Letters

Brookhaven Accelerator Time

John Walsh (News and Comment, 6 Sept., p. 841) attributes to a senior visitor at the FNAL (Fermi National Accelerator Laboratory) a remark that is totally without foundation. We refer to the statement that the attitude at Brookhaven used to be, "Let the amateurs in during the summer, we'll do the real research the rest of the year." This was a comment about the presumed "competition between staff and visitors for time on the machine." The statistics (which include both Alternating Gradient Synchrotron and Cosmotron time) show that the vast majority of accelerator time at Brookhaven has been assigned to visitors for many years.

Fiscal year	Machine time (%)	
	Staff	Visitors
1963–1968	33 ± 5	67 ± 5
1969	10 ± 2	90 ± 2
1970	10 ± 3	90 ± 3
1971	13 ± 2	87 ± 2
1972	10 ± 2	90 ± 2
1973	18 ± 2	82 ± 2
1974	8 ± 2	92 ± 2

In fact, Brookhaven has led the way in providing centralized facilities for university research groups. Doing so has always been a primary (and publicly accepted) objective of the laboratory's program. While resources have never been such as to provide for every need of every user, this mode of operation has been so successful as to be universally adopted by other major high energy physics laboratories.

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Hydrogen Storage in Metal Hydrides

The use of metal hydrides for hydrogen storage, discussed in a letter by Brattain and Gunsul (25 Oct., p. 302), has been the subject of a great deal of research in our laboratory and elsewhere (*1*). Such storage does indeed have advantages over the use of compressed gas or liquid hydrogen, both technically and economically.

Research has been under way at Brookhaven National Laboratory since 1965 on metal-hydrogen reactions, with the aim of developing improved storage media. Certain alloy-hydrogen systems have been discovered that appear quite promising, especially for stationary storage. An example is $FeTi$-H_2, which is under development as a component of a load-leveling system for electric utilities; it would store hydrogen produced electrolytically from off-peak power and later feed it to batteries of fuel cells to supply the peak load. Other, lighter metal-hydrogen systems are under development for automotive applications.

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References

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Brattain and Gunsul comment on the capacity of rare earth intermetallics to absorb hydrogen and suggest that these materials might be the key to the storage problem involved in the use of hydrogen as a nonpolluting fuel for automobiles. The absorptive power of rare earth transition metal systems is indeed enormous—the per unit volume of hydrogen that can be retained by $LaNi_5$ (*1*) or $ErCo_3$ (*2*) at modest pressures (greater than 10 atmospheres) is roughly twice that of liquid hydrogen. The absorptive power of the elemental rare earths is even greater; Ho, for example, has a capacity to absorb hydrogen that is roughly 50 percent greater than that of $LaNi_5$ (*3*). However, these elements are devoid of interest for hydrogen storage because hydrogen release and uptake is a very slow process except at temperatures above 400°C. The truly remarkable feature of the rare earth intermetallics lies not in their capacity to absorb hydrogen but rather in the speed with which they take up or release hydrogen at temperatures below 100°C.

Despite the possible advantages of using rare earth intermetallics for hydrogen storage, the disadvantages are so formidable as to be virtually insurmountable. For example, to obtain the energy equivalent of 20 gallons of gasoline from hydrogen stored in an intermetallic, one needs 1 to 1.5 tons of $LaNi_5$ or $ErCo_3$. If obtainable at all, these materials at present would cost more than $40 per pound, or $80,000 for a single automobile. Hence the obstacles of weight and cost stand in the way of using rare earth intermetallics as hydrogen storage media in mobile vehicles. Metal hydrides, to be attractive for normal vehicular use, must be at least an order of magnitude lighter and an order of magnitude cheaper than the rare earth systems presently under consideration.

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References

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2. T. Takeshita, W. E. Wallace, R. S. Craig, *Inorg. Chem.* **13**, 2283 (1974).
3. A. Pebler and W. E. Wallace, *J. Phys. Chem.* **66**, 148 (1962).

Uniformity of References

It is a fairly common experience for an author of scientific papers to have his manuscript rejected. The next step, unless the author is completely discouraged, is to revise and resubmit the article, often to some other journal where a more kindly review is at least a possibility. Sometimes, if the author is convinced that his data are valid and his presentation is reasonable, no changes in the manuscript are necessary other than those required to suit the rules and format of the new journal. Usually such required changes are minimal, with one exception—almost