAS, 2004), a position that led to familiarity with many of the top scientists of the era. It was a time of great advances in science and optimism for more growth in the future. This article was also written at the time Weaver was formulating ideas that would later be published with Claude Shannon in *The mathematical theory of communication*, which laid the foundation for information theory. Weaver’s thoughts during this time on how computers might be employed in machine translation were later collected in his famous memorandum on the topic that “formulated goals and methods before most people had any idea of what computers might be capable of” (Griffin,i997).

The optimistic attitude of the power of science is also reflected in “Science and Complexity.” In the first part of the article, Weaver offers a historical perspective ofproblems addressed by science, a classification that separates simple, few-variable problems from the “disorganized complexity” of numerous-variable problems suitable for probability analysis. The problems in the middle are “organized complexity” with a moderate number of variables and interrelationships that cannot be fully captured in probability statistics nor sufficiently reduced to a simple formula.

The second part of the article addresses how the study of organized complexity might be approached. The answer is through harnessing the power of computers and cross-discipline collaboration. Weaver predicts:

> *“Some scientists will seek and develop for themselves new kinds of collaborative arrangements; that these groups will have members drawn from essentially all fields of science; and that these new ways of working, effectively instrumented by huge computers, will contribute greatly to the advance which the next half century will surely achieve in handling the complex, but essentially organic, problems of the biological and social sciences.” (Weaver, 1948)*

When reading this, there is a bit of déjà vu in what we sometimes hear today of our study of complexity. So too in the statement that “science has, to date, succeeded in solving a bewildering number of relatively easy problems, whereas the hard problems, and the ones which perhaps promise most for man’s future, lie ahead” (Weaver, 1948). In the end the reader is left with conflicting feelings of surprise that we are not further along in our understanding of complexity given Weaver’s ideas nearly 60 years ago, while also still being optimistic in our success for the same reasons Weaver was optimistic.

The original article can be downloaded from here.

References

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