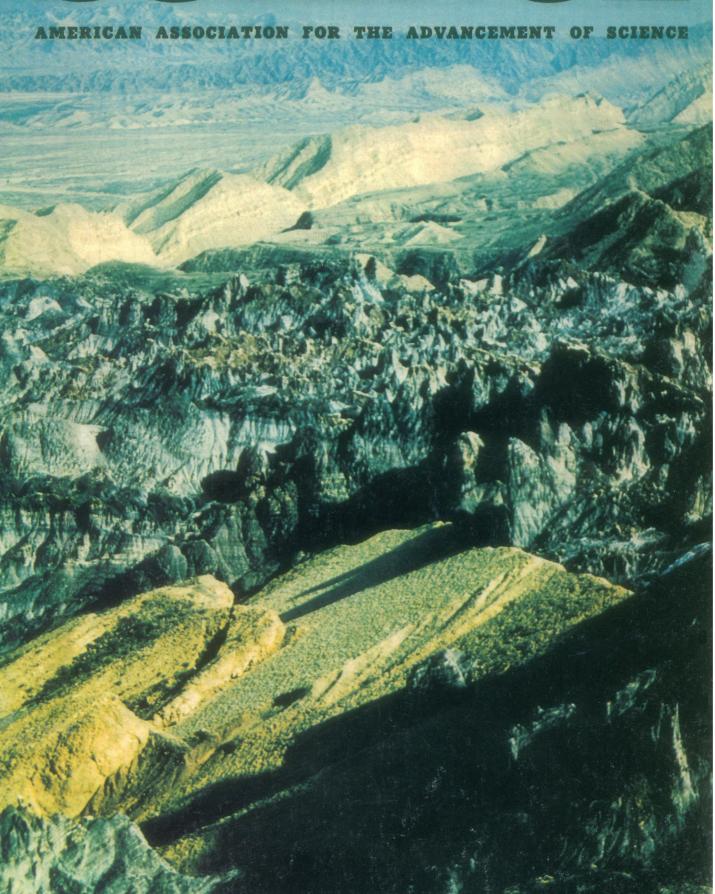
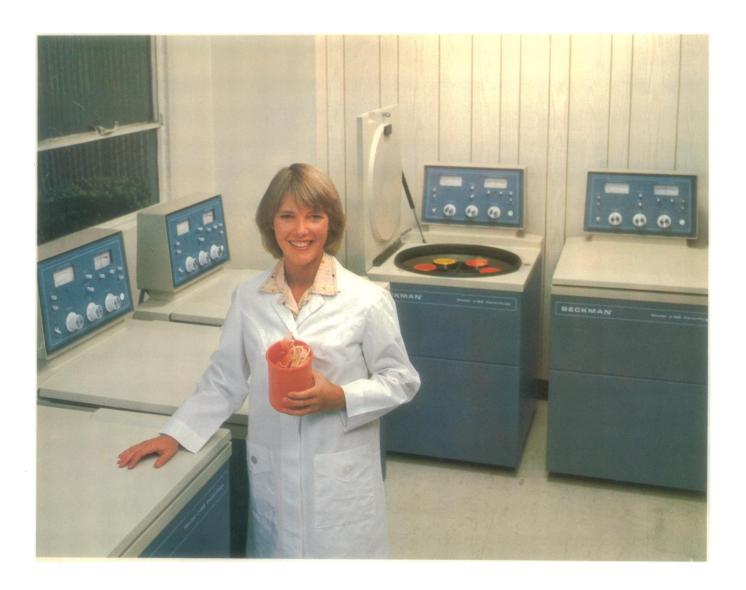
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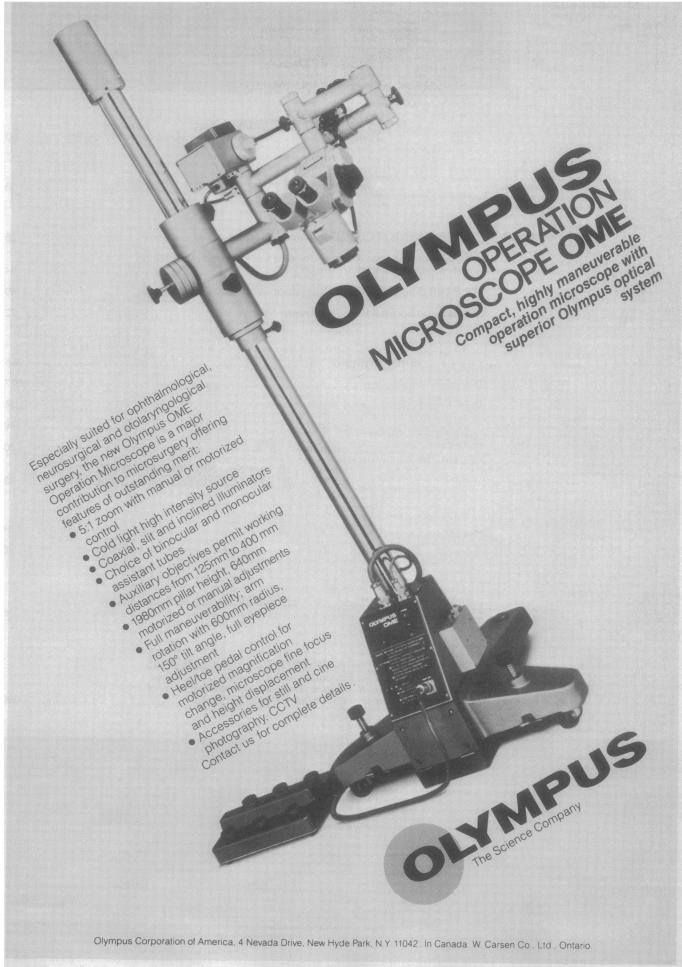
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Glacier of salt flowing right to left around (honey-colored) ridge of Eocene limestone in southern Iran. See page 395 [C. J. Talbott, The University, Dundee, United Kingdom]

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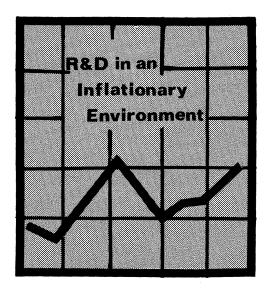
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- State and Local Interests in R&D State and local funding of R&D • Federal R&D and state and local needs • Technology transfer and building state and local science and technology capabilities
- Research and Development: AAAS Report V, by Willis H. Shapley, Albert H. Teich, Gail J. Breslow, and Charles V. Kidd, will be provided in advance to Colloquium registrants. The Report covers R&D in the federal budget, R&D in industry, and other topics relating to R&D and public policy. Registrants will also receive the published proceedings of the conference.

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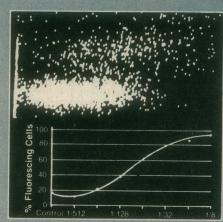
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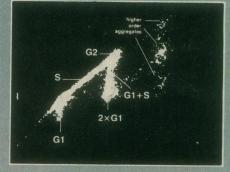
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1. Upper: Direct immunofluorescence test (cytogram). Lymphocytes from CLL patient incubated with FITC labelled anti-human 1gG. Lower: Titration of V-25 Leukemia cells from C-57 black mice different dilutions of FITC conjugated rat radiation leukemia virus antibody.

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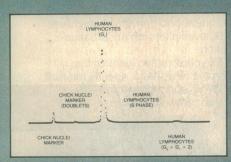
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2. Cytogram of somewhat clumped Erlich ascites tumor cells, stained for DNA with ehtidium bromide. Correlation of pulse area measurement (X) with pulse area (Y) with pulse height (Y) permits distinguishing G2 cells from 2 x G1 aggregates.

to display pulse height, pulse area or pulse width analysis for each—





3. Histogram of human lymphocytes utilizing a chick nuclei marker for standardization and stained for D.N.A. with Propidium Iodide. C.V. = 1.65% (Human Lymphocytes)

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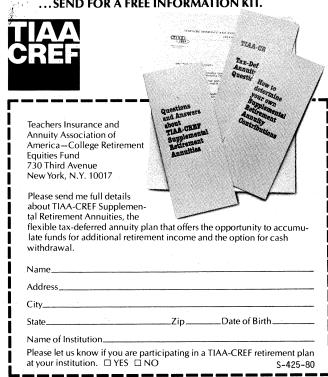
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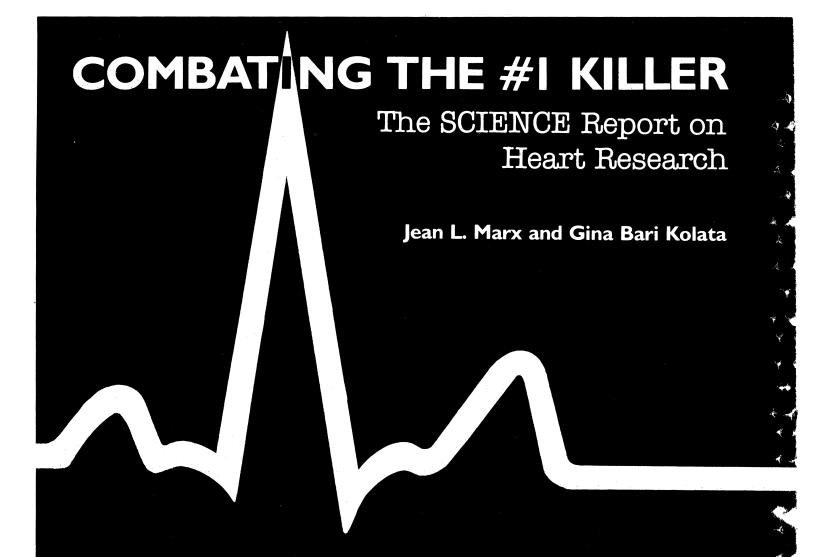
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25 APRIL 1980 343



Cardiovascular diseases — diseases of the heart and blood vessels — are the leading cause of death in this country. They afflict more than 29 million people and are responsible for almost a million deaths per year in the United States alone. The American Heart Association estimates that the total economic costs of these diseases in 1978 will be in excess of \$28 billion.

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The French Institute of Health and Medical Research (Institut National de la Santé et de la Recherche Médicale) is organizing a series of meetings on advanced research topics in various biomedical fields. The meetings which started three years ago, are known as the INSERM CONFERENCES.

The aims of the conferences are:

- to foster the exchange of ideas, to evaluate new methods and new lines of investigation; to bring together scientists, mostly from European countries, working in universities and public or private research institutions. The meetings will be held under the direct responsability of a chairman and a co-chairman.

The INSERM CONFERENCES have the following special features:

- only highly topical subjects are dealt with;
- if possible, the data presented should not have been the subject of any earlier complete publication, a condition which therefore excludes general reviews;
- the Conferences do not publish proceedings or any other material, even in a summarized form.

The chairman of each INSERM Conference will invite 15 to 20 scientists to give a report in line with the above conditions. The number of contributions will be limited to three of four per session and, at the discretion of the chairman, at least one third of the time will be given over to discussion and brief informal communications.

In addition to the invited speakers, at least fifty participants will attend the meeting, and efforts will be made to select young scientists. Experienced research workers from fields other than those relating to the Conference will also be welcome to attend. Participants will be chosen in such a way as to enable those engaged in all types of scientific research to establish personal contacts, exchange information and find new ways of working together.

#### **PRACTICAL ARRANGEMENTS**

The INSERM CONFERENCES 1980 will be held at the Domaine de Seillac, near Blois (180 km from Paris), during the month of September (full address: Domaine de Seillac, 41150 Seillac, France). Each conference will last three and a half days, from Sunday evening (departure from Paris) to Thursday afternoon. Working sessions will be held from 9 a.m. to 12.30 p.m. and from 5.30 p.m. to 8 p.m. On free afternoons, participants will have a wide choice of leisure activities at the Domaine de Seillac and in the

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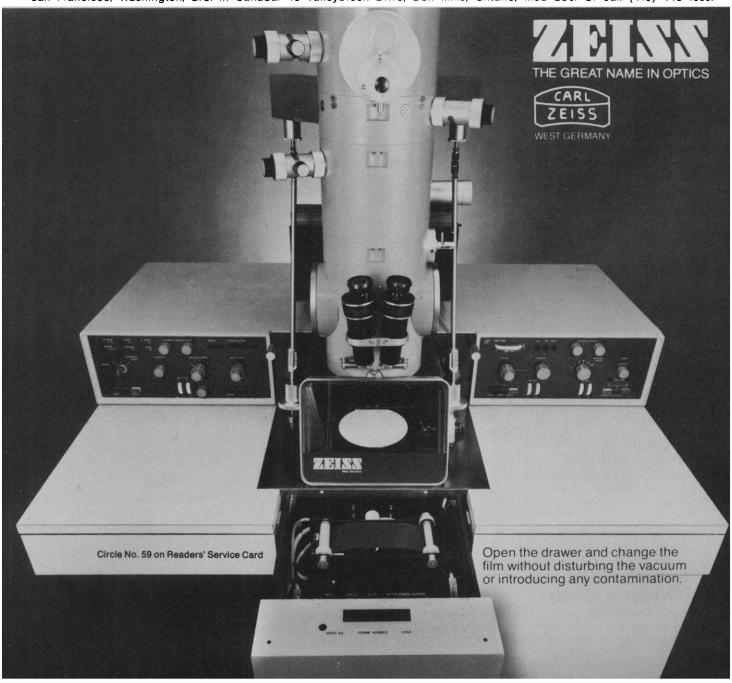
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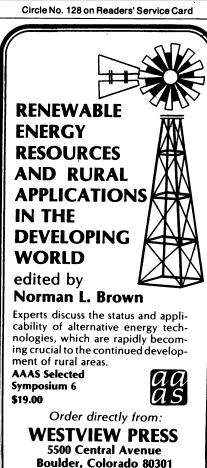
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#### **LETTERS**

### When Should the Gas Guzzler Go?

The interest evoked by my letter of 7 March (p. 1028) has prompted me to address the more difficult (and more interesting) question, *When* should the gas guzzler go?

By assuming that a new, high mileage car would be bought in Y years whether or not one is bought to replace the gas guzzler right now, my letter gave an upper bound (1) on the optimal length of time to keep the guzzler.

That optimal time depends on a whole slew of parameters; the most important is the discount rate, k. In my earlier letter, I assumed that the interest rate you can get on your money was a satisfactory value to use. And it should be. But the discount rate, which expresses the relative value of having a dollar now or later, must be at least as large as the inflation rate. Some investments may have a higher yield than the current inflation rate (none of mine do).

If the amount by which the discount rate exceeds the inflation rate is quite small (such as zero), and the lower maintenance costs of the new car are just balanced by its higher insurance premiums, the optimal value of Y is zero. When? Now! (Of course, if you like ye olde guzzler better, you may not want to base your decision on just the financial tradeoff.)

Taking into account loan financing parameters and the income tax deductibility of interest payments, as well as the discount rate and various other parameters, the optimal amount of time to keep the guzzler can be found by the following algorithm.

1) Obtain the values of k, the discount rate in percentage per month; Z, the monthly cost of insurance and repairs for the guzzler; H, the same for the highmileage car you are considering; C, the cost of the new car; S, the trade-in value of the guzzler; P, the price of gasoline: D, the annual miles driven; M, the guzzler's mileage in miles per gallon; L, the replacement period for the new car in years; f, the trade-in value of an L-yearold high mileage car as a fraction of its purchase price; h, the amount by which the discount rate exceeds the escalation rate for repairs and insurance on the high mileage car; z, the same for the guzzler; c, the amount by which the discount rate exceeds the escalation rate of new car purchases; g, the amount by which the discount rate exceeds the fuel escalation rate (this may be negative!); s, the amount by which it exceeds the guzzler's

trade-in value escalation rate; i, the same for the loan interest rate; I, the loan interest rate itself; R, the ratio of mileage of the new car to the improvement in mileage that would result from dumping the guzzler; d, the down-payment fraction on new-car loans; N, the new-car loan period in months; and finally T, your marginal income tax rate (2).

2) Calculate the monthly gasoline cost savings by

$$A = DP/12 MR$$

- 3) Calculate an upper bound on the optimum time to keep the guzzler. From my earlier letter,  $Y_{\text{max}}$  = the smaller of (C/12A) and (years until the guzzler will drop dead).
- 4) The formula for the capital recovery function is

$$crf(r,n) = \begin{cases} r/[1 - (1 + r)^{-n}] & \text{if } r \neq 0 \\ 1/n & \text{if } r = 0 \end{cases}$$

5) Find the Y from the set  $\{0, 1/12, 2/12, \ldots, Y_{max}\}$  that maximizes V. I'll leave the search procedure up to you, the reader. V, the net present value of keeping the guzzler for Y more years before replacing it with a sequence of high mileage cars instead of replacing it immediately, may be obtained as follows: Expenses:

$$X = H/crf(h, 12Y) - Z/crf(z, 12Y) + A/crf(g, 12Y)$$

Capital required:

$$Q = \frac{C \times c}{crf(c, 12Y)} \left[ 1 + \frac{1 - f}{(1 + c)^{12L} - 1} \right]$$
$$- \frac{S \times s}{crf(s, 12Y)}$$

Down payments:

$$D = dQ$$

Loan payments:

$$E = (1 - d) Q crf (I,N)/crf(k,N)$$

Tax reductions:

$$B = T \left\{ E - \frac{(1-d) \, Q[crf(I,N) - I]}{(1+I) \, crf(I,N)} \right\}$$

Finally,

$$V = X + D + E - B$$

If none of the values of Y produces a positive value of V, get rid of the guzzler now—unless, of course, you *like* it better.

In closing, I might point out that the trade-off considered here is that of a continuation of high operating costs versus an initial investment followed by low operating costs. Thus, with appropriate interpretation of the parameters, it can be applied not only to gas guzzlers versus

gas sippers, but to economic questions involving more money, such as installation of a solar energy system on your house to cut your gas and electric bills.

ROBERT G. CHAMBERLAIN

Operations Research Group, Jet Propulsion Laboratory, California Institute of Technology, Pasadena 91103

#### References and Notes

1. Discussions with Doug Armstrong of the Milwaukee Journal have caused me to realize that I should have pointed out that all percentages have to be converted to fractions (by dividing by 100 percent) before they can be used in the second equation in my earlier letter. More important, the "improvement" obtained by using the second equation instead of the first is quite small: If d=10 percent, then i=1.5 percent per month (18 percent per year compounded monthly, a rather high rate) and K=0.25 percent per month (3 percent per year compounded monthly, a rather low rate) and Y only increases by a factor of 1.3. Reversing the values of i and k decreases Y by the same factor. The adjustment for the gasoline inflation rate, g, is a rather weak approximation.

2. All percentages must be converted to fractions (by dividing by 100 percent) before use in equa-

tions.

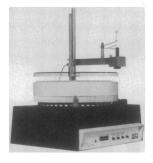
#### **Brown's Administrative Philosophy**

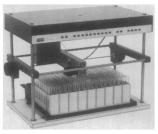
Luther J. Carter's article "Carter and the environment" (News and Comment, 14 Mar., p. 1190) leaves the impression that I, among others, might not share the judgment of the League of Conservation Voters that, on the issues, California Governor Brown had the strongest record of any of the candidates. On the contrary, I was extensively consulted by the League in developing the material on Brown and believe that those materials fairly represent his record. His administrative weaknesses are explicitly referred to in a number of places. If, as I believe, certain programs have moved ahead more swiftly in Brown's absence, it should not be overlooked that they have been moved ahead by appointees of the Governor's choosing, as part of an explicit philosophy of public administration. Governor Brown's explicit philosophy is to appoint men and women with whom he is in agreement on priorities and values. This contrasts with President Carter's approach when he appointed James Schlesinger to head the Department of Energy and then tried to steer the Secretary down the path of presidential values. On the record, Brown's approach seems to work better for the environment than Carter's.

CARL POPE

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Erratum: The price of The Properties of Diamond, J. E. Field, Ed., Academic Press, reviewed by F. P. Bundy (29 Feb., p. 974), is \$75.



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# **Diversion of Funds from Research**

The various components of the federal government act with what they believe to be laudable intentions. But the cumulative effect of their actions is often a poor result. Important examples are the bureaucratization of the universities and a related severe injury to academic research. An ever-increasing share of monies ostensibly appropriated for research is being creamed off by university administrators to support federally mandated or inspired bureaucracies. The fraction of the grant funds actually devoted to research is in many instances two-thirds or less.

At one time, federal support of research was provided with a minimum of federal stipulations and the result was world leadership. But after they were hooked on federal dollars, most university administrators, with the notable exception of Kingman Brewster, did not have the wit and courage to protest when Congress held research grants hostage to social and other legislation. Today, 59 different federal laws and regulations such as fair employment practices affect the cost or conduct of research. Agents of the federal government can threaten a cutoff of federal funds if their whims are not catered to. The university bureaucracies use the real or implied threat of the feds to enhance their own power and status on campus and to expand their already swollen ranks. During a period when the number of professors was being held constant at many universities, the administrative complement increased threefold or more.

Diversion of funds hits aspiring young scholars most severely. Many of them cannot obtain research support. Young researchers who do obtain a grant must spend an inordinate amount of time coping with the paper work. Top-rank professors who hold large grants or contracts fare better, but at a cost. They are sufficiently well supported that they can minimize the impact of the bureaucrats. A practice they often follow is to create their own counterbureaucracy. Thus the slim research dollar is further attenuated. This practice helps to reduce routine annoyances, but it does not eliminate deleterious effects of the downgrading of the status of research.

Recently I canvassed a cross section of leading research professors around this country. The consensus was that despite their favored position, they were finding it harder and more time-consuming to achieve objectives. One veteran with a long record of notable accomplishments soberly estimated that the time required by his group to complete a substantial project had doubled. He had recently spent some months in West Germany and had found to his dismay that tasks there were being accomplished with the kind of verve and effectiveness that at one time characterized efforts in this country. Other professors noted that many of the best young people were leaving academia without advanced degrees and that a brain drain of established investigators to industry and to other countries was picking up momentum.

The impairment of academic research is a process that both Democratic and Republican administrations have contributed to. In its budget cuts the Carter administration has been relatively solicitous of research. However, the Office of Management and Budget, which is the President's servant, is proceeding with its demands for unrealistic accountablity embodied in its revision of the A-21 regulations. Politicians and bureaucrats in Washington seem not to realize that perfect time and effort accountability is a costly delusion. The bean counters drain off funds, spawn a bureaucracy, destroy morale, and hinder progress of research. They do not seem to understand that for research to be vital, creativity must take precedence over highly detailed bookkeeping.

University presidents who are close to what is happening and who have a responsibility to take constructive action have been relatively inert. If they would act in concert and marshal their alumni, their political clout would be enormous. Instead, they temporize. Ultimately the scientists will have to engage in cooperative political effort both on and off campus.

—PHILIP H. ABELSON

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