

## LETTERS

### Limits of Scientific Growth

As one of the organizers of the International Forum of Young Scientists (a satellite of the World Congress of Science on 23 and 24 June in Budapest, Hungary), I hear more and more complaints from fellow researchers from all over the world about the increasing fragmentation of scientific knowledge. There is only a limited effort to achieve the appropriate balance between the discovery of new facts and finding their proper place and importance in the framework of science (1). Science itself is not self-integrating, and there are fewer and fewer people taking responsibility for "net-making." Undergraduates are forced to learn entire telephone books (disguised as textbooks), and graduate students often jump into the middle of a scientific problem having no one around to explain to them the place of their study in the whole of science. "Discussions" in papers relate new findings only to their "nearest neighbor"; review papers often list existing knowledge instead of structuring it; and scientific conferences have turned into information "stock exchanges" instead of places for evaluation and discussion. Grant applications follow one other almost uninterrupted; we are told it is better to publish daily than to perish; and a never-ending stream of technically correct, but shallow, papers make excellent technicians out of our Ph.D. students instead of true scientists.

Although databases, the Internet, and novel tools of information management help the synthesis of knowledge, they do not provide integration. We have no excuse. Using all the help around, we must keep up with the increasing information flow and meet the growing challenge of integration. Integration needs time and patience; it cannot be achieved in the hurry of our modern data factories, in the present frustrated scientific world, where "competitor" has replaced the old words "fellow," "trusted colleague," and "scholar." We should limit our competition. Groups working on parallel projects should seek joint publications instead of the duplicate, or even triplicate, articles appearing in several journals, including *Science*. The scientific community should slow down and observe the "limits of growth." More self-constraints should be exercised, and much greater credit should be given to those who make serious attempts to integrate their findings into the whole of human knowledge.

How can we give better support to this so-much-needed integration? Grant-giving agencies and bodies should set up more long-term (5- to 10-year) grants providing generous support to younger (age 35 to 45) researchers who have already proved their excellence. Such a system would give greater freedom to the best scientists in their most prolific period to open new research areas and to make fundamental discoveries. Grant peer-reviews should be restructured: more reviewers should be sought from fields not directly related to the exact discipline of the applications. A review from an open-minded colleague working in a distant field would give precedence to those applications that are clear and far-sighted enough to make sense to even the "alien" referee. More conferences should be organized where the 20-minute lecture plus 5-minute discussion scheme is changed to a 5-minute lecture (with a detailed summary obtained through the Internet before the meeting) plus a 20-minute discussion protocol (2).

I agree with Mott T. Greene (1) that "the compelling vision of the whole of science is crucial in maintaining cultural, political, and financial support for science." Moreover, to maintain science itself, it is crucial to maintain its sanity. In many respects, we should go back to the lifestyle of a 19th-century scientist to be able to respond to the challenges of the 21st century.

**Peter Csermely**  
Department of Medical Chemistry,  
Semmelweis University,  
Post Office Box 260,  
Budapest 8 H-1444,  
Hungary.  
E-mail: [csermely@puskin.sote.hu](mailto:csermely@puskin.sote.hu)

## References

1. M. T. Greene, *Nature* **388**, 619 (1997).
2. P. Csermely, *FASEB J.* **12**, 264 (1998).