wouldn't be able to hold so many constant while you varied a few. I gather your results pretty well justify that there were only several of these that were quite influential. Is that correct?

B: Yes.

C: The procedure in most laboratories is to set up what you want to do and then send it over to the math group. They set up the statistically designed experiment so that they can analyze the results properly.

A: I'd like to point out that that is a rather dangerous procedure.

C: Our math group has some chemical engineers.

A: That certainly helps a lot.

Given the broad range of outlooks typified by this discussion, one doesn't expect, and doesn't find, uniform agreement on educational objectives or procedures in the second half of the volume, which is devoted to papers and discussion on present and future polymer curricula. An oversimplified but perhaps reasonably accurate summary is that an undergraduate *major* in polymer science is unwise, but that elective courses should be available. At the graduate level there is no *best* approach since local conditions will determine the optimum structure of a polymer program, department, or institute. It is clear that there is no unique solution to the "materials science" *vs.* "polymer science" problem that is especially acute when a materials science group, probably composed primarily of metallurgists, is encouraged to expand its scope to include polymers. One speaker noted that in such cases the *band* theory all but excluded the *bond* theory.

The second section of the proceedings could be a useful sourcebook for university faculty and administrators who are wondering how best to fashion a polymer program into the educational structure. The reader will not find the answer, but he can at least be exposed to the hopes, fears, successes, and frustrations of some who have wrestled with this problem.

From Electrocatalysis to Fuel Cells, Edited by G. Sandstede, University of Washington Press, Seattle, 1972, 415 pp, $12.50. Reviewed by R. E. Meredith, Oregon State University, Corvallis, Ore.

This book contains more than thirty papers which were presented at a three day seminar, under the same title, at the Battelle Seattle Research Center. Unlike many publications of this nature, the articles are well grouped and edited to give the book the appearance and utility of a text on the subject. The participating authors include Bockris, Cairns, Kordesch and others who have worked extensively in the field for many years. Emphasis is placed on presenting the latest developments and applications along with the current standing of research

The coverage given in this book to the studies in developing inexpensive catalysts to compete with the heretofore unchallenged domain of the platinum family should be especially interesting to the investigators who have developed an almost economic fuel cell except for the cost of the catalyst. Disclosures are presented on the behavior and properties of inexpensive and novel catalysts such as tungsten carbide, bronze compounds and organometallic complexes. It is pointed out that the stimulating work in this area has encouraged the examination of a great many other compounds and these studies may very well lead to cheap electrodes for acid electrolyte fuel cells in the near future.

The section on fuel cells is categorized not only as to whether the system is acid or alkaline but also with regard to fuel and application. The problems associated with each system are covered in discussions and summaries. For instance, it is noted that in spite of the fact that the electrochemical problems of the hydrazine cell have been practically solved, the cost of hydrazine continues to make that unit uneconomical. It is also mentioned that although the alkaline systems appear to have the advantage on the state of development at the moment that recent advances in the acid electrolyte cells promise to place them in a strong competitive position in the near future. As an example of the completeness of fuel cell coverage, a rather short but interesting section is devoted to the state of development of implantable fuel cells in the body for the operation of pacemakers.

Not to be excluded are topics such as solid electrolytes, thermocatalytic hydrogen generation, power generation using coal, organic cathodes, metal-air systems, and the use of fuel cells for practical energy conversion systems.

The book concludes with a section on "Developmental Goals and Prospects" which state the restrictions on fuel cell applications in a realistic manner. It is suggested that anti-pollution forces are going to have to become a lot stronger or else the country will have to be very concerned about "hydrogen ecology" before applications would be created to cause industrial capital to be spent in the volume needed to develop and market fuel cells in large quantities. Fuel cells would appear to find their best application in areas now covered by combustion engines but they fail to adequately compete because of unfavorable "power density" and "value per dollar."