

Letters

Mystery resolved?

Your otherwise thorough and informative item, "Magnetite in Bacteria Linked to Orientation" in "Search and Discovery" (November, page 22) is a beautiful illustration of the reluctance of scientists to cross disciplinary boundaries as we have noted in a recent¹ paper on this orientation phenomenon.

For years geologists, anthropologists and biologists have been aware of a striking correlation between geomagnetic field reversals and biological extinctions which have periodically occurred in the geologic past. In 1970 I. K. Crain² concluded that the zero field, which existed for thousands of years during the reversals, was somehow lethal to the small organisms inhabiting the ocean sediment. These organisms should have survived the increased levels of cosmic radiation, but somehow did not. He did not know why the non-zero field was essential to survival.

In your article you state (without reference) that in 1975 Richard Blake-more discovered the magnetic crystals in various species of aquatic bacteria. This is the unknown cause-and-effect link missing from Crain's postulate, which to our knowledge has not been suggested before.

Hence the further testing of the navigational hypothesis under controlled conditions is certainly desirable, but may only corroborate the results of an experiment that has already been done many times in Earth's geologic past.

References

1. G. P. Williams, D. Solenburger, D. Weaver, *Bull. Am. Phys. Soc.*, November 1979, page 10.
2. I. K. Crain, *Geol. Soc. Amer. Bull.* 82, 2603 (1971).

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Physics and geometry

As a differential geometer who has tried to understand and contribute to

the study of the role of geometry in physics, I very much appreciate C. N. Yang's tribute to the role of geometric thinking in physics, in his article in June (page 42). However, there is a missing link in his comments about connections in fiber bundles. Mathematicians did not develop them "without reference to the physical world." The theory developed out of Elie Cartan's work in the 1920's, which in turn had two influences: the physics of the day, and an attempt to extend Felix Klein's ideas on how geometries are defined by groups of transformations to the case where the groups are only present in a "non-holonomic" way. One can trace these developments in a significant series of papers in Volume 2, part 3 of his *Collected Works*. In my opinion this is the most profound work in geometry since Gauss and Riemann.

Cartan also clearly believed that physicists would ultimately benefit from his more sophisticated way of thinking about the geometrical nature of the world, which involved a unification of topology, group-theory and geometry. The physicists of the 1920's cannot really be blamed for not appreciating this—even the mathematical world did not fully understand Cartan's ideas until 1950. The recently published correspondence between Einstein and Cartan in the 1920's is very sad—Cartan tried very hard to give Einstein some glimpse of the sort of mathematics he would need to carry out his ideas, but it was pretty much the "dialog of the deaf."

In the last paragraph of his article Yang is surprisingly fatalistic, perhaps one might even say smug, about the lack of communication between contemporary physics and differential geometry. I know that physicists glory in their mathematical amateurism, but physics is a pretty expensive business these days and some vulgar soul is liable to question why, if there is a relation, it is not pursued at maximal efficiency, with the help of the professionals.

ROBERT HERMANN

Association for Physical and Systems

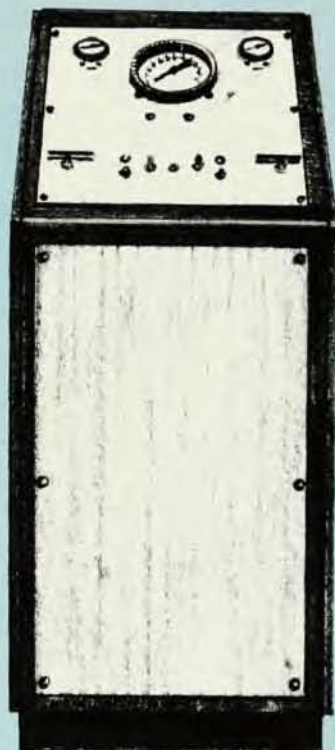
Mathematics

6/25/80

Brookline, Massachusetts

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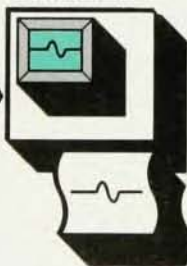


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letters

THE AUTHOR COMMENTS: The first two paragraphs of Robert Hermann's letter are interesting in that they trace the mathematical concept of fiber bundles to Cartan's work, which in turn was influenced by the developments in physics before and during the 1920's. The last paragraph is also interesting since it reveals Hermann's resentment (which is shared by some mathematicians, but not all) that physicists are not listening to the mathematicians enough. In my opinion there is some truth in this complaint, but the reason for it is not that physicists are fatalistic or smug, but that our two disciplines fundamentally have different value judgments, as I emphasized in the last paragraph of my article.

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7/22/80

Unaffiliated physicists

The letter by Lance Kethley in May (page 82) calls attention to the publication plight of the unaffiliated physicists. In the last ten years I have been, off and on, in the same situation as the author. While my experiences agree *grosso modo* with his observations I do believe that some APS editors deserve a friendlier word.

I have published several times in APS journals using my private address. No page charges were paid, and I don't believe my publications were unduly delayed.

Such accommodating attitudes may not in general be expected from APS publications that fall into the so-called "prestige" category. Since prestige is, in so many ways, synonymous with funding, one may understand that the chances for a "have-not," of getting a word in edgewise, are indeed slim.

The reviewers used by prestige journals frequently tend to be intimidating rather than to the point and business-like. One may have some doubt whether some editors read the reviews they send off to their authors; because why forward comments that abuse the privilege of anonymity with irrelevances or even insults? To give the editors the benefit of the doubt, shall we assume that such oversights have occurred at the secretarial level?

When suffering indignities it is good to remember that APS membership is neither mandatory nor a license for publication privileges. There are European and even US journals of good standing that do not require page charges. Keep in mind though: European editors are apprehensive of accommodating an increasing number of American physicists, who are refugees

from the page-charge plague. In case of a European refusal, remember: page charges are ironically (and as usual with best intentions) funded by our own Federal government.

Furthermore, a good-sounding affiliation also helps with European editors. One editor quietly changed my private address for a university affiliation I had in the past.

Indeed, the not always rational criterion, called prestige, rules well in excess of its limited intrinsic potential. Prestige can push the income of some into the six-digit bracket, and the lack of it can sometimes be translated into: no income at all. Drawing a 19th-century parallel, one wonders whether the pay scales of Faraday and Maxwell exceeded the pay scales of their less renowned colleagues.

Just for the sake of inviting a Proxmire citation, I have, at times, been tempted to add a note to my papers: "Work supported by the US Social Security Administration." So far I have felt that, in doing so, I might overextend my welcome with our American editors, many of whom have a hard enough job as it is.

Indeed, I concur with Kethley. There is room for more human rights here at home, but let it be human rights with spirit and sincerity rather than human rights solely by rule and legislation, or worse: solely for publicity.

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7/18/80

High-energy physics?

I read with great interest the article by W. K. H. Panofsky on future high-energy accelerators. I must take exception, however, with his statement that "high-energy physics... is almost synonymous with elementary-particle physics." "High-energy physics" is a poor term requiring periodic redefinition. This is reminiscent of 1980 physics texts entitled "Modern Physics." "High-energy physics" describes research being performed at "high-energy" accelerators, although presumably it would not include biomedical or synchrotron-radiation work being performed at such machines. The distinction based on energy is somewhat blurred: Is research at the 6-GeV KEK accelerator high-energy physics? What about LAMPF (800 MeV)?

Much work of paramount importance to elementary-particle physics has not taken place at high energies. In the past several years there have been important low-energy experiments performed on parity violation in weak neutral current atomic transitions and muon number violation. Interest has recently been stirred by a reactor ex-



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