The thirteen papers presented in the two sessions on cost evaluation and economics were an interesting blend of realism and speculation. It was emphasized that before making cost comparisons the ground rules should be carefully defined to justify comparative evaluation. Most of the studies show that nuclear power plants in the size range considered would cost at least fifty per cent more than conventional power plants with no sharp decrease anticipated in the near future. The important effect of the annual fixed charges on the comparison between conventional and nuclear plants is illustrated in several papers. The calculated conventional fuel costs which would be equaled by nuclear power were quite high in most cases. It was clear that considerable improvement along the lines anticipated in the cost of the over-all nuclear fuel cycle were essential along with improvements in the capital costs if reactors in this size range were to be competitive in most situations.

In the final session the economists evaluated theoretically the potential of nuclear power in underdeveloped countries. The difficulties of power supply in less well developed countries is dealt with in a survey paper by the UNO. Nuclear power was favored for remote areas where hydroelectric power has to be transmitted over long distances and there are no sources of indigenous fuel.

The International Atomic Energy Agency, the sponsors of this conference, are to be commended for arranging this technical exchange which should be a milestone in the development of small or medium power reactor technology. Taking an over-all view of the whole conference the competitive usefulness of medium power reactors seems to be limited and there is no firm assurance that the nuclear power from these reactors will become competitive with conventional power in the coming decade in any except special circumstances.

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"Materials Science and Technology for Advanced Applications." Edited by Donald R. Mash, Prentice-Hall, Englewood Cliffs, New Jersey, 1962. 767 pp., $12.

The Foreword to this book begins, "It is not often that technical papers delivered at a regional conference are published in book form." Evidence that this is probably a good idea is given by a look at this book.

Mr. Mash's master mishmash consists of unrelated materials, including everything from a pep talk on success (p. 639) and two poems (pp. 92, 93), to a few sound technical discussions of some materials problems. Apparently the papers presented by the contributors to the 1962 Golden Gate Metals Conference were simply bound up together with no attempt at correcting, editing, or interrelating. The only unifying theme is the often repeated reminder that we now live in something called the "Space Age," although the Foreword states the basic theme is, "Effective performance by the metallurgist and materials engineer in meeting their responsibilities in the Space Age can be sustained only if progress in materials technology is accompanied by an appreciation of current and planned engineering applications."

Topics included vary all the way from discussion of specific impulse values for various chemical rocket fuels through specific materials problems on the B-58, and from lubricants (in space, of course) to corrosion in liquid metal systems. Some authors have attempted to direct their papers to problems arising from a specific application such as ion propulsion, plasma propulsion, nuclear ramjets, nuclear rockets, supersonic aircraft, "space," or high frequency electron tubes, whereas others have done better by concentrating on somewhat more narrow but better defined topics such as columbium physical metallurgy, pyrolytic materials, and electron emission from single crystals. It is quite remarkable to find a sound technical article on physical metallurgy for example in the same volume which also contains what is essentially a Chamber of Commerce talk about a metal forming machine. It makes one wonder what the various speakers at this conference could have found to talk about in common at the social events, except perhaps the social events themselves.

Several papers contain some careless pseudo-technical language such as that in one on direct conversion, which speaks of the desirability of high conductivity "so that the current developed is not dissipated in resistance heating." The author of the article on high energy rate forming (naturally of "space age materials") seems to have discovered a vector form of energy for he speaks of an occurrence in which "the kinetic energy of both assemblies is equal and opposite." The article on high frequency electron tubes talks about "the Cerenkov scheme" without ever saying what this is unless it may be contained in the cryptic sentence of this section, "megavolt electronics underlying the Rebatron is a process of multiplication." Perhaps this is a new way in which the gostock distims the doshes or maybe it refers to a time when it was brillig in the wabe.

In the paper on materials for plasma propulsion, beryllium oxide is mentioned with the statement "present supply is apparently difficult, and forming is a specialty." This reviewer has a strong prejudice for always reminding people that beryllium oxide is highly toxic. Also it is not clear why the "difficulty" of the supply or of the forming is necessarily greater than for some of the other materials mentioned in the same context, for example, tantalum carbide.

In the chapter on materials for nuclear ramjets, the remarkable statement is made that power densities in metallic structures in the reactor can be several times larger than the power densities in the fuel elements themselves. This is hard to imagine, and of course classification makes an explanation in this book impossible. If this is so, perhaps we have been missing a bet by using humdrum uranium. This chapter also states that cladding is impractical at "these" temperatures without stating explicitly what "these" are and without reference to the possibility of ceramic cladding, which published work from Battelle and other places has shown can have as high a melting point as the ceramic fuel element itself.

An over-all criticism of the book is that although it is presumably intended to give engineers some understanding of the requirements and limitations on materials for conditions of high temperature and, to some extent, nuclear radiation environments, there is really very little discussion of the science behind the observations. Certainly the materials engineer, unless he is to be simply a person who goes to a materials library to draw out a suitable stock item, some "stock of the month" presumably recommended by a super librarian, will want to have some understanding from the solid state physics point of view of why materials do have limitations. Such statements as these selected more or less at random do not seem to add to this understanding: on the laser, "the idea of the laser device is to amplify light by the stimulated emission of radiation." Or on high energy rate forming, "the rate of strain is also a function of velocity."

But the book is not all bad. There is some useful engineering information on various lubricants in air and in vacuum. There is a factual discussion of solar energy convertors and one on thermoelectric materials (not the section on thermoelectricity); there is an interesting discussion on pyrolytic materials and one on fiber reinforced materials. And the nice discussion of columbium has been mentioned above. Considering the lack of organization and editing of the book, it would not have been surprising also to have found a chapter on niobium.

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