mer. Any significant changes will be released for public comment prior to implementation, and may require approval of the National Science Board.

NSF's responsibility as a steward of public funds rests on the integrity of the proposal review process. It is important and timely for NSF and the research community to review the process as thoroughly and impartially as possible—particularly in this era of cutbacks and public skepticism about all forms of public spending.

ANNE C. PETERSEN
National Science Foundation
Arlington, Virginia

How Not to Cut One's Fingers in Physics

In "Agreement Between Theory and Experiment" (June, page 33), Amikam Aharoni mentions that faith in their results is an important factor in leading experimenters to publish their data. Because of this faith, experimenters should not be afraid to publish data that as yet cannot be explained by theory or that contradict theoretically predicted behavior. Though I subscribe to these statements fully, one example in Aharoni's paper perturbs me. In his figure 1, he presents measurements of the diamagnetic susceptibility of bismuth at 14.2 K from a paper by Wander Johannes de Haas and Pieter Marinus van Alphen.[1] He claims that de Haas and van Alphen had very little to support their conclusion that "the susceptibility of bismuth at [liquid] hydrogen temperature is found to be a periodic function of the field." In Aharoni's view it was the experimenters' faith alone that suggested a periodic relationship. Faith undoubtedly was a factor, but de Haas and van Alphen were not making an unsupported attempt to mesmerize readers into accepting a periodicity. I have an interest in this matter because I worked under de Haas from 1934 to 1946.

In 1914 de Haas published a paper[2] in which he suggested that in diamagnetic metals a conduction electron could be bound to more than one ion. He concluded that in an applied magnetic field H, a correlation should exist between the electrical resistance R and the diamagnetic susceptibility χ.

A promising track to check the validity of de Haas's suggestion was opened by the large number of data on $R(H)$ published in 1930 by L. Schubnikow on Bi crystals.[3] These data showed clearly in the $R(H)$ plots a surprising periodicity in H at liquid hydrogen temperatures (the Schubnikow–de Haas effect).

Results on force measurements on a Bi rod[4] indicated an abnormality in the force starting at the field where $R(H)$ starts to deviate from its normal behavior, indicating that χ is field dependent. Susceptibility measurements on Bi were reported by de Haas and van Alphen[5] and compared with $R(H)$ data for material of similar purity. The full $R(H)$ and $\chi(H)$ graphs indicate the periodicity in $\chi(H)$ at the same fields in a direction perpendicular to $R(H)$. It must have been exciting for de Haas to see the experimental evidence—in particular in a crystal showing an unexpected electron behavior—a correlation between resistance and susceptibility that he had suggested as much as 16 years earlier. Later followed more convincing results of $R(H)$ and $\chi(H)$ at liquid helium temperatures and in larger magnetic fields. De Haas expected the periodicity also to occur in the Hall coefficient, as was subsequently found to be correct.[6]

De Haas was not a person who relied on good luck. One did not bring a report of an experiment to him without first being sure one had eliminated all possible errors, miscalculations and fictions. In fact, a meeting with him was an ordeal, for he always stressed that he did not want to run the risk that, with his name on a paper, he would (as he liked to say) cut his fingers. He would not have considered a set of data as shown in Aharoni's figure 2 to be different from deviations due to experimental errors.

In conclusion, I feel that Aharoni has not chosen well in using the de Haas and van Alphen results to illustrate his argument, and he has unwittingly put a stamp of arbitrariness on the presentation of their earlier experimental results. Rather, I see three factors that were important in their case: (1) faith in data combined with (2) a similarity in $R(H)$ that was (3) predicted by earlier, more-or-less intuitive considerations.

References

1. W. J. de Haas, P. M. van Alphen, Commun. Phys. Lab. Univ. of Leiden, report 212a (1930).
2. W. J. de Haas, Verhandelingen van de Koninklijke Akademie van Wetenschappen, Amsterdam, **16**, 1180 (1914).
3. L. Schubnikow, W. J. de Haas, Commun. Phys. Lab. Univ. of Leiden, report 207a (1930); report 207d (1930); report 210 (1930).
4. W. J. de Haas, P. M. van Alphen, Commun. Phys. Lab. Univ. of Leiden, report 208d (1930).
5. *Ibid.*, report 212a (1930).
6. A. N. Gerritsen, W. J. de Haas, Commun. Phys. Lab. Univ. of Leiden, report 261b (1940).

ALEXANDER N. GERRITSEN
West Lafayette, Indiana