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The Suggestions on Improving the NSFC Peer Review System

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NSFC's reputation as a responsible steward of public funds rests on the integrity of the proposal review process. It allows NSFC to earn the society's confidence by demonstrating that the agency is guided by principles of quality and merit when allocating the resources entrusted to it. The proposal review process is at the core of everything NSFC does, thereby deserving constant examination and improvement.

1 A definition of peer review

Peer review is the name given to the judgment of scientific merit by other scientists working in, or close to the field in question. Peer review is premised upon the assumption that a judgment about certain aspects of science, for example its quality, is a decision made only by those who are sufficiently knowledgeable about the cognitive development of the field, its research agenda, and the practitioners within it.

The Ideal state for operation of peer review is to have: (1) not severely constrained resources; (2) decisions by disinterested parties; (3) a large pool of peers; (4) well-defined disciplines; (5) a sole criterion of scientific merit.

2 Problems with competitive peer review

The system tends to be conservative (overall a good thing), but how to invest in some appropriate level of risk? Many applicants find that they get rejected when they try to cross disciplinary boundaries. Its disciplinary structure is inherently biased against interdisciplinary work. Conflicts of interests: (1) some reviewers take advantage of position by holding up or disparaging work of a competitor; (2) review results would change if reviewers were changed, just because of different views, or preferences; (3) program officer biases, it is getting harder and harder to recruit good program officers. Fund the best scientists judged by track record in research. There is excessive focus on publication quantity, which drives academics to produce excessive numbers of journal articles as opposed to other forms of output or activity.

3 Strategic inflection points for science management

Pure scientific merit is not the only criterion, and other factors also count: (1) national goals in basic research emerge after the Cold War; (2) for a long time, national goals in basic research were a secret because of the aims of the military; (3) today, science is driven not so much by disciplinary paradigms as by issues and problems that cut across disciplinary fields. Knowledge production is ever more mission-oriented as strategic research is performed .

Foresight-priority setting, foresight is a systematic means of assessing future global trends in markets and in the technological potential to identify generic technologies and their related scientific research, which will have long-term impacts on economic and social benefits. This is all about building a consensus between business, government and universities on the national priorities for research. Scientific priorities change, and the best way to manage the system will change too.

Performance evaluation, to support long-ternbasic research is clearly a job for governments. Governments' interest in the evaluation of scientific research has increased performance. Performance evaluation can force administrators and researchers promoting new programs not only to justify these new programs, but also to find ways to cancel existing ones. Under these circumstances, performance indicators are seen as a way to improve the decision-making process.

4 Perspectives and suggestions

NSFC's reputation as a responsible steward of public fund rests on the integrity of its peer review system. NSFC should have two goals in the allocation of its resources, one is to support first-rate research on the frontiers of knowledge, identified and defined by the best researchers; the second goal is a balanced allocation of resources in strategic research areas in response to scientific opportunities to meet national goals.

Advances in science and engineering are central to the aspirations of all nations. We need ideas not only from a broad range of specialties, but also from different geographic regions and from all cultures. Study on what criteria are really correlated with reviews, should encourage different standards for different levels of complexity. All the criteria are addressed by reviewers.

Scientific and engineering research is changing in the 21 century. In many areas of research, scientific progress requires the cross-fertilization of ideas, models and experimental platforms from many disciplines. Modern biotechnology has developed with contributions from a broad range of disciplines: biology, chemistry, physics, mathematics, engineering, and computer science. Nanoscale science and engineering (one of the potentially revolutionary technologies of 21 century) calls upon an equally diverse range of disciplines. NSFC should pay more attention to strengthen processes for identifying areas of opportunity and moving resources to them.