1. Introduction

One year has passed since the inauguration of the National Institute of Advanced Industrial Science and Technology (AIST) as an independent administrative institution. Currently our research units are making steady progress in their work, and results are beginning to appear as much as we had anticipated from the outset. In addition, we have expanded our intellectual property program, launched a new venture assistance program, set in motion various AIST-initiated ventures, and begun other projects. We believe these efforts have put us on the path toward the New AIST. This document outlines the AIST annual research plan for FY2002.

2. Main Elements of Our 2002 Research Plan

A. Life Science and Technology (Table 1)

The Basic Biotechnology Research Program for Health Maintenance and Improvement includes bioinformatics research, analytical research on the structures and functions of proteins and genes, and research on glycogenes. The Green Biotechnology Program includes research on environmental biotechnology, and the Development Program of Medical and Welfare Apparatus for Healthy Life Extension comprises regenerative medical engineering as well as research and development of medical and welfare apparatus.

B. Information Technology (Table 2)

As part of the Program for Upgrading the Telecommunications Foundation of the Ministry of Economy, Trade and Industry (METI), AIST is slated in 2002 to participate in the research and development of technologies for network computing, organic semiconductors, nonvolatile magnetic memory devices, and high-frequency devices. Under this program, we will develop: technologies to make integrated use of large, distributed collections of data and sensor information; low-power-consumption semiconductor devices to use in highly convenient portable equipment; and next-generation wireless network devices operating at over 20 GHz.
In the area of consumer-support interface technology, we are researching how to infer a user's intentions by using sound and images, nonverbal information such as nods and other responses, and user location. AIST is using software verification technologies and research on Web and mobile equipment security to create systems that are secure, worry-free, and highly reliable. We will also use open-source software methods, which are in the spotlight because of Linux, to develop a high-quality software base with the goal of business use. In the Program of Next-Generation Semiconductor Device Process Technology, launched in 2001, the completion of a super clean room will further the centralization of research and development, making this a year that promises great accomplishments leading to industrial application.

C. Environment and Energy  (Table 3)

Our priority research areas will be: for global warming, technologies to reduce global warming agents, technologies to raise the efficiency of and to distribute energy systems, and environmentally friendly production process technologies; for pollution, chemical substance risk management and reduction technologies; and for a stable energy supply, cleaner and more diverse energy sources. Another priority research area that AIST will add is techniques for the integrated assessment of environmental and energy systems, of which life cycle analysis (LCA) is a representative example.

In 2002 AIST will participate in the Ministry of Economy, Trade and Industry’s research and development program, which addresses the priority research areas mentioned previously. Development efforts will focus especially on chemicals risk assessment methods, ultra low loss power device technologies, hydrogen energy and fuel cells using various fuels, energy-conserving process technologies, superconducting technologies, and other areas, as well as development in areas including diesel exhaust control technologies, contaminated soil remediation technologies, development and assessment of substitutes of fluorine compounds, and LCA methods. From a medium- and long-term perspective, AIST will also start new research and development work on methane hydrates, biomass, and advanced energy network technologies. In performing this research, there are plans for positive crossover initiatives such as environmental information technology.
D. Nanotechnology, Materials and Manufacturing (Table 4)

In 2002 the Nanotechnology Program will include the Nanostructure Polymer Project, the Synthetic Nano-Function Materials Project, Nanotechnology Glass Project, and the Nanotechnology Material Metrology Project, and the program will work on developing the technologies for devices and materials operating on new principles, measurement and assessment methods that will underpin the advance of nonatechnology, simulation techniques, and material structures that display innovative physical properties. Other research includes synergy materials for the development of material production system technologies, and the Digital Meister Project, which is concerned with key technologies for manufacturing. We will also work on developing carbon nanotube technologies that hold promise for a wide variety of applications such as hydrogen storage for fuel cells and the materials for ultra-low-voltage wall-mounted displays. Through these and other initiatives, AIST aims to play a leading role in nanotechnology, which is currently in the world spotlight.

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Table 4 Main Projects in Nanotechnology, Materials, and Manufacturing

- **Nanotechnology Program**
  - Nano-Materials and Processing
    - Nanotechnology Carbon Project (1)
    - Synthetic Nano-Function Materials Project (2)
    - Nanostructure Polymer Project (2)
    - Nanotechnology Glass Project (2)
    - Nanotechnology Material Metrology Project (2)
  - Nano-Manufacturing and Measuring
    - Nano Crystal Integration Ceramics Project (1)
    - 3D Nanoscale Certified Reference Material Project (1)

- **Innovative Component Industry Program**
  - Innovative Material Processing
    - Materials Creation and Processing for Precision Components Project (1)
    - High-Precision and Energy-Saving Molding Process for Functional Metallic Materials (Metallic Glass) Project (1)
  - Material Production Systems
    - Other (a related project)
      - Synergy Ceramics Project (2)

- **Reduce-Reuse-Recycle (3R) Program**
  - 3R Key Technologies
    - Development of Recycling Technologies for Construction Wastes/Glass, Etc. (2)

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Figure 1 AIST’s Potentials in Geological Survey and Geoscience, Marine Science and Technology

**Basic information on the territory**
- Basic maps: Geological maps of land and marine areas
- Thematic maps: Volcano scientific information maps and active structure maps; urban geology maps; mineral resources maps
- International geological standards; comprehensive data center for geological information
- Safety of Japanese islands
- Disaster prevention of earthquakes and volcanic eruptions
- Predicting damage from earthquakes and tsunamis

**Environment**
- Geo-sphere environments
- Marine environments
- Stratrum disposal of high-level nuclear wastes

**Resources and energy**
- Gas hydrates
- Mineral resources on the ocean floor

**Provision of earth sciences information on safety of the territory and its natural environment, mineral and energy resources**
AIST will carry the activities over into 2002: (1) the preparation of comprehensive and systematic basic earth sciences-related maps, including 1:50,000-scale geological maps and 1:20,000-scale geological maps of land and marine areas; (2) the preparation of maps related to the earth sciences, including active structure maps and active fault strip maps, maps for predicting damage from earthquakes and tsunamis, geological maps of volcanoes, and volcanic scientific information maps; and (3) the preparation and provision of geological information. AIST will carry out surveys and research on earthquakes and active faults, volcanoes, and deep geological environments, and use the information for purposes such as predicting disasters. In addition, we will conduct exploration for, and the assessment and development of, geothermal energy and coal-seam gas, as well as minerals and methane hydrates in the earth's crust or on the deep sea floor, and other energy and mineral resources on the sea floor or in sea water, and we will develop technologies to extract them. The Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP) is striving toward sharing geological information throughout East and Southeast Asia, and AIST serves as the managing Asian body for the International Consortium of Geological Surveys (ICOGS), the Commission for the Geological Map of the World (CGMW), and other organizations.

In 2002 AIST aims to begin providing a total of at least 30 new standards from among the 158 standards to be provided under our medium-term target. These include at least 10 physical standards and at least 20 reference materials. In this way, AIST will try to begin the early provision of reliable measurement standards based on the government's standards development plan. To build a sustainable and stable system to provide measurement standards, and to assure compliance with international standards, AIST also intends to obtain proof of compliance with ISO/IEC 17025, and in order to build a quality assurance system complying with ISO Guide 34, AIST plans to complete accreditation in over 60 reference materials. In the area of measurement standards and measurement and analysis technologies, AIST will also be using the Nanoscopic Measurement Technological Infrastructure Project to work on research and development for next-generation standards, and, by means of the Remote Calibration System Based on Information Technology Project, will attempt to become a world leader in research for developing a network-based standards provision method. Further, in addition to promoting international mutual approval for measurement standards and legal metrology, we will represent Japan in the international efforts for this purpose. AIST's international cooperation includes managing the Asia-Pacific Metrology Programme (APMP) and the Asia-Pacific Legal Metrology Forum (APLMF), and technical cooperation with Thailand.