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.

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