



IHTC
SINCE 1951

Room A, 15:50-18:10, August 14, 2014

Panel Discussion on
**The Role of Thermal Science in Meeting
Societal Challenges**

Panelists

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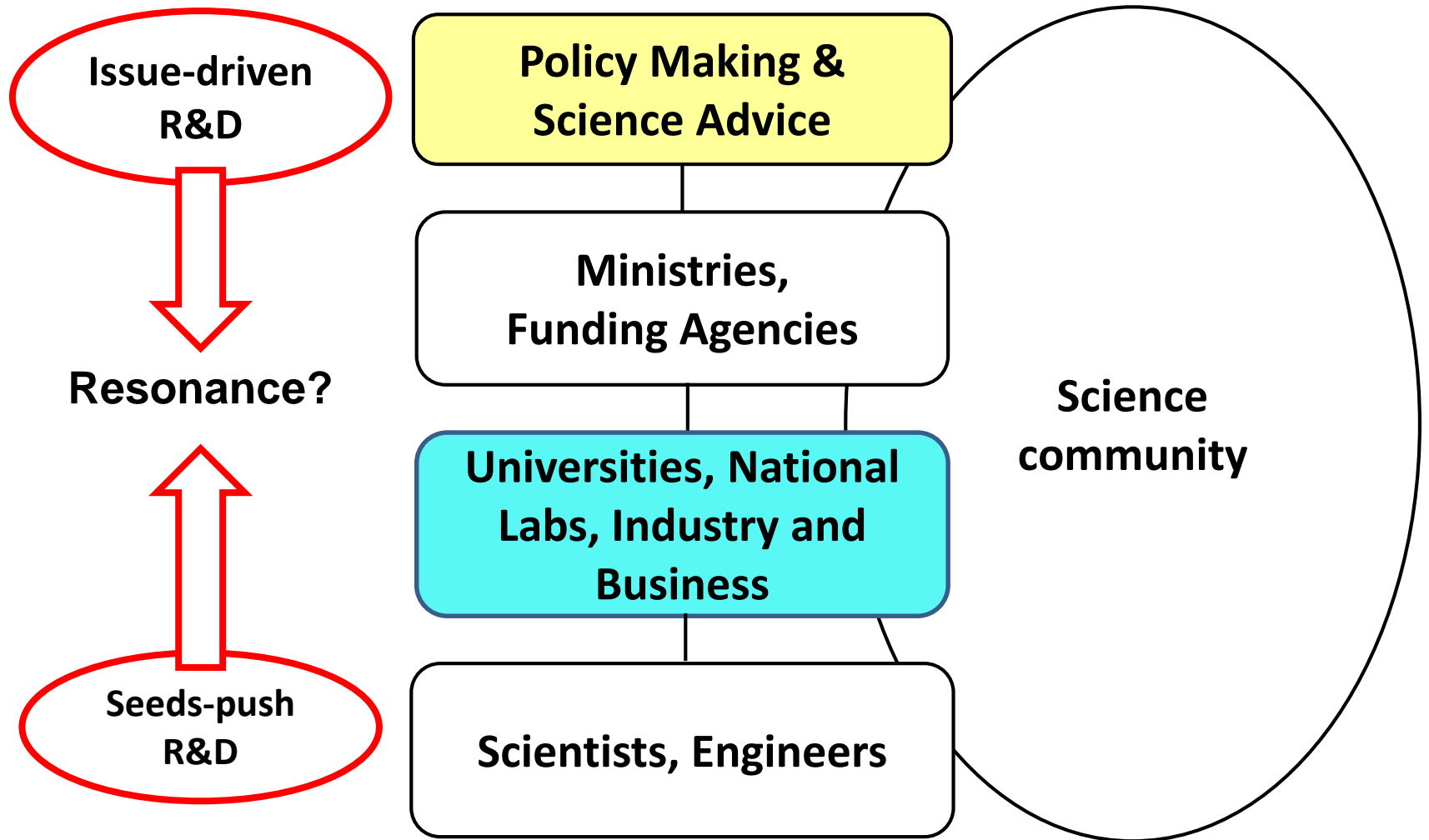
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Japan Science & Technology Agency / The University of Tokyo

Discussion

National Governance System of Science, Technology and Innovation



Question: Top-down vs Bottom-up ?

There is a trend that the research funding is formulated in a framework of **issue-driven (top-down) R&D** rather than **seeds-push (bottom-up) R&D** in many countries.

However, a dilemma exists

1. Can we justify research funding and acquire public trust by participating in top-down research?
2. How to design, legitimate, implement, evaluate and push forward issue-driven R&D?
3. How to cultivate and stimulate motivation of researchers and keep science autonomy under such policy environment?

General Discussion

The Message from the Panel

Messages from the Panel

- Needs for **transdisciplinary collaboration** in thermal science to meet societal challenges
 - ✓ **Integrating** fundamental thermal sciences with other disciplines (applied energy research, material sciences, ..., and in some cases mathematics, sociology, economics) is definitely needed for innovative and holistic solutions.
 - ✓ Transdisciplinary research is quite complex and has some **positive and negative** aspects and consequences.
 - ✓ A **good balance** between disciplinary and transdisciplinary research is needed as well as a good balance between **top-down** topic definition and **bottom-up** approaches.

Messages from the Panel (contd.)

- Focus on “**transformative energy technologies**” beyond pure heat transfer science
 - ✓ The pathway to a sustainable energy future will include the deployment of **transformative/disruptive technologies**.
 - ✓ The development of such technologies requires a holistic way of thinking across disciplines, accounting for **socio-economical geographical and political** realities: No single recipe.
 - ✓ The heat transfer community must **define and claim its (currently diffuse) role** in the competitive field of transformative energy technologies.

Messages from the Panel (contd.)

- Thermal science needs to be deployed to enable **sustainable and safe energy supply with least environmental impact**
- ✓ Must play leadership role in **environmental studies**. Should work with experts in environmental science and interact with government to guide policy. Articulate research needs.
- ✓ Should lead collaboration with material scientists and industry to develop cost effective methods for **energy storage** and for fabricating and implementing **renewable energy** systems.
- ✓ Major thrust needed on **reducing energy consumption** in energy intensive systems through **optimization**, with support from industry.
- ✓ Must get strongly involved in **safety issues** related to power generation and utilization. Results should translate into policy.

Messages from the Panel (contd.)

- Thermal engineering as a key in **green growth** as well as **environmental sustainability**
- ✓ It is necessary to carefully identify the upbringing technologies in thermal engineering for the potential green-tech business.
- ✓ A **strategic program** should be developed for the high quality research output from university to convert to tangible assets, and finally to the successful business.
- ✓ To create new growth engines, an **integrated approach** is necessary for coordinating R&D investment strategies, education, technology transfer for commercialization, and industrial collaboration with research institutions.

Messages from the Panel (contd.)

- **Renovation of teaching** thermal science: An urgent matter
 - ✓ Students, faculty and administrators should work together to fully **exploit new digital technologies** for faster information flow, interactive communication and evolving curricula.
 - ✓ To create **global knowledge capital** of thermal science we should continuously create an environment to teach thermal science and engineering to public and to scientists and engineers of other disciplines.

Messages from the Panel (contd.)

- **Issue-driven R&D strategy** better balanced to seeds-push strategy in meeting societal challenges
 - ✓ Identifying societal issues **free from traditional disciplinary boundary** and institutional interests
 - ✓ **S&T goals defined clearly** in terms of resolving the existing societal issues and implementing functions needed in the future society to justify public funding
 - ✓ Cultivate cross-disciplinary science and **dynamic interaction between basic and engineering sciences**
 - ✓ Promote collaboration of **industry-academia-government** leading to innovation