autumn of 1695 it could hardly be said that the country possessed, for practical purposes, any measure of the value of commodities. . . . On a market day, the clamours, the reproaches, the taunts, the curses, were incessant. . . . Never had there been an occasion which more urgently required both practical and speculative abilities." These abilities were displayed in the plans to overcome the crisis that were formulated by the politicians Somers and Montague and the philosophers Locke and Newton.

The old currency was recalled and replaced with new currency; the then novel process of milling the coins' edges was used. Until the new coins were issued, commerce was forced to creep along largely by credit and barter. At that juncture, Montague appointed Newton to be Warden of the Mint, an office that had previously been a sinecure. Under Newton's vigorous leadership, coin production leaped to almost ten times what the old officers of the Mint had considered an excellent level. During this time, Newton wrote that he did not love to be "teased by foreigners about mathematical things, or to be thought by our own people to be trifling away my time about them, when I am about the King's business."

Perhaps there is a lesson for our times in this cooperation between politicians and intellectuals to solve a pressing social problem.

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Reference

1. T. B. Macaulay, *History of England* (Dent, London, 1966).

Information Systems

Although John H. Schneider (23 July, p. 300) makes some valid points in his article on selective dissemination of information (SDI) systems, particularly when he points out that scientists should be encouraged to use the process more, I feel that he has unfairly downgraded the usefulness of keyboard searching.

I am a subscriber to an SDI system that matches titles of journal articles against a keyword profile. When I took the output of the last year and subjected it to the sort of analysis that Schneider used, I received 1314 references on information science (at least as broad a topic as cancer research), of which 54 percent would fall into his "very useful" or "definite" use categories. Therefore, in the same amount of time (12 months) I received approximately the same number of references (1314) as his subjects (1386), with exactly the same percentage of usefulness, using a keyword search of titles of articles. Schneider's conclusion, that classification indexing is (in some way) better than keyword indexing, is thus open to question.

The cost involved, the time needed, and the professional expertise required both to create the hierarchical classifications and to index articles make the system proposed by Schneider impractical, except perhaps for narrow disciplines. The adoption of this system on a large scale would result in a sizable delay in the appearance of articles on the SDI tape services and an increase in the cost of such services, perhaps greater than the $200 per year target figure Schneider suggests.

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McMullen's position as chief of Communications Data and Library Services probably requires that he maintain a broad overview of the entire information field. This may explain why he found 709 out of 1314 references on information science to be either "very useful" or of "definite" use. I regret that my study did not include such omnivorous users of information. Instead, the participants in my test situation were the principal investigators of research grants who were working on very narrow, specific fields of research. The purpose of my experiment was to exactly identify these research areas as categories in a classification so that each scientist could be matched precisely with documents useful to his specific research effort. Under these circumstances, I believe the criteria for ranking "usefulness" by the participants in my study were much more selective than those used by McMullen, and a comparison of his personal experience with the results I presented has little validity.

At no point in my article did I make a blanket statement that "classification indexing is better than keyword indexing." Instead, I tried to present the advantages and disadvantages of both types of systems. Clearly an SDI system based on automated indexing of key-

words in the titles of articles is much cheaper and requires less time and less professional input than a system based on classification indexing. If low cost and speed are the prime considerations, then keyword systems such as the one McMullen is using are undeniably excellent. However, if intellectual indexing is used, then the advantages of classifications (particularly in terms of precise indexing of intact concepts, use of obvious generic-specific relations between items of information, and ease of retrieval) should be considered by those who are interested in developing information systems with a higher level of performance than that of keyword systems.

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Particle Accelerator Application

In his article "Relevance of particle accelerators to national goals" (6 Aug., p. 490), Louis Rosen lists ways in which accelerators have been applied to the study of radiation damage processes in fast breeder reactors. We would like to call attention to another recent application of this type.

In fast breeder reactors, a significant reduction in reactor efficiency is caused by the swelling of the stainless steel cladding of fuel elements. This swelling is due to the intense fast-neutron bombardment that produces a high density of small voids inside the steel. In the light of the national objective to construct a demonstration breeder reactor by 1980, it has been necessary to mount a large research effort to study systematically the void-swelling phenomena and to develop low-swelling alloys. This work is being expedited by the use of accelerators to simulate neutron-damage effects by ion bombardment. Because heavy ions have a high cross section for producing atomic displacement, it is possible to build up, relatively quickly, a region of intense radiation damage; the structure of this damage is similar to that observed in reactor irradiations. Further, the examination of samples is facilitated by their lack of residual radioactivity.

At Argonne, if a beam of 2-μÅ Ni^+ ions from the 4-Mv Dynamitron accelerator is used, a 1-year irradiation in Experimental Breeder Reactor-II