their skills to persuade scientists to expose what they know to be the most vulnerable aspects of their own work, rather than those that are easiest to defend against criticism by those less knowledgeable in their specialty.

All those concerned would agree that meteorites and their asteroidal sources hold the key to our understanding some of the deepest mysteries of the earliest solar system. It should be embarrassing to all of us that the sources of the most abundant type of meteorite appear to be nearly absent from the asteroid belt. If we can't understand the present solar system, how can we hope to see back 4.5 billion years?

There must be some answer to this "spectroscopic paradox," even though it is easy to give plausible arguments showing that every possible resolution of it is probably wrong. I actually find Jeffrey Bell's suggestion that the ordinary chondrite sources are concentrated among the smaller asteroids quite attractive. If only someone could find out what is wrong with the good reasons that seem to argue against this. We few who are trying to understand the dynamical aspects of the problem are best equipped to identify what may be faulty in our own reasoning and calculations, and spectrophotometric observers have a similar opportunity. I believe discussions with one another must be directed toward attempts to explain and understand, rather than toward trying to win an argument.

It is true that if I had to guess, I would guess there is something wrong with the interpretation of the spectroscopy of either the S or the C asteroids. But guesses aren't worth reporting.

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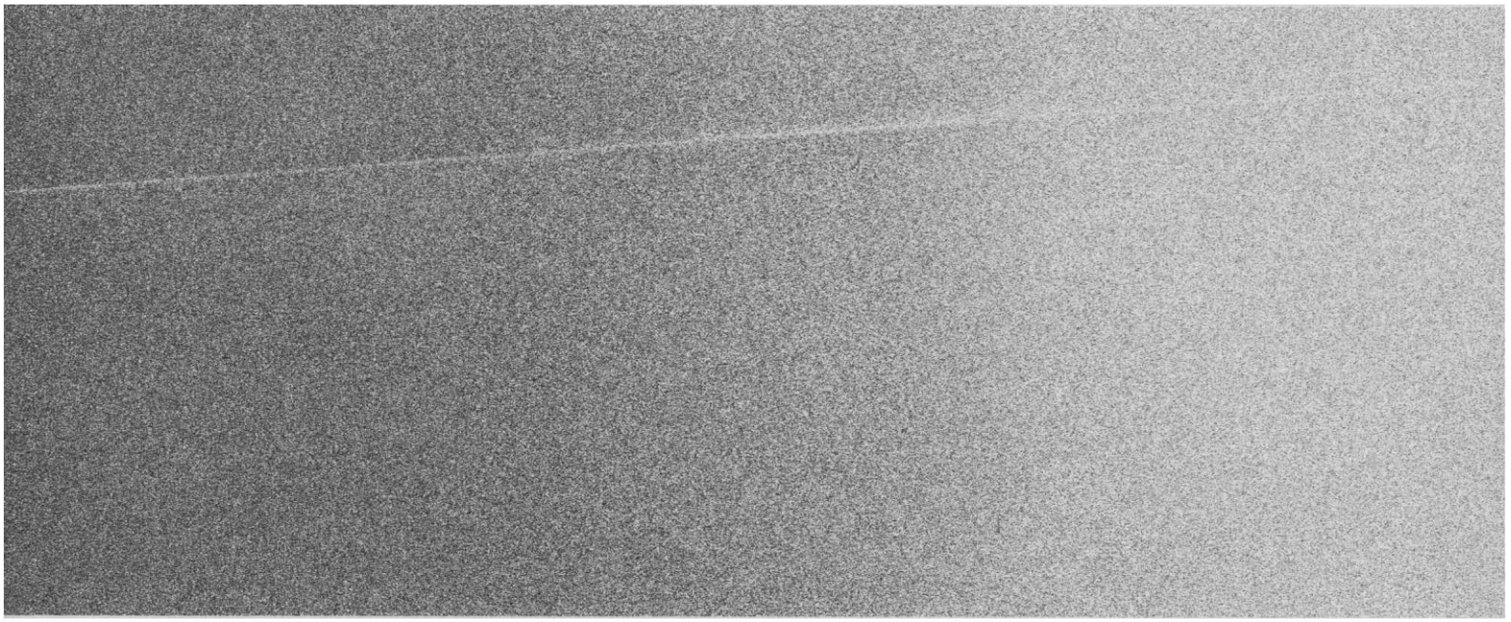
The Antibiotic Record

Robert P. Crease, in his article "Righting the antibiotic record" (Research News, 17 Nov., p. 883) reports on the symposium "Launching the Antibiotic Era" held at Rockefeller University on 23 October 1989. The symposium marked the 50th anniversary of the discovery of gramicidin by Rene Dubos.

I write to clarify certain points arising in the report as they concern Alexander Fleming, the discoverer of penicillin. We are told that Dubos was the first to put an antibiotic to clinical use, having discovered gramicidin around 1939. This misrepresents the published facts concerning penicillin. Fleming's penicillin had been used on patients in 1930 by C. G. Paine, a former student of Fleming. Paine used crude penicillin successfully on patients by local application in the treatment of particularly severe eye infections in Sheffield, U.K. In the course of treating five patients, he demonstrated a clinical cure of infections caused by the pneumococcus, the staphylococcus, and the gonococcus (*1*).

Some of Fleming's pupils are also adamant that Fleming had not lost interest in the potential clinical use of penicillin even as late as the second half of the 1930s; but Fleming was no chemist, and the purification of crude penicillin had always been beyond his capabilities. The need for purification of penicillin was recognized by the Oxford University workers, who began to take up the demanding challenge around 1938.

Fleming did not "misunderstand" the



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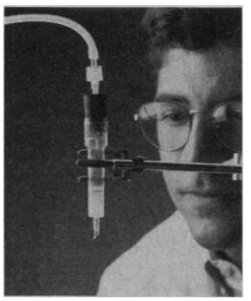

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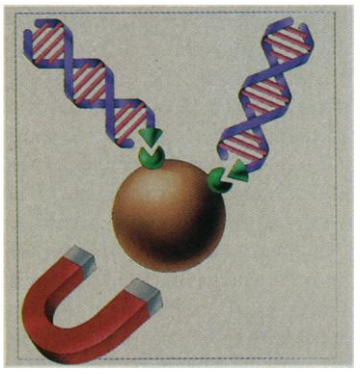

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properties of penicillin. Indeed, working as a bacteriologist but not as a chemist, he characterized them so well, even in his initial publication of 1929, that when Ernst Chain read Fleming's publication 9 years later he was immediately attracted by the potential of penicillin for what was to become his subsequent research with Howard Florey. It is universally accepted that the Rockefeller Foundation deserves the greatest credit for recognizing the validity and promise of the research that Chain and Florey were proposing to do and for supporting this recognition with a generous grant. Many other workers were important in the subsequent development, including Norman Heatley, who spoke at the symposium.

Crease's article reports gramicidin as having had to take second place clinically to the sulfonamides. This, Crease says, was due to the toxicity of gramicidin, which never became clinically important, although it held an important place in research. Prontosil was introduced as an antibacterial agent in 1935, and its less toxic successor sulfapyridine in 1938.

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REFERENCE

1. M. Wainwright and H. T. Swan, *Med. Hist.* **30**, 42 (1986).

A Broken System?

Recently, while completing a National Institutes of Health (NIH) grant application, I noticed the following printed in small type.

> PHS estimates that it will take from ten to fifteen hours to complete this application. This includes time for reviewing the instructions, gathering needed information, and completing and reviewing the form. . . .

After I stopped laughing, I guessed that this estimate is low by a factor of 10.

After completing the application, I began to think more about the implications of the actual time consumption. If approximately 4500 new and competing continuation grants are being funded this year (down from 6500, as I understand), and if (as rumors have it) the current funding cutoff is approximately the 15th percentile or below in most institutes, and if the true time to prepare each application is about 100 hours, I reach the remarkable conclusion that 3×10^6 scientific person-hours are expended each year in writing proposals, the full-time output of approximately 1500 people. This estimate is conservative; since it represents only proposals to the NIH and does not include the time spent reviewing the proposals, it is clear that a vast amount of scarce scientific resources are being consumed. When this much effort is wasted with so little result, the inescapable conclusion is that the system is broken.

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Conservation of Rare Plants

Philip H. Abelson's editorial on the medicinal properties of plants (2 Feb., p. 513) was very informative and helpful—one of the best I've seen on this important topic. As ranking Republican on the Senate Foreign Operations Subcommittee, I am working to eradicate the global development lending policies that are currently laying waste to many of these valuable resources.

We don't even know many of the rare species that are being destroyed, and unless we stop, the human race will pay a severe price for this neglect.

ROBERT W. KASTEN, JR.
Committee on Appropriations,
U.S. Senate,
Washington, DC 20510–4902

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