

as it contributes to a solution of the consumption of information problem.

But there are other solutions to the dilemma of information overload as well that pertain more directly to its consumption rather than to its production. Review articles are very useful ways for scholars to learn what is happening outside the field of their immediate interest. Unfortunately, we do not value the reviewing activity as highly as we ought. Book chapters do not bring us many kudos, and so they may be tossed off more lightly than they should be. Besides, as noted above, books of chapters may be out of date by the time the editor is able to secure the products of all the contributors, and they are priced exorbitantly. Perhaps journals, especially those which seem to be having some difficulty attracting suitable material, should make concerted and strenuous efforts to elicit carefully considered and constructed reviews of parts of the literature. Perhaps we should, in our own evaluative systems, raise the assigned value of a careful appraisal of the research of others at least to the height of a piece of original research. A good review could take as much creativity and intellectual effort as a good piece of research or a good theoretical treatise. All we have to do is believe that this form of synthesis is a truly worthy and important part of our job.

Finally, it strikes me that another solution to the problem that research may suffer from lack of familiarity with what might be quite relevant knowledge is to encourage more collaborative endeavours. I am not suggesting interdisciplinary research, which is commendable but frequently difficult, primarily because participants do not speak the same language. But why not more large-scale collaborations among people in closely-linked areas who might have less difficulty in appreciating each other's approach? Thorngate talks about increasing fragmentation which produces island empires of information: neo-Piagetian-cognitive-social-developmental psychologists who have never read Mead or Vygotsky but who publish articles on language and the self. Why should people in closely allied areas or people with similar interests but different backgrounds not be encouraged to come together in a major collaboration. Our style of research tends to be individualistic, one person or two or three at most who read essentially the same literature. Perhaps we should adopt an approach which is more prevalent in other areas of science, that is, large laboratories with many people working on different aspects of the same problem. It is an approach which has paid off for other sciences, and it is an approach which might well pay off for us.

MALTHUS FOR PSYCHOLOGY?

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Almost 2 centuries ago, Thomas Malthus (1798), "the gloomy parson," disturbed the complaisance of his readers by publishing his famous (or infamous) "law of population." That law pointed to an inevitable discrepancy between humanity's powers of reproduction and the limited possibilities of increasing the food supply. Whereas the number of individuals would tend to increase geometrically, the available food could be expected to increase only arithmetically. The result must be starvation and early death for the majority, unless mankind could be persuaded to control its reproductive urges.

Now, Warren Thorngate has undertaken to disturb his audience of psychologists with an analogous model for depicting the dilemma faced by the discipline. The key factors in this analysis are identified as information, which multiplies at a rate that even rabbits might envy, and attention, which, alas, is "a fixed asset." In order to survive, information must be attended to. As the amount of potential information becomes ever greater, it must compete for limited attentional resources. Not only is much of this information condemned to an early death (often at birth), but the competitive process is such that it does not even guarantee the survival of the most deserving items. On the

smaller stage of psychology, Thorngate echoes Malthus's advice to humanity by considering how "we can save our discipline from the consequences of its fecundity." It turns out that this can be done only by "production reduction."

In the course of getting to this conclusion, Thorngate makes a number of telling observations about the state of the discipline with which few would disagree. What he says about our "methodological obsession," about the neglect of worthy older sources in favour of dubious newer ones, about irrational appeals in supposedly scientific publications, and about other such pathologies is right on the mark and fully confirmed by others' experience. Yet I wish these well-placed critical comments had not been embedded in a quasi-Malthusian model of scientific production and consumption, for I believe that this model is inappropriate and leads to a misdiagnosis of some of the underlying problems.

In particular, it must be questioned whether the deformations of rational scientific practice that Thorngate describes so incisively are primarily responses to problems of scientific consumption faced by individual psychologists. That is the context in which Thorngate presents these deformations, and that may

indeed be the context in which many individual psychologists first become aware of them. However, it does not follow that that is the context which is ultimately responsible for the existence of these phenomena.

If that were the case, one would expect to find that the phenomena which Thorngate traces to the problems of overwhelmed consumers would have made their historical appearance when these problems became acute and would have increased in magnitude as the production of new information increased. Now although I am not aware of any relevant trend studies, I am aware of numerous statements by prominent psychologists of past generations that complain of tendencies in the discipline which have at least a family resemblance to the tendencies deplored by Thorngate. In particular, the tendency to misapply purely formal standards of methodological rigour seems to have been a source of concern at least since the end of World War I (e.g., Boring, 1919; Dunlap, 1926; Judd, 1932). In those days the problems faced by the consumer of psychological literature were miniscule compared to the problems diagnosed by Thorngate's contemporary analysis. This suggests to me that what Thorngate presents as strategies of *consumption* are probably secondary effects of problems that have long existed at the level of the *production* of psychological knowledge (Danziger, 1990).

One of these problems derives from the early prevalence of what is often referred to as a Baconian conception of science. That is based on a vision of science as basically fact gathering. Knowledge comes in bits, and the more bits one collects together, the more knowledge one has. Although this view of science has been criticized for centuries, not least by scientists themselves, it still seems to exert a seductive influence. No doubt this is reinforced by its institutionalization in the forms of knowledge production that we have inherited, for example, the research paper that reports the results of a single experiment. Each such paper represents a knowledge claim that must be assessed as to its validity. Now, in the strict Baconian view, what counts in making this assessment is the factual status of the reported empirical results. That, however, is established by applying conventional standards of methodological rigour. Such issues as conceptual clarity and theoretical relevance are of secondary importance, because knowledge, in this view, is essentially equated with the collection of atheoretical facts.

Few psychologists have ever explicitly supported this extreme point of view; yet they have often acted as though they implicitly believed in it (Toulmin & Leary, 1985). Even Thorngate's analysis shows sufficient traces of this point of view to make me wonder whether it should not be counted as part of the problem rather than as part of the solution. At the centre of this analysis, there is the concept of information. This is not explicitly defined, but Thorngate's whole argument seems to invite us to think of information as a collection of little bits of fact. That conception makes

it possible to present the problem in quantitative terms as a discrepancy between a certain amount of information produced and the limited information processing capacity of the individual consumer. Moreover, when Thorngate discusses the dimensions of information expansion, the fact module model of information remains undisturbed. Even the dimension of depth, which raises expectations of the introduction of qualitative features, is equated with detail, (i.e., yet more bits of fact).

All this leads me to the conclusion that the significance of Thorngate's analysis depends rather crucially on an implicit model of the production of scientific knowledge. If one equates the latter with the accumulation of bits of information, then his diagnosis of the problem is essentially correct. However, if one makes a clear distinction between scientific information and scientific knowledge, then the nature of the problem and its possible remedies are likely to be seen rather differently.

As a recent analysis of cognitive functioning in practical contexts puts it: "Knowledge is not primarily a factual commodity or compendium of facts, nor is an expert knower an encyclopaedia" (Lave, 1988, p. 175). Ultimately, the function of scientific literature is not just the spread of information, but the construction of knowledge. Although knowledge certainly cannot be constructed without information, there is no necessary relationship between the quality of the knowledge product and the quantity of factual information that has gone into its making. Far more important than the sheer amount of information is its broad theoretical relevance and fertile cognitive texture. The problem, therefore, is not that too much information is being produced, but that too little of it is rich in the qualities of knowledge that is not just a compendium. Much of the blame for this, Thorngate would seem to agree, lies in our use of standards that do not particularly foster the production of anything but humdrum information. To cut back production while the old standards and institutions are still in place would simply ensure that there would be even fewer excellent publications than there are now. A better idea might be to give some thought to changing the standards that lead to the "hypertrophy" (Ravetz, 1971) of fields like psychology.

The problem of an oversupply of information is not, of course, a new problem for the older natural sciences. Half a century ago the problem was being discussed quite seriously (Bernal, 1939) and probably not for the first time. In the meantime, the magnitude of the problem would seem to have increased manifold, and yet science flourishes. There must therefore be factors at work which mitigate the potentially negative effects of the information explosion. Some of these factors, like ever increasing specialization, are well known and require no additional comment here. However, there is one factor that is particularly relevant to Thorngate's analysis of the problem as a

consumption problem. That analysis conjures up the image of the lone reader confronted by an utterly overwhelming mountain of literature. Put in these terms, the problem does seem pretty hopeless and ripe only for a Malthusian solution.

Fortunately, the image of the lone reader distorts the real state of affairs and leads to an exaggeration of the magnitude of the problem. Science, as has so often been observed, is a social activity. The fact that this is obviously true of the productive aspect of science should not lead us to forget that it is also true of the consumption of scientific products. Researchers and scholars do not relate to the literature of their field as isolated individual consumers. They are typically linked to others in informal networks that make use of a variety of communication channels (Ziman, 1968). Formal publication in "official" journals is only one part of the scientific communication process and perhaps an increasingly less important part. Scientists seem to have reacted to the kinds of problems that Thorngate notes by relying quite heavily on informal or semiformal networks to alert them to those parts of the formal literature that are worthy of their attention. This kind of preselection (quite apart from the formal preselection through the referee system) tends to limit the real pool of papers that are candidates for individual consumption to a tiny fraction of what is potentially available.

Of course, one can quarrel with the standards that operate in informal networks, just as one can quarrel with their formal counterparts. However, as I have already indicated, I do not see a strong link between the intrinsically very important issue of standards and the issue of scientific overproduction.

Transplanting the phenomenon of networks back into the terms of Thorngate's analysis, it seems that his third axiom (attention can be divided across people) potentially supersedes the effects of his second axiom (attention is a fixed asset). Unfortunately, his discussion of the implications of the third axiom is decidedly truncated, while the second axiom is made to do most of the explanatory work in the body of his discussion. This tends to minimize the possibilities for making consumption more efficient and, therefore, for strengthening his case for production reduction.

Although I am in sympathy with many of Thorngate's concerns and admire the elegant way in which he has expressed them, I do not consider the overall framework within which he presents his analysis to be particularly helpful. In fact, I am afraid that the adoption of this framework would lead us in the wrong direction when we look for solutions to some of the problems that beset our discipline.

PUBLICATION, SPECIALIZATION, AND FRAGMENTATION: PSYCHOLOGY IN THE ACADEMY

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Thorngate's Thesis

Warren Thorngate presents a series of arguments for "production reduction" in psychology. Beginning with a historical observation on the enormous growth of our collective productivity, he maintains that limitations on our individual attentional resources necessitated specialization which, consequently, resulted in even greater productivity. However, it is the increase in productivity, and not specialization, which has fragmented psychology to the point where it is in danger of disintegration. That we are losing the discipline is exemplified by the following trends and practices. First, "topical concentration," "historical truncation," and "synopsis" have yielded a superficial understanding of psychology as an intellectual endeavour and, presumably, the nature of the psychological. Second, by focussing exclusively on the adequacy of our methods of research, the discipline has become synonymous with empirical research. Third, because of this exclusive focus on our research methods, the discipline has been subject to a

"profusion of topical and methodological fads." Fourth, as a result of these three trends, as well as the competition for psychological knowledge in society, we have allowed others outside the discipline to define our research problems. Finally, our fecundity, which is reciprocally related to the economic and political forces of academia, has resulted in an impoverishment of the quality of academic life and, therefore, the prospects of attracting new scholars.

Underlying Thorngate's assessment is a largely implicit view that psychological science ought to be a coherent and cohesive enterprise, which presumably it once was but is no longer as a result of overproduction and fragmentation. In other words, neither specialization nor high productivity have served to advance the discipline of psychology as a coherent domain of scientific inquiry or to enhance its applications and benefits to the public. Since this state of affairs persists because of our institutionalized academic practices, Thorngate's solution is straightforward enough, namely, production reduction by changing the academic reward system.