Introduction to Akita University
Located at latitude 40-N, same as New York, Peking, Madrid.

Japan Sea

Pacific Ocean
World Famous Lantern Festival of Akita in early August
Akita is known for

- Udon noodle
- Akita Dog
- Kiritampo
- Namahage
Akita is known for:

- Kanto Festival
- Fireworks Competition
- Kamakura- Snow House
- Shirakami Forest (World Heritage Site)
- Cherry Blossom in Kakonodate

Images:
- http://blog.goo.ne.jp/mizukawa-tomo/e/7f2760a23385274d7e054e5a668cb635
- http://www.yokote-kankou.jp/?p=10221
- http://meito.knt.co.jp/1/cb/20202001/1
- http://www.takashimakanko.com/02/84.html
Akita University

Front View of Administration Building
Front View of Administration Building at Tegata in Winter
May, 1949 Founded through Amalgamation of *Akita Teachers College* established in September of 1873, and *National Akita Mining College* established in March, 1910

April, 1965 Established Graduate School of Mining and Engineering

April, 1970 Added School of Medicine

April, 1976 Established Graduate School of Medicine

April, 1989 Established Graduate School of Education

April, 2014 Established Faculty of International Resource Science, Faculty of Engineering Science
UNIVERSITY STAFF

AS OF MAY, 2013

Academic Staff  651
  Professors  178
  Associate Professors  149
  Lecturers  74
  Assistant Professors  163
  Teachers at Affiliated Schools  87

Management Staff  1,032
  Administrative Staff  267
  Technical Staff  86
  Medical/Hospital Staff  717

Grand Total  1,721
Undergraduate: 4,560
Graduate: 597

International Students: 194
Undergraduate: 149
Graduate: 45
Akita University being Upgraded

4 Undergraduate Faculties from April 2014

New Faculty of International Resource Sciences
Dept International Resource Sciences
Dept School Education Dept Regional Studies and Humanities

Faculty of Education and Human Studies
School of Medicine School of Health Sciences

Faculty of Medicine

Faculty of Engineering and Resource Science
Dept Life Science Dept Materials Science Dept Mathematical Science and Electrical-Electronic-Computer Engineering Dept Systems Design Engineering

3 Undergraduate Faculties Currently

Faculty of Education and Human Studies
School Education Regional Studies International Language and Culture Studies Environmental and Mathematical Sciences

Faculty of Medicine
School of Medicine School of Health Sciences

Faculty of Engineering and Resource Science
Graduate School of Engineering and Resource Science

for Master Degree:
  Dept. of Earth Science and Technology
  Dept. of Applied Chemistry
  Dept. of Life Science
  Dept. of Materials Science and Engineering
  Dept. of Computer Science and Engineering
  Dept. of Mechanical Engineering
  Dept. of Electrical and Electronic Engineering
  Dept. of Civil and Environmental Engineering

for Doctorate Degree:
  Dept. of Geo-sciences, Geo-technology, and Materials Engineering for Resources
  Dept. of Advanced Materials Engineering
  Dept. of Production and Civil Engineering
  Dept. of Electrical, Electronic and Computer Systems Engineering
Vision of the Undergraduate to Graduate school of International Resource Sciences

- 2012: Start Establishment of New Faculty “International Resource Sciences”
- 2014: Start Master Course
- 2018: Start Doctor Course
- 2020: Progress of Global Resources Education

Global Challenges on Resource Development

Leading Doctorate Degree Program on Resources
New Faculty: “International Resource Sciences”, Akita University
Mining Museum, Akita University
Mining Museum, Akita University
New Faculty of International Resource Sciences

i) GOJ’s approval to launch in April, 2014.
ii) Aiming at practice-oriented education for student capable of engaging in highly competitive resource businesses in the world.
iii) Composed of three Departments of Resource Policy, Geo-science, and Geo-environmental engineering with the annual intake of 120 students.
ix) All courses will be given in English from 3rd year.
x) Becoming national center for Resource Education and Research in a close linkage with GOJ, universities, and private sectors.
xi) Overseas experience and internship of students is integral part of education program.
International Center for Education and Research on Energy and Mineral Resources

i) Established in 2010.
iii) Additional Academic Staff Granted by GOJ (Ministry of Education)
iv) One Month Short Stay Program in Akita Consisting of Two Weeks of Lectures and Two Weeks Laboratory Work Training For Graduate Students from Partner Institutions.
Leading Doctorate Degree Program on Resources

i) GOJ initiative to produce globally capable and competitive Doctorate Degree holders in the field of Resources.

ii) Total of 10 students per annum are admitted to the program in which they are expected to undertake 5 consecutive years to complete.

iii) Seven year Program starting in October 2012, with a budget of about 2 million USD annually.

ix) Interdisciplinary education with the participation of entire Faculties and Departments of Akita University.

x) Significant needs in collaboration with partner universities both locally and internationally.

xi) After the end of seven years, in 2019, the program will be incorporated into New Faculty of International Resource Sciences.
MEXT (Monbukagakusho) Scholarship Slots for International Students exclusively for PhD Program at the Department of Geo-sciences, Geo-technology, and Materials Engineering for Resources

i) GOJ’s approval to launch in October, 2014.

ii) All courses will be given in English.

iii) Total of 3 students per annum are awarded in addition to self-funded 3 students including scholar from their host country and from JICA.

iv) Priority will be given to applicants from MOU partner universities in SE Asia, Central Asia and Africa.
Collaboration with JICA (Japan International Cooperation Agency)

i) MOU for Human Resource Development on Resources signed in November, 2013.

ii) “Partner on Resources” Projects Scholarship from JICA to be awarded to applicants from SE Asia, Oceania, Central Asia and Africa for master and PhD program.

iii) “ABE” Initiative Scholarship from JICA to be awarded to applicants from Africa for master program.

iv) Other scholarship under bi-lateral projects funded by JICA (currently from Afghanistan, Mongolia and Pakistan, previously from UNHAS).
Partner Universities in Resources

- Freiberg University of Mining and Technology, Germany
- Lulea University of Technology, Sweden
- Mongolian University of Science and Technology
- East Kazakhstan State Technical University
- University of the Philippines, Diliman
- Chulalongkorn University, Thailand
- Institute of Technology Bandung, Indonesia
- University of Malaya
- University of Yangon, Myanmar
- Montana Tech, University of Montana, USA
- Memorial University of Newfoundland, Canada
- Curtin University, Australia
- (University of Witwatersrand, South Africa)
- University of Botswana
- Botswana International University of Science Technology
National center of Research and Education on Resource Sciences

Partner Universities in Japan
University of Tokyo, Tohoku University, Waseda University, Kyushu University, Kumamoto University, and others

Companies
METI, JOGMEC, Metal Mining Companies, and Petroleum Exploration Companies.
Provisional Schedule/Program
DAY 1
arrival of participants, check-in their hotels,
in the evening, ice breaker

DAY 2
AM Opening Session (including opening remarks, etc)
lunch at university cafeteria
PM Sessions for presentation by the participants
in the evening, reception/dinner at a hotel banquet room

DAY 3
AM Parallel Sessions for discussion on networking, mobility, etc.
lunch at university cafeteria
PM Closing Session to summarize parallel sessions on networking, mobility, etc.
after closing session, visit university’s Mining Museum
in the evening, reception/dinner at a hotel banquet room

DAY 4
Excursion to Kosaka, Osarizawa and Hachimantai
After Kosaka Mine Office, break into three groups, (1) urban mine/recycling smelter at Kosaka, (2) Osarizawa vein deposit underground mine visit, and (3) Tamagawa hydrothermal vent and Sumikawa geothermal power plant.
return to Akita by evening.
Dinner will not be organized by the host.

Day 5
check-out hotel, and departure to each destination.
Invitation to World Forum of Universities of Resources on Sustainability 2015
Akita, Japan
September 2015

Timing: September 2015
Venue: Akita University, Japan

Accommodation: to be booked by participants (we will provide a list of hotels in the city)

Transportation: to be arranged by participants
  air: nine (9) flights per day from Tokyo Haneda Airport (1 hour)
    operated by All Nippon Airways (Star Alliance) and Japan Airlines (One World)
    also from Osaka and Nagoya
  international flight from Incheon, Korea three (3) times per week (seasonal for 2014)
  train: high speed train every hour direct from Tokyo central station (3hr 45 min)

We will collect registration fee (tentatively estimated USD-250 per participant)
The fee will cover
  ice breaker on the 1st day of arrival of the participants
  reception/dinner of the 2nd day and 3rd day to be held at a hotel banquet room
  excursion cost including bus, lunch, entrance fee to the Osarizawa mine
Why Akita? Home of Kuroko (VMS) Deposits

Japan: Located along the Ring of Fire: Western Pacific Subduction Zones
Epithermal Au and VMS (base metal) deposits but no porphyry Cu deposits

Hedenquist et al. (2000)
Mineral Resources in Japan

large production of both base metal and gold ores in the past

but only one major active mine currently for gold
  Hishikari low-intermediate sulfidation vein-type gold deposit
  (370+ tons of gold)
with small production from
  Kasuga, Iwato and Akeshi high-sulfidation gold deposits

all base metal mines have been closed
  vein (e.g., Toyoha Ag-Pb-Zn-In)
  skarn (e.g., Kamaishi Fe-Cu, Kamioka Pb-Zn)
  VMS (Kuroko: Hanaoka, Kosaka etc Cu-Pb-Zn)
  (Besshi Cu, Hitachi Cu)
Japan imports ores/metals from the world (JOGMEC)
Number of mines operated in Akita Prefecture in the past = 238

Number of mines operated in the Hokuroku district = 116

Mineral, Oil and Gas Resources in Akita Prefecture

- Au-Ag vein
- Cu-Pb-Zn vein
- Kuroko Stockwork
- Limonite
- Mn deposit
- Oil and gas
History of the Kosaka Kuroko mine

(1861) Discovery of Kosaka deposit by a farmer, Mr. Kobayashi
(1865) Operated by local government
(1869) Operated by the central government
(1897) Electricity installed (first in the prefecture)
(1900) Smelter completed
(1903) 5,400 Employees, 213,098 t of Ore Produced
(1906) Largest Smelter in the World Completed
(1907) Largest Production in Japan
(1908) Hospital Completed
(1945) Operated by Dowa Mining, rehabilitated
(1959) Discovery of Uchinotai Deposit (orebody) followed by other major discoveries
(1989) Subsidery company, severe condition due to currency exchange rate
(1990) Closure of Uchinotai mine (Kosaka)
(1996) Closure of Matsumine and Fukasawa mines (Hanaoka)

Smelting imported ores

Current Operation for Recovery of Metals from Electronic Devices (Urban mine collaborated with Akita University)
Former Kosaka Mine Office
View of Kosaka Refinery (Smelter)
Distribution of Kuroko deposits

Hokuroku Basin

Hokuroku District

Kosaka

Hanaoka
1st Stage Opening started in 20 Ma

2nd Stage Opening Around 15 Ma

Opening of the Japan Sea and Plate Tectonics (Otofuji, 1996)
**Kuroko = black ore**

- kuro = black
- ko = ore (or mineral)

black colored polymetallic massive sulfide ore

Where and When were the Kuroko deposits formed?
- Formed on the Sea Floor of Backarc Basin
- Base Metal Sulfides Deposited from Venting Hydrothermal Fluid
- Associated with Submarine Volcanism related to the Opening of Sea of Japan in Miocene

Genetic Model (Establishment of Syngenetic Theory)
- Resulted in Discoveries of Major Deposits
  - Not only in the Hokuroku District, Akita
  - But also in the other part of the world
Kuroko ore (Black ore)

(A specimen in the Mining Museum, Akita University, collected from Ainai Kuroko deposit)

Showing sedimentary structure (graded bedding)

Significant to the genesis (syngenetic theory)
Schematic Cross Section thru Kuroko Orebody

- Hematite-chert
- Barite ore
- Black ore (Pb-Zn massive ore)
- Yellow ore (Cu ore)
- Siliceous ore, stockwork ore

図2 典型的な黒鉱鉱床の模式断面図(Sato, 1974, 一部修正で)
Importance of Genetic Model to Exploration Strategy

How and Where are the Deposits Formed

Constraints to form Ore Deposits

Establishment of Syngenetic Theory of Kuroko Deposit in Japan
(Denying Epigenetic Theory)

Associated with Miocene Submarine Volcanic Rocks
in the Particular Horizon (ca.15Ma) in Volcanic Sequence
throughout the Hokuroku District
(Hokuroku Basin, Volcano-sedimentary Depression)

Resulted in Discoveries of Major Deposits in 1960-70s
in the Hokuroku District, Akita

Application of Knowledge Acquired from Kuroko (Sysgenetic Theory) to the Other Part of the World

Resulted in Major Discoveries
“The Present is the Key to the Past” (James Hutton, 1726 - 1797)

Since 1970s: Discoveries of Ore Deposits Being Formed on the Sea Floor!

mid-oceanic ridge
  mafic submarine volcanic suite
  similarity Cyprus-type (Cu)

backarc basin (Okinawa trough, Mariana Trough etc)
  bimodal submarine volcanic suite

continental spreading (Red Sea) Atlantis II Deep

submarine volcanoes in island arc (Izu-Bonin arc)
Sea Floor Hydrothermal Cites of Pacific Ocean (JAMSTEC, 2001)
Submersible Shinkai 6500 (JAMSTEC, 1989)

Discovery of Sea Floor Hydrothermal Deposit in Izu-Bonin Arc (Iizasa et al., 1999)
Active Black Smoker Chimney (East Pacific Rise)
Present-day Black Smoker Chimney (collected from Mariana Trough)
Miocene Black Smoker Chimney (Tsutsumizawa Orebody, Hanaoka Mine)
Mineral, Oil and Gas Resources in Akita Prefecture

Number of mines operated in Akita Prefecture in the past = 238

Number of mines operated in the Hokuroku district = 116

Osarizawa vein-type deposit

Au-Ag vein
Cu-Pb-Zn vein
Kuroko Stockwork
Limonite
Mn deposit
Oil and gas
Osarizawa vein-type deposit
Osarizawa vein-type deposit
See You in Akita Next Year!

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