

## Overview of Laboratories

NHK Science & Technical Research Laboratories (NHK STRL) is the research arm of Japan's public broadcasting corporation, Nippon Hoso Kyokai (Japan Broadcasting Corporation). STRL was established in 1930, five years after NHK launched Japan's first radio broadcasting service. For over 70 years, it has specialized in research and development of broadcasting and related technologies. STRL will continue to promote broadcasting in the 21st century. Its new research facility was opened in April 2002.

### Research Activities

STRL's overall goal is to facilitate the creation of a new broadcasting culture. To do so, we feel it is important to study emergent technologies and to improve current broadcast technologies. Our activities range from fundamental research on human vision and audition, physics, and materials science to the development of complete broadcasting systems and services.

#### ■ Advanced ISDB

Research on ISDB (Integrated Services Digital Broadcasting) is intended to provide broadcasting services that will enrich the viewer's cultural life. BS digital broadcasting, which was launched in 2000, is one example of ISDB. One focus of our ISDB research is *seamless services* (seamless programs use several transmission media and can be accessed any time and anywhere) and home information networks (television-centered services that use a large-capacity home server to store television programs).

Another important research focus of ISDB is *barrier-free information technology* that makes the wealth of services available to everyone.

#### ■ Contents production technology

Research into *'intelligent', efficient contents production* is meant to reduce the cost and to ease the technical burden of television program production that often limit the choices of producers and talent in creating new audiovisual expression. Additionally, this research has yielded equipment for live broadcasting of breaking news, including super-sensitive cameras and small, lightweight devices for news gathering and transmission. This reflects NHK's responsibility as a public broadcasting organ to supply precise information to viewers to help protect lives and property in the event of disaster.

#### ■ Future broadcasting service and fundamental technology

Research on *'super-surround' audio visual systems* includes an ultrahigh-definition system (4000 scanning lines) that outperforms HDTV in terms of picture sharpness, auto-stereoscopic television, and a 3D acoustic system.

The development of *new transmission technology and frequencies* centers on the use of the frequency band allocated to broadcasting satellites (21 GHz and above).

*Materials and devices* research may lead to technological breakthroughs giving rise to radically new broadcasting services. Research topics include small ultrahigh-sensitive image pickup devices, foldable displays, and very small super-dense recorders that can record HDTV pictures for hours.

### Topics

#### New Director-General



As part of personnel changes announced on June 3, 2002, Dr. Sei Miyake has become the new Director-General of STRL. Dr. Miyake joined NHK in 1970. He has held successively the titles of director of Human Science of NHK STRL, Deputy Director-General of NHK STRL, and Associate Director-General of the Corporate Planning Bureau of NHK. His major fields of expertise are image processing, image recognition, human interface and computer science.

#### ORGANIZATION

##### NHK Science & Technical Research Laboratories

###### Planning & Coordination

Planning and management of research work, international correspondence, public relations on research issues

###### Multimedia Services

ISDB services, next-generation program production ...

###### Digital Broadcasting Networks

Terrestrial ISDB, optical fiber transmission systems, ...

###### Digital Satellite Broadcasting Systems

BS digital transmission systems, millimeter-wave systems, ...

###### Advanced Audio & Video Coding

Next-generation digital compression systems, multimedia coding, ...

###### Three-Dimensional Audio-Visual Systems

3-D images, 3-D sound systems,...

###### Human Science

Human-friendly broadcasting, image and speech recognition technology, human interface, ...

###### Recording Technology & Mechanical Engineering

Ultrahigh-density recording, mechanical engineering, ...

###### Advanced Imaging Devices

Imaging devices, IC devices, ...

###### Display and Optical Devices

Display devices, optical devices, ...

###### General Affairs

General affairs and personnel

Personnel:291

**Seamless service**

**Terrestrial digital broadcasting**

Digital terrestrial broadcasting can be viewed, not only on a regular TV set, but also via an automobile receiver or from a portable terminal.



**Barrier-free information technology**

**Captioned broadcasting service for the hearing-impaired**

NHK has been expanding the scope of captioned broadcasting for the hearing-impaired. A recent example is "News 7," a news program in which the announcer's words are subtitled by an automatic subtitling machine that uses voice recognition technology developed by STRL.



**Intelligent, efficient production system**

**Face Recognition technology**

When a facial image is entered into this system, it retrieves video scenes containing the specified subject. To do so, indexing data is attached to each video scene.



**Automatic program production**

A system that automatically produces television programs from scripts written in the TV-making language (TVML) is being developed. In a language education program, for instance, a human operator only needs to insert individual topics into the script template; the system will then automatically produce the rest of the program.



**'Flexible' production system**

**Image-based virtual studio**

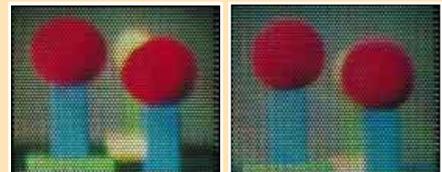
An extremely realistic video image can be created through the composition of a CG image, a background image, and the images of the performers. This natural production system uses light that is visible to the performers but not to the camera.

**Super-surround audiovisual broadcasting system**

**Stereoscopic television system**

The viability of the binocular 3D HDTV system has been proven in many demonstrations. To eliminate the need for viewers to wear special glasses, our research team has developed a hardware prototype based on real-time integral photography (IP)\*.

\*Integral photography: An image-forming method that uses an array of small lenses.



**Development of new transmission technology and frequencies**

**Next-generation satellite broadcasting system**

The 21-GHz band, which is expected to be utilized by advanced satellite broadcasting systems in the future, shows significant rain attenuation for satellite broadcasting signals. Our challenge is to overcome this problem.

**Materials and devices**

**HARP image pickup technology**

With 100 times the sensitivity of an ordinary camera, the HARP (High-gain Avalanche Rushing amorphous Photoconductor) pickup tube is used in emergency broadcasting and other applications. A new prototype imaging device, a field emitter array image sensor with HARP target, has been developed by STRL with the aim of achieving an ultrahigh-sensitivity compact camera.



**Flexible display**

A flexible, rollable, display device can be made from a liquid crystal film. Research continues on a new film structure that combines polymers with materials such as high-molecular organic EL and ferroelectric crystals. The hope is that such displays will be foldable.



**High-speed recording on a phase-change optical disk**

An optical disk is a recording medium that has superior ease of handling and random access capability. Our research focuses on developing a disk camera that can record news materials for about 20 minutes at the transfer rate of 200 Mbps.

