

Editorial & Letters

EDITORIAL

New Zealand's Foresight Project

How can governments best position science and technology policy while the knowledge revolution is driving profound changes in economies and societies around the world? What can small countries such as New Zealand, which account for only a tiny fraction of global science and technology investment, actually contribute to global knowledge? And what role should government play? These questions are at the heart of the Foresight Project, initiated in New Zealand last year to review priorities for public investment in research, science, and technology and to motivate strategic thinking about the future across New Zealand. The project could be a model for other small countries seeking to redefine relationships between government and industry.

New Zealand has a proud tradition of research, science, and technology. Our unique biological, geological, and climatic features have required science and technology that cannot simply be transported from elsewhere in the world. In addition, contributing to the global knowledge base has been an important part of building a national capability for locally interpreting and adapting international advances. Traditionally, government funding and institutions have dominated research, science, and technology in New Zealand, and public investment still accounts for about two-thirds of total research and development. Indeed, our private sector investment is among the lowest among countries in the Organization for Economic Cooperation and Development. New Zealanders also have a relatively low awareness of the benefits of science and technology, particularly its link to wealth creation, so it is vital that a public debate about the future direction of public investment in science and technology be tied to a general discussion about the role of new knowledge and technological change in meeting the needs of and creating opportunities for our society.

A public debate might address questions such as these: Who is responsible for providing public services that until now have been delivered by government? What as individuals, local communities, and citizens are we obligated to provide for the greater good? Where do we draw the line between public and private responsibilities? The process we undertake to answer such questions will be as dramatic as the answers themselves. In countries like New Zealand, dominated by small firms that have difficulty realizing the benefits of investing in new ideas, governments play an important role in research and technological innovation.

In the emerging knowledge economy, the role of government needs to be reconsidered. A new focus on fostering linkages and information flows and on building human capital needs to be achieved. There must be sufficient incentives to invest in knowledge creation. Governments must underpin innovation throughout all sectors of society, focusing on the needs of end users. The New Zealand Foresight Project provides a framework for various groups to think about their future and thereby define a context for the government's research, science, and technology investments. These groups—ranging from the fruit industry to local governments—are being asked four simple questions. First, describe your group's future strategic position and significance. Next, outline the key achievements or milestones that enable this position. Then, identify the new knowledge and technologies that these achievements require. Finally, review the investments required in terms of costs and benefits and articulate the expected relationship to government investments. The strategies for innovation that come out of this exercise will feed directly into the government's review of its goals and priorities for research, science, and technology investment.

In the knowledge age, developing "smart" policy will depend on engaging the wider community, drawing on extensive information, and fostering new ideas about how to address goals. This is not a task to be restricted to the academically or technologically elite. Instead, we need open and public debate about policy objectives and how they will be met. This debate must include people from all perspectives to ensure that social, ethical, environmental, and economic perspectives complement the technological perspective that scientists provide. Furthermore, the policy dialogue may itself foster the interaction between scientists and end users that is sorely needed to develop innovation in countries like New Zealand.

The success of the Foresight Project should therefore be judged by its impact on how various groups across New Zealand think about the future role of knowledge and technological change. It should also be judged on the basis of the associated changes in investments, partnerships, and competencies brought about to support our development as a knowledge society.

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LETTERS

Whose property?

A Brazilian senator argues for "recognition of the contributions and the resulting intellectual rights" of rural native groups in Brazil (below, right). International collaboration in high-energy physics is encouraged. And authorship of a ring laser design is discussed. Other letters discuss an entropy effect in virus formation, human iris morphology, a self-funding scientist, and gray whale research.



The Gentle Force of Entropy

On reading the Research News article by David Kestenbaum "The gentle force of entropy bridges disciplines" (20 Mar., p. 1849), I was reminded of the old saying, "What goes around comes around." The article reports that in the case of a suspension of two sizes of spheres, the larger ones aggregate spontaneously, thereby giving more space to the smaller ones—resulting is a maximization of the entropy of the system as a whole.

In the first (1960) edition of my book (1), I cited the peculiar phenomenon of tactoid formation by the rodlike tobacco mosaic virus [a 1941 observation (2)] as resulting from a kind of entropic force. As illustrated in a figure from that book, at a certain concentration, a solution of the virus separates into football (American)-shaped aggregates or tactoids in a thereby diluted solution of the remaining individual molecules. Papers by Onsager (1949)(3) and Flory (1955)(4) were cited. Here, asymmetry in shape rather than difference in size was involved.

The topic was retained in my second (1967) and third (1976) editions, but was dropped in subsequent ones [including the current sixth edition (5)], as no longer being of timely interest. In the Research News article, a 1958 paper by physicists is said to have given the first explanation of this type of entropy effect. It appears, however, that physical chemists, at least Onsager and Flory, led the way.

Arthur W. Adamson