

tive magnitude of large programs, particularly in engineering, is obscuring the nature and importance of the working scientist.

Project directors, laboratory chiefs, and research directors are obviously important and they deserve their recognition. But the inference is strong that their functions are more important, rather than just different, and that such positions should be the ultimate ambition of every scientist. This social pressure to "advance" can become overwhelming.

True creativity in research demands an intuitive insight of uncommon quality, perhaps more characteristic of the artist than the executive. Where this has been highly developed, it should be nurtured and honored as a worthy achievement in itself, not merely as a rung on the administrative ladder.

Perhaps the givers of awards and the setters of salaries should take a second look at the criteria they are encouraging. If the laboratory becomes merely a way station to executive rewards, quality will suffer and the cause of science and society will not be served.

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Effects of Penicillin

... In his discourse on the older history of observations concerning effects of penicillin on bacteria [*Science* **139**, 682 (1963)] Robertson Pratt appears concerned that one of our recent articles on the antimicrobial action of penicillin [*Science* **137**, 982 (1962)] does not refer to certain papers that were published nearly 20 years ago.

In our paper, "Concurrent morphological and chemical events in *Staphylococcus aureus* exposed to penicillin," we emphasized not the individual effects of the antibiotic, each of which has been observed individually and previously by others, but the contemporaneous nature of all these effects when recorded on a common time scale. Our statement, "lysis of *S. aureus* under the influence of penicillin has rarely been mentioned," represents a correct assessment of the state of the field even if one takes into account the early publications of Bonét-Maury and Pérault [*Nature* **155**, 701 (1945)] and of Nitti *et al.* [*Ann. Inst.*

Have you Automated Your Data Files?

or are you operating with eighteenth century abstracting and filing techniques in your research work? Partly because all other data recovery systems have been costly and complex scientists have shied away from changing the methods by which they index and cross correlate their personal files.

These days so many laboratory procedures are automated—weighing, pipetting, setting exposure times, recording data, that it is surprising so little has been done with the most basic part of the scientific process—the research itself. Chances are that your abstract file is just the same as it would be in the lab of an eighteenth century scientist. You put the articles into files by authors or by categories; abstracts are kept the same way. But did you know that for no extra cost you can keep articles and abstracts on file in up to ten thousand categories at once? Think of the possibilities this creates for cross correlating raw data, or bringing together papers that incidentally touch on related subjects.

Highly efficient

Information retrieval systems for personal use or small card files are usually expensive, cumbersome, and require special personnel to reprogram the sorting procedures. The Geniac Portable Memory Unit is suited particularly for files of 1000-10,000 where low installation costs and maintenance by office personnel are highly desirable features. Sorting equipment is simple but effective so that there can be no need for outside repairment or service.

Furthermore sorting rates are conservatively 400 per minute with simultaneous sorting in 25 categories at once. Procedures with other equipment of this speed require one sort per category. Our PMU therefore reduces the time you have to spend waiting for the retrieval sort to be made.

USERS (partial list)

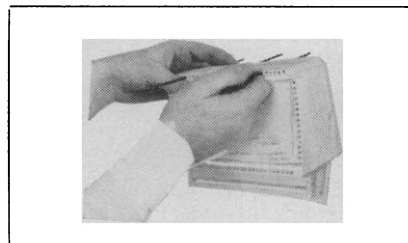
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Sylvania Electric	Equitable Life Insurance
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Bureau of Engraving and Printing	US Forest Service
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	Dearborn Michigan
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University of Minnesota	Dartmouth College
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Low Installation Cost

A crucial part of any decision to install a data retrieval system is: How Much Will it Cost to Install and Maintain? The installation cost properly includes the expense of transcribing data into the new procedure. With our standard PMU cards (5x8 inches with 88 holes around the edges) the data can be typed on the surface, pasted on as abstracts from journals or in the case of smaller articles pasted right on the card. Larger cards are available on special order for any purpose with printing if required. We have found that most customers are satisfied with the standard cards.

Coding of the cards is extremely simple using a random overlapping code for the basic categories you choose for each item. Once you have checked off the phrases or numbers coding proceeds by notching the cards around the edge at the appropriate numbers. This work is readily delegated to non-trained clerical personnel as is the sorting procedure. You do not need specially trained operators for our equipment.

Cards once used do not have to be replaced in order. Just drop them back, after use, anywhere. The file is immediately available for reuse. This, by the way, avoids the terrible danger that a card, through misfiling, will be permanently unaccounted for in routine searches.



Cards are readily sorted by hand rods.

An Intelligence Amplifier

We think the time has come to automate research thinking. We like to consider our PMU units intelligence amplifiers because you get out an assortment less random than the data you put in. Purists may not consider this a true amplifier of intelligence but they cannot disagree with us that it speeds up routine crossfiling, intercorrelation and data retrieval enormously.

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There is no charge for you to inspect our system. So why don't you try this inexpensive simple method for improving your own data file today. Elsewhere on this page we have a list of firms, institutions and government offices that have ordered and are using our PMU system. We are pleased, too, that every day we receive reorders for more cards to expand their files and for new basic sets so that their associates and friends can get their research done more efficiently.

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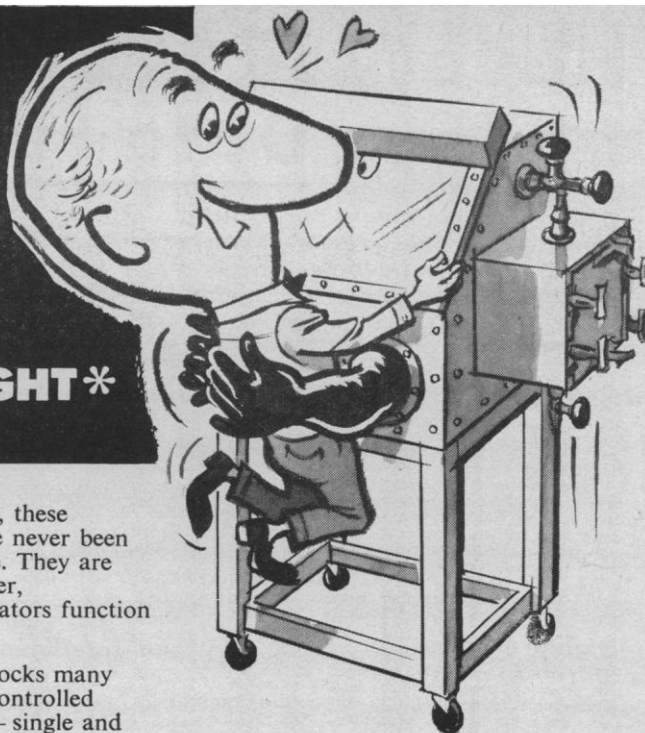
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Pasteur 70, 80 (1944)] in addition to the two references we cited.

We are familiar with the papers by Duffrenoy and Pratt on cytochemical mechanisms of penicillin action [*J. Bacteriol.* 53, 657 (1947); 54, 127 (1947)], but their relationship to our own work seems to be peripheral mention of bacteriolysis. We wish to observe that neither Pratt nor ourselves have claimed to be original discoverers of the lysis phenomenon. . . .

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**How Can Science Teaching
Be Improved**

High-level planning for improvement in science teaching has progressed to the point where scientists and educators are concerned about the programs in the elementary and high schools. More school administrators are becoming aware of the role science must play in the lives of our students and are ready to look in and work with the science teacher to up-date the local program. Industrial leaders, long the kidnappers of our best science teachers, are now loaning capable scientists to the classroom for brief periods to present new concepts with excellent equipment.

Each of these efforts is worthy of much discussion and exploration, but we can improve science teaching best by improving the teacher of science. Teachers are part-time employees. A position for 36 weeks with 16 weeks of unemployment each year is not a profession. A salary based on part-time employment is not the economic status of a professional.

A program providing 48 weeks of employment for our teachers each year—36 weeks in the classroom to educate the students, and 12 weeks of advanced training in a program for educating the teacher—would permit each teacher to keep up with the rapid expansion of knowledge and the best ways for transmitting it.

The salary for teaching 36 weeks would continue to be provided by the school district under the present financial structure. Then the national community could assume the financial responsibility of employing the teacher for the twelve weeks of advanced study. The dividends to the nation would far