

is much less well represented in the literature. I have not so far tracked down the papers by Philip Vincent, but if there are any more recent or more rigorous references to the theory of the bicycle than the ones I quoted, I would be very glad to know of them.

As Hoskin points out, the motorcycle presents a more complicated problem than the pedal cycle. Apart from suspension complications, its higher design speed and massive front wheel mean that gyro effects will be much more important. Furthermore, the greater weight of the swivelling front assembly, whose center of mass is well ahead of the steering axis, contributes another important torque on that axis when the bike leans. I feel it would be prudent to be sure of the theory of the simple bicycle before attempting detailed analysis of the motorcycle.

DAVID E. H. JONES
Runcorn, UK

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David Jones errs in calling his creations URB's, or unrideable bicycles. Because they can all be ridden, with greater or less difficulty, they are, at best, subURBs.

C. W. McCUTCHEN
Bethesda, Md.

The nonscience major

As an applied scientist, I was interested in your special issue (March) on "The Nonscience Major." The implication throughout the issue is that faculty members in the pure-science departments have an important role to play in teaching science to nonscience majors. I would raise two questions: One, do they really have a major role to play in this important area? Two, do the physicists not realize that the applied scientists have been playing an important role in relating science to nonscience majors for years? Let us look briefly at these two points.

Consider the first. I think it is well to remind ourselves that there is a continuum in science and technology going from the pure sciences through the applied sciences to engineering. Each of these areas has important responsibilities; the whole of science and technology is only as strong as the strength of each of these individual

segments. Pure-science departments continue to have an important mission, that is, the training of their own students and the offering of basic science courses to students in the applied-science and engineering disciplines. It is of vital importance that students in the latter two categories have a firm foundation in basic science upon which to build. I question that the pure-science departments also have a major role to play in the teaching of nonscience majors.

This brings us to the second point. Faculty members in academic departments of applied science within the areas of biological sciences, earth sciences and materials sciences have for years been teaching students the application and relevance of science to the world around them. I contend that these faculty have been successful at this task and that they are the logical people to teach "science" to the nonscience majors. After all, they have been concerned with the application of science and its place in society long before it became the "in thing" to do. At my university, the most successful science courses for the nonscience majors are not primarily taught by members of the physics or chemistry departments but by biophysicists, biochemists, geologists, meteorologists, and materials scientists. Again I emphasize that I think this is what one would expect. The application of science is being taught to the nonscience majors primarily by the applied scientist and not by the pure scientist.

In the special issue on "The Nonscience Major", the writers seem to be on the defensive about the lack of activities in physics departments in the application of science and their offering of suitable courses for the nonscience major. Some young people seem likewise to be concerned about this. I think the answer is straightforward and that the pure scientist need make no apologies. The production of useful things and processes for society rests heavily on the foundation laid down by the pure scientist. Thus, the pure scientist simply recognizes that responsibility and is not defensive about it.

As I see it, it is increasingly the responsibility of the applied scientist and engineer to emphasize to the young people, society, and the government the vital role that the basic scientist is playing in our overall science-technology effort and to urge

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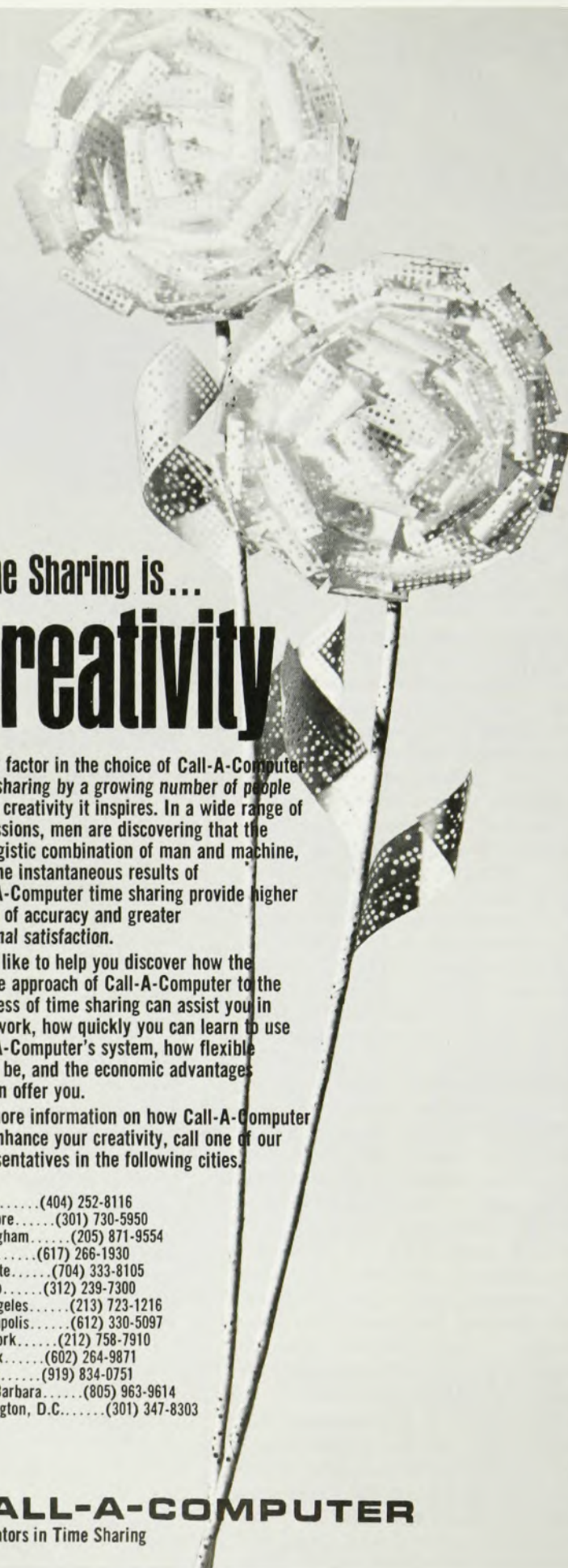
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LETTERS

that he continue to be supported at a sufficient level so he can fulfill that role. In the meantime, I would urge the basic scientist to better understand and *respect* the role of the applied scientist and engineer in our overall mission and not to abandon his own ship. Remember that we are colleagues in an existing mission, where we each have an equally important part to play.

P. L. WALKER, JR

The Pennsylvania State University

I found your issue on the nonscience major most revealing. It is a good thing that physicists (scientists) have become aware (perhaps belatedly) that they cannot continue their activities in the relative isolation they have enjoyed in the past. Although the subject was treated from several aspects a few things stood out:

- Some scientists are not taking the education of nonscientists seriously; they seem to be treating it as a fad useful for bolstering enrollment.

- Although most scientists give lip service to the fact that nonscientists are not necessarily dumb, there exists a tendency to treat them as if they were.

- Especially when talking to non-scientists there is an almost irresistible temptation to revert to the 19th-century concept of a completely knowable, mechanical universe.

These ideas combine in a complex way to give the impression that scientists think of themselves as an elite group, a priesthood who know rationality and "nature's constants." Now in our great good will we are willing to share some of our wisdom with less fortunates, the nonscientists. However, it is difficult to decide what to tell them or how to evaluate their learning. I would argue that this approach is not only condescending and absurd but patently dangerous.

We should recall that the scientific approach is one of many ways of organizing perceived chaos and that beyond the rather questionable criterion of technological advancement, there is nothing to indicate that we scientists have a better truth than anyone else. With this firmly in mind I think it becomes easier to see that our goals in science for nonscientists involve not "instilling a way of think-

ing" but explaining science as an approach to the universe and why scientists do science.

This qualitative, experiential approach may be very difficult for some scientists to achieve; however, if we can not begin to look at science "non-scientifically" we can not expect non-scientists to be able to look at science from our point of view (the modern phrase would be "to get into our space").

The current interest in science by laymen, language students, history majors, psychologists, and all the other nonscientists as well as our own concern is an implicit recognition that the artificial barriers between science and "nonscience" must be removed through an increase in communication. This can only be achieved through a high level of participation on both sides of the "line" by all concerned.

DAVID SMALL

*Simon Fraser University
Burnaby, British Columbia*

Business-meeting complaint

Perhaps it is a case of "You had to be there. . .", but I found the description of the American Physical Society business meeting in Chicago very irritating. On a motion urging that APS take a position opposing the supersonic transport, "Alvarez ruled the motion out of order, deeming consideration of it more appropriate for an organization such as the American Institute of Aeronautics and Astronautics. . ." Talk about vested interests! When I read the paragraph to a colleague he remarked that this was like setting up a panel composed of the presidents of GM, Ford, Chrysler, and American Motors to set standards for air pollution from automotive engine emissions. Let physicists collectively decide either to discuss or to ignore such subjects as Vietnam, environmental pollution, and so on, but at this stage what we don't need is a cop-out.

FREDERIC P. FESSENDEN
Norwich, Connecticut

First polarized targets

In response to a letter I received from A. Abragam in connection with my article on Nucleon-Nucleon Scattering (December, page 21), I would like to offer a few clarifying remarks. When I mentioned Saclay as a "recent entrant into low-energy nucleon-nucleon



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