However, even if the necessary broad technical competence could be assembled, the actual social decisions involve assessment of the social and other values associated with different choices of technologies. In the present case this would require evaluation of the public consequences and relative values attached to radiation vs. toxicants from fossil fuels.

As Devaney suggests, there is much to be done in evaluating risks from coal, and one suspects that these risks are considerable. The Panel would be interested in a proposal that focused on the physics issues involved in this question. Indeed, some members of the Society have suggested that a study of the physical role of submicron aerosols in pollution could be useful, not only in evaluating the present problem, but also in its technical and legislative amelioration. It has also been suggested that a study be made of the relationship between sources of pollutants and ambient air quality.

Suggestions or proposals for studies that might be sponsored by The American Physical Society would be welcomed by the Panel. Guidelines for APS-sponsored studies will be published in the September *Bulletin*.

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Surface theory

The atomic structures of many molecules and solids are today well understood, but we are only beginning to explore the fundamental structure of surfaces. The articles in the April issue of surface physics did an excellent job of outlining the transformation that is taking place today in this subject. By describing the many new ideas and techniques that have appeared in the last few years, the authors have acquainted the general reader with many recent developments.

A key feature in analyzing atomic structure is the close interplay between theory and experiment, an interplay which in the past has proved essential to working out the basic interactions in atoms, molecules and solids. It is therefore a pity that, in their otherwise excellent article on theory, Robert Schrieffer and Paul Soven in their concluding paragraph (April, page 28) may have left their readers with the impression that all theorists have been working only on "highly simplified models," and that it is a task for the future to do theoretical work on "more realistic systems."

While theoretical work at the University of Pennsylvania has concentrated mainly on simplified models (such as *s*-band cubium), there has been, as Schrieffer and Soven indeed note, theoretical work by J. A. Appelbaum and D. R. Hamann[1] on semiconductor surfaces that has identified new surface states (back-bonding states, as distinguished from Shockley's dangling-bond states). What they did not mention was that these new surface states have been observed experimentally on Si and Ge (III) surfaces by J. E. Rowe and H. Ibach.[2] By examining differently reconstructed (III) surfaces, Rowe and Ibach were able to show that the back-bonding surface states are a characteristic primary feature of the relaxed semiconductor surface, independent of the lateral reconstruction (which involves secondary interactions). Thus Appelbaum and Hamann's derivation for a relaxed but unreconstructed model of the surface is relevant to experiment. In my opinion, it is general distinctions of this kind, rather than extensive computer studies of highly simplified unrealistic models, that constitute the major contribution that theory will make in this field.

Let me add that valuable work on surfaces is carried out by chemists as well as by physicists, and that many of the most useful new ideas are of a chemical rather than a physical nature. (This conclusion is implicit in the excellent article on photoelectron spectroscopy by Dean Eastman and Marshall Nathan (page 44).) The theorist who wishes to make a significant contribution to the field of surface science does well to regard himself as a scientist who combines theoretical ideas from *both* physics and chemistry.

References

1. J. A. Appelbaum and D. R. Hamann, Phys. Rev. Lett. **31**, 106 (1973).
2. J. E. Rowe and H. Ibach, ibid., 102.

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High-field superconductor

The news article, "Superconductor operates in magnetic fields above 500 kG" (January, page 17) reports a comment by Myron Stongin in which he points out that $H_{c2} = (2)^{1/2} \kappa H_c$ (bulk) where κ is the Ginzburg-Landau parameter, H_{c2} is the upper critical field and H_c (bulk) is the bulk critical field which increases with transition temperature, T_c. He notes that "a very large κ usually indicates lower ultimate values of the flux pinning forces, which could imply a small useful current density." He thus argues that the κ for the lead molybdenum sulfides with T_c = 14.4 K should be much larger than κ for Nb_3Sn with T_c = 18 K. Strongin's argument applies equally well to V_3Ga as to the lead molybdenum sulfide materials.

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