

「システム構築による重要課題の解決に向けて」 3.2.2012 JST/有本建男

- 単品、ばら売り、売り切り、モノづくりへのこだわり、良いものは売れる？、世界の潮流を見失う。
- 分野毎の個別知識、要素還元、縦割り、個別益
- 分析、観察、論文、PEER REVIEW
価値中立、研究自由

- システム、処方箋、こと作り、社会イノベーション
ハード・ソフト・サービスの統合、データ駆動
(例)都市、交通、水、医療、公共サービス
- 構成、俯瞰、学際、境界を越える、多様性、地域性、価値・文脈依存
- 構想力、構成力、デザイン、マネジメント、コミュニケーション、ネットワーク、collective intelligence
- 人材育成・工学部教育の改革: design and system thinking
- 課題解決issue-driven型へ
政策手段の改革(課題探索、ファンディング、評価法等)

「システム構築による重要課題の解決に向けて」

ーパネルディスカッションー

3.2.2012 有本メモ

○「システム科学の可能性を探る」

安岡氏：要素と全体、認識と設計

データ・情報・インテリジェンス・戦略

藤田氏：スマートシティ（環境・エネルギー、水、セキュリティー、ライフスタイル）、

ロバスト分散協調、全体最適、system of systems

○「システム科学へ何を期待するか」

藤原氏：全体俯瞰、想定内要素技術、集中と分散、

社会システム改革、サービスとしての運用

大畠氏：製品開発と社会システムネットワークとの連携、

全てが繋がりに変化する予測困難時代、

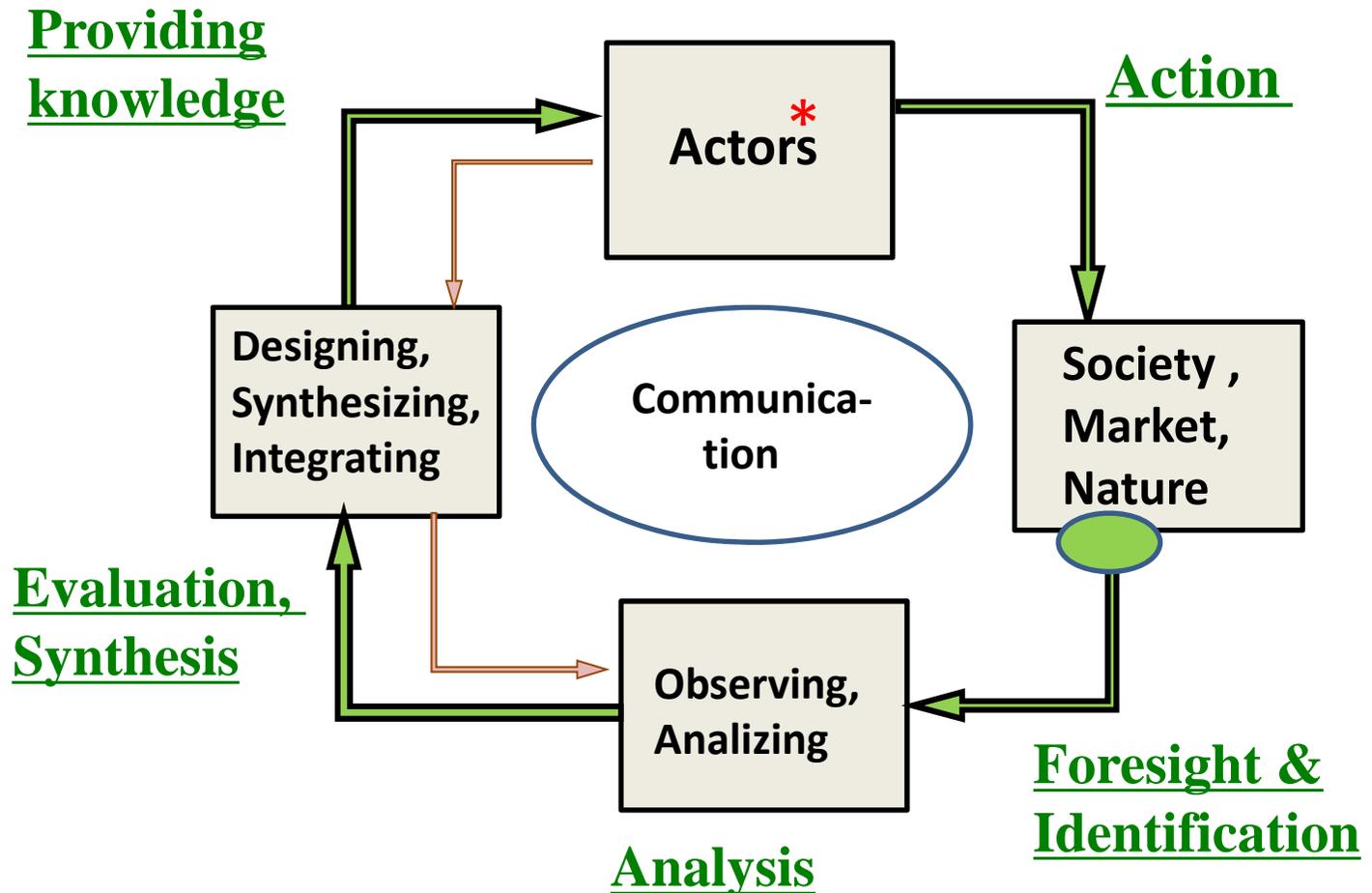
集団知と人材育成

桑原氏：国際競争力あるシステム構築、方法論、

発想法・思考プロセス、知の集積・統合

Basic Loop for Sustainable & Resilient Society – Role of Actors and Scientists

*
Actors in Society
citizens
statesmen
policymakers
businesspersons
layers
administrators
engineers
educators
writers
artists
journalists
etc...



Funding system for science-based national innovation system in Japan

Science

Market & Society

Diversity

curiosity-driven research ('bottom-up' research)

Scientific frontier
Technological seeds

Sprouting Phase

*mission oriented basic research
Exploratory & high risk research*

*"Exit" oriented R&D,
prototype, demonstration &
Social experiments*

JSPS

JST

NEDO

Valley of Death

backcasting

Creating new fields

Science

Technology

RISTEX/JST

Public sectors
NGO etc.

Intellectual & Cultural value

Social & Public values

Economic Values

Redesigning funding systems for issue-driven innovation

International competition and collaboration of funding systems

"Cloning" DARPA (DOD,DOH,DOE,DOEd,NIH), NSF&USAID FP#8(2014-2020), European Technology Platform (ETP), VINNOVA, ANR : Bridging the gap, Transformative research

THIS WEEK

EDITORIALS

OBESITY Prevalence of diabetes soars in the United Arab Emirates p.276

WORLDVIEW Spanish science faces trouble and terminal decline p.277

JET SET How the zebrafish got its stripes p.278

Tough choices

Scientists must find ways to make more efficient use of funds — or politicians may do it for them.

Scientists in the United States can find plenty of good news as they page through President Barack Obama's 2013 budget proposal. Despite substantial cuts elsewhere — and fierce pressure from Republicans to cut more — Obama called for healthy overall increases in both fundamental research and science education (see page 283).

But the good news, of course, is tempered by reality. Obama's budget document is one long struggle to balance two contradictory goals: to stimulate the lagging US economy and to curb the annual budget deficit, which is more than US\$1 trillion. Science and science education are widely viewed as helping with the first, and will doubtless continue to be seen as such no matter who wins November's presidential election.

The idea that science is a driver of prosperity is one of the few things on which the United States' bitterly divided political parties still agree. But the science funding agencies themselves are by no means immune to the second goal. The harder the cuts bite, the more those agencies will have to streamline their operations and merge or terminate programmes.

This week's budget proposal, which contains many references to "tough choices", shows that this process is already well under way. The Department of Energy (DOE), for example, wants to discontinue funding of several dozen projects that have not met their research milestones, or that seem otherwise unpromising. The National Science Foundation (NSF) is likewise cutting back on some \$66 million in lower-priority education, outreach and research programmes. The National Institutes of Health (NIH) has been ordered to pursue "new grant management policies" to increase the number of new grants by 7%. And NASA is being obliged to make drastic cuts to its Mars exploration programme so as to finish building its flagship James Webb Space Telescope.

Conceivably, this process could get even more drastic. Last month, Obama asked Congress to give him the authority to consolidate and streamline agencies on his own initiative — and suggested that one early application would be to transfer the National Oceanic and Atmospheric Administration from the Department of Commerce to the Department of the Interior. If Congress were to give Obama that power, it is possible to imagine him — or some future Republican president — sending all of the NSF's science-education programmes to the Department of Education, or merging the DOE's particle and nuclear physics research into the

NSF, under the guise of making management of science more efficient.

White House officials insist that no one in the administration is even contemplating such a wholesale restructuring. But the arithmetic of the deficit is unavoidable. Individual researchers, scientific societies and

"Researchers, societies and funding agencies can no longer afford to be purely reactive."

science funding agencies can no longer afford to be purely reactive, responding to each cut as it comes along. They need to be part of the debate, thinking systematically about how programmes and even whole agencies could be restructured to make them more efficient at using the scarce funds available, and more effective at promoting the best science.

To do that, and to address the increasing demands from politicians and voters for evidence that fundamental research is useful, scientists must also find better ways to measure the effectiveness of the nation's investments in science. The usual technique is to insist that principal investigators produce more and more reports, which tends to be a waste of everyone's time. A consortium of six universities called Star Metrics, launched in 2010 and headquartered at the NIH, has shown that it is possible to do better by using natural language processing and other tools to mine the data and reports that the agencies already collect. But even that is just a beginning. Researchers and research institutions need to help to devise still better measures — because if they don't do it themselves, politicians and others who know much less about science may very well do it for them. And who knows where that would end. ■

16 FEBRUARY 2012 | VOL 492 | NATURE |

EDITORIAL

Rethinking the Science System

AS THE U.S. BUDGET ENVIRONMENT FOR SCIENCE AND TECHNOLOGY (S&T) THREATENS TO GET WORSE, it is essential for the scientific community to go beyond just advocating for special consideration. There is a strong case for maintaining investments in S&T as a foundation for long-term economic growth and social well-being. But when resources are constrained, it is essential that they be used effectively and efficiently to avoid losing scientific momentum and to ensure that society will benefit maximally from S&T's potential. The scientific community cannot afford to simply adapt passively to reduced budgets. The impact of impending cuts can be at least partially mitigated by some fundamental rethinking of the ways in which S&T are both funded and conducted. Although the United States is used as the example here, the same issues will apply in many other parts of the world.

Some relatively inexpensive process and policy changes could make a big difference. For example, the Federal Demonstration Partnership has reported that 42% of an American scientist's research time is spent on administrative tasks. Much of that burden comes from redundant reporting and assurance requirements that vary across granting agencies and universities. The National Science and Technology Council, which represents all of the U.S. research funding agencies, should intensify its efforts to harmonize funding and reporting policies across granting agencies to reduce wasted effort. As another example, in the face of potentially lower success rates that could end up generating even more proposals to review, new forms of shorter grant proposals or the use of preliminary proposals might help greatly in reducing the burden on funding agency program officers, on already overworked peer reviewers, and on project investigators. New models of streamlined or batch-reviewed peer review might also substantially improve efficiencies.

Another large-discussion issue that should be addressed at this time concerns funding grants based on detailed project descriptions versus grants based primarily on the accomplishments of the investigator. In a time of very constrained funding, it is not the best use of an established investigator's time to require yet another detailed project description when a simpler approach might suffice for renewed funding decisions. The National Science Foundation's Accomplishment-Based Renewal is one such example, where the decision on whether to renew a grant is based on recent success, rather than on projects yet to come. In considering this kind of approach, it would be important to include mechanisms that avoid skewing review decisions so heavily in the direction of established investigators that young investigators see little opportunity in the system for them. In that context, another approach that should be considered involves putting limits on the number of grants and/or the amount of funding awarded to any single investigator. This would make more funds available for young investigators or those new to the field.

The time is right for a fundamental re-envisioning of the system. Crisis can breed opportunity as well as hardship. Some in-depth analyses of the U.S. S&T enterprise are already under way and can provide excellent starting points for continued discussion. For example, the President's Council of Advisors on Science and Technology is currently studying the U.S. S&T enterprise and writing a report. The National Research Council is nearing completion of a study on the future of research universities. The difficult decisions will, of course, ultimately be made by policy-makers, but these decisions must be informed by a broadly inclusive conversation among all the stakeholders — government agencies and other policy-makers, industry, academia, patient groups, and researchers. The National Institutes of Health has recently sought broad input on its efforts to manage in fiscally challenged times (<http://textus.od.nih.gov/dl/rock-talk>), and the S&T community should respond. Although consensus on the specifics may not be possible, the participants in the S&T system must all be willing to entertain truly bold and innovative ideas for moving forward in the new budget climate.

— Alan I. Leshner

10.1126/science.1212296



Alan I. Leshner is the chief executive officer of the American Association for the Advancement of Science and executive publisher of *Science*.



論点

- 課題の探索・設定
 - ビジョン・目標、科学と社会との架橋
- 具体的プロジェクトの形成
 - 研究体制(COE & NOE)、社会実装、
多様なステークホルダーの関与
 - 境界を越える:分野、組織、プロジェクト、国境
- ファンディングの仕組み
 - PD/PO、マネジメント体制と方法、評価方法、
“意思をもったファンディング”
- 科学的方法論・発想法、知識の集積・統合
- 人材の育成確保、教育