

# New Agents of Action Addressing the Challenges to Humanity

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Last year saw Mother Nature demonstrate her meaner side. Japan was battered by one massive typhoon after another. Moreover, the typhoons followed a different course than in years past, cutting through Shikoku and causing much of the country extensive damage from high winds and heavy rains. The Chuetsu Earthquake in Niigata was also extremely intense. The devastation suffered by people in the affected areas there was unimaginable. These were outcomes of the immense forces of nature, forces that humankind is powerless to change. Once again, we were compelled to acknowledge the vast power of nature, and the reality that human populations are only able to live under “mild” natural conditions. In that respect, the very notion of “environmentally friendly” technology conversely seems to reflect a certain human overconfidence.

Still, humanity cannot afford to sit on its hands and do nothing when confronted by the hazards of nature. Because humans are not the most physically resilient species on the planet, we have prevailed over our adversaries by applying our powers of knowledge and wisdom. We have tamed wild beasts that once preyed on us, conceived of medical technologies to counter microbial agents of disease, built homes and other structures that are more resistant to the devastating forces of typhoons and earthquakes, and developed water management and flood control technologies that protect us from the ravages of swollen rivers. Thanks to these technologies, human populations today have a much safer environment in which to live than would have been possible against the many dangers faced by their ancestors eons ago. However, as last year’s catastrophes served to remind us, we have not yet done enough. It is accordingly with strong resolve that we strive to forge ahead, developing even newer technologies, building even stronger homes and embankments, developing even more effective medicines. In the process, though, we find ourselves confronted by yet another reality: namely, in the form of new problems stemming from the contradictions that technological overkill represents in terms of the laws of nature and the core ethical values we as human beings embrace. Is there any path that leads away from that contradiction? The road ahead is not clear to us, even as we strive to engineer new technologies. Nonetheless, we do face the expectation that we frame that road in clear terms even though we ourselves cannot ignore the fact that our research strategies are driven by hypotheses and theories.

## The Challenges for Humanity

If there is any utterance that concisely exemplifies the broadly shared goals of humankind today, it is probably the phrase, “sustainable development.” First and foremost, this expression comprises the challenge of finding solutions to the key problems currently burdening humanity: that is, by eradicating poverty, relieving people from the miseries of disease, reducing the impact of natural disasters, maintaining a climate of international order, preserving diverse human cultures, and closing the gap in access to information. This, moreover, is to be achieved while either preserving or improving the global environment, comprised as it is of the atmosphere, hydrosphere, lithosphere, and biosphere.

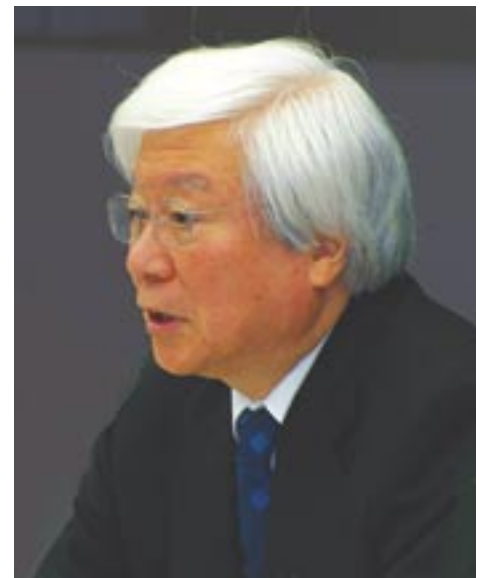
The challenge here is to find solutions simultaneously to two ostensibly separate sets of issues: the problems confronting humankind, and the task of protecting the natural environment. However, for our modern civilization, these seemingly disparate challenges have begun to display an interconnectedness. Indeed, there is a dark side to this mutual relationship that has confronted us with a new set of difficulties, in that any attempt to solve one set of problems could lead to an aggravation of the other.

Based on our current knowledge, at a minimum, finding solutions to the array of problems outlined above would presumably demand that we move forward with the application of available technologies, automation, the pursuit of increased affluence, and the assurance of security. In real terms, this means continued industrialization. However, it is already a known fact that industrialization without consideration for the environment is inconsistent with the need for environmental preservation. That said, the task of reducing carbon dioxide emissions into the atmosphere counts as a classic example of an environmental problem that will be difficult if not impossible to solve without adversely impacting industrial activities.

Humankind has no choice but to strive to simultaneously address both sides of this dichotomy. Not only that, but unless it begins that undertaking immediately, expectations are that grave dangers will loom ahead. As

matters currently stand, the world has yet to agree even on a program of action. Many international treaties, economic policies, and frameworks have been hammered out and put into effect to address individual problems. These steps have revealed problems and charted the course that should be taken, but in reality they have demonstrated only limited effectiveness. The world has not yet reached a consensus on strategies that will ensure the potential for sustainable development as a whole.

Given this state of affairs, so far, consensus has emerged only to a minimal degree: namely, the recognition that our knowledge of science and technology will be essential to realizing the goal of tackling human and environmental issues simultaneously. Nonetheless, many unknowns surround the questions as to which forms of scientific knowledge are needed, and how they should be applied.



## Research Strategy at AIST

AIST has just completed its first research phase and is preparing to enter the second. Currently it is putting together a research strategy that will serve as the foundation for the medium-range plan that will carry it through that second phase. This strategy is related to what we call “field strategy” which is the outgrowth of repeated reflection and debate, stretching back over the past two years, into the fundamental nature of AIST’s mission and strategy. Thanks to the intensive efforts of our formulation group, we now have a strategy that is taking tangible form. With this foundation, we have launched a research strategy workshop as the fourth round of our workshop series on “Full Research,” in which all AIST personnel take part. It seems worthwhile here to review and elaborate on some of the more noteworthy factors involved in the formulation of our research strategy.

In drawing up a new strategy, it is important that we aim first for a set of clear objectives. What is more, those objectives must be clear and understandable not only to us, but to all members of society at large. Second, it is imperative that we be certain about the specific resources we will be allowed to utilize in attaining those objectives. On this understanding, we then strive to identify and counter any factors that may pose obstacles to the attainment of our objectives.

AIST is a publicly funded institution. As such, it is a necessary condition that its research objectives be in the public interest and meet with societal expectations and approval. Assuming that society in general shares the expectation that science and technology be applied to the search for solutions to the difficult task of simultaneously addressing human problems and the need for environmental protection, it is natural for AIST to make that solution one of its objectives. In addition, given that poverty reduction and many other issues will hinge on industrialization-led improvements in standards of living, it seems evident that AIST should also adopt the goal of developing industrial technologies that will help humankind achieve a more harmonious balance between industrial progress and environmental protection.

Confronted with the challenges of sustainable development, industry can be expected to gradually evolve and adapt as it assimilates new technologies. That process will involve industry-specific adaptations as all industries strive for environmental balance, and may ultimately be compared with the industrial revolution that began some 200 years ago. If this is to be described as a new “industrial reform,” then it follows that AIST should adopt the goal of generating, through research, the technologies and knowledge that will bring this new industrial revolution to life.

If we think along these lines, it begins to become clear how AIST’s strategy should be developed. It should start with a detailed examination of current industrial conditions from the perspective of environmental balance mentioned earlier. Industry is creating wealth, but the issue is whether industry can respond as a whole to the ever-changing demands of environmental protection. Many companies have made independent strides toward this goal in recent years. Nonetheless, it remains to be seen whether industry as a whole, or at least at its core, will steadily adapt in the interest of achieving environmental balance. Gauging the level of industrial adaptation toward this goal, moreover, will provide us with information as to which technologies are needed or in short supply. That information in turn will help to define the technology-related challenges that should be addressed by new research.

Next, the research required to solve these technology-related challenges must be remolded into a strategy for the implementation of substantive AIST research projects. It is hoped that this will be a strategy framed in the creative language of science, and worthy of the effort by the many highly qualified scientists at this unique institution to devote their fullest abilities as aspiring researchers who share the same lofty goals.

Through this approach, AIST will acquire a harmoniously structured strategy that upholds goals reflective of the demands and expectations of society, and that on that basis enables AIST researchers to achieve those larger goals collectively through the research accomplishments they amass on the basis of individual research incentives.

# Research Strategy and “Full Research”

Let me reiterate here that a balanced research strategy as described above will be conditioned on the implementation of “Full Research.” This ties in with issues that were debated during our previous series of workshops. During those sessions, I explored the processes by which Type-I basic research themes may be shaped by Type-II basic research or product development-related research, and argued that the themes so derived may differ from the themes that arise from traditional disciplines, and that as a result, the potential to seed new and innovative scientific research is huge. In actuality, this same perspective or spin applies to the task of formulating the research strategy I touched on earlier. Consequently, the basis for balance or harmony here is that the research strategy for AIST as a whole overlaps with the research strategies pursued by each research unit or individual researcher.

At this point, I would like to devote attention to the relationship that AIST and its researchers have with society. AIST has a research strategy similar to the concept of “Full Research.” In the eyes of society at large, researchers are usually not thought of as “agents of action.” An agent of action in this context is a person who provides society with a direct impact or benefit of some kind. This person may be an educator, politician, administrator, entrepreneur, engineer, physician, reporter, artist, novelist, or someone else who is directly involved within a certain social sphere, elicits an impact of some kind, and assumes responsibility for that impact.

By contrast, scientists are engaged in the generation of knowledge. In itself, that knowledge does not have any impact on society. It is only when that knowledge is applied by someone that it has a societal impact of some kind. Accordingly, this step requires the presence of an intermediary — a user who is an agent of action. Moreover, it is expected that this user should assume responsibility for the resulting societal impact. Scientists are not in a position to be accountable for each and every effect or impact stemming from the utilization of the knowledge they generate. Hence, the social responsibility of a scientist is

considered to be fulfilled by the pursuit of research and the provision of appropriate counsel to society. Appropriate counsel must be counsel that is neutral and conditioned on the consent of the scientist. This is a fairly stringent code of conduct that applies to the scientific community at large, and to be sure, counsel based on this code is something that society needs. Furthermore, the condition that scientists not be directly engaged in having a social impact is something that in return guarantees them social freedom to engage in the research they choose.

However, if there are any researchers at AIST who have doubts about this perspective on the scientist’s role, I want to welcome and encourage you. Such is the nature of a researcher who has the courage to break out of the traditional mold or stereotype of the scientist and step into a new realm.

Actually, this idea is already integral to the concept of “Full Research” and the research strategy I mentioned earlier. When a scientist contemplates the objectives he or she shares with society in putting together a research strategy, and thinks about the perspectives within the scientific realm that derive from those objectives, he or she is beginning to assume a newfound sense of responsibility for the impact that his or her research accomplishments may someday have on society in the hands of a user, even if those accomplishments amount to nothing more than a set of purely scientific data. Furthermore, it is unlikely that researchers involved in “Full Research” will feel anything at all unnatural about the sense that they have a certain responsibility due to their involvement. Above all, they will have fully demonstrated this sense of responsibility if they decide to launch a new business venture based on the accomplishments of their own research.

As individuals who have chosen a social role that is rooted in the pursuit of “Full Research” by becoming new agents for action in society, we are putting into practice the now increasingly accepted modern understanding of science as an integral part of society.