Hatsujiro Hashimoto

1921 - 2017

From 1973

From 1986

Biography

In brief:

- Born 26 Dec. 1921, Died 15 April 2017
- BS: Hiroshima University of Arts and Science, 1945
- Dr. Sci.: Kyoto University, 1953
- Prof.: Kyoto Institute of Technology (KIT, 1962-1975)
- Prof.: Osaka University (1972-1985)
- Prof.: Okayama Univeristy of Science (1985-1993)
- Emeritus Prof.: KIT and Osaka University
- He was known by many for New Year cards depicting his paintings.
- Awrded the "Medal with Purple Ribbon'" (1884) and the "Second Class Order of the Sacred Treasure" (1992), both from the Emperor of Japan (shown with the awards, below).

Early inspiration:

At M&M2002 in Quebec City, MSA recorded a video interview with Prof. Hashimoto. Several frames are extracted for this poster. At this point, he is giving an account of his early interest in science and is describing making a telescope as a boy. Improving technology has always been one of his strong interests.

Sample of key achievements:

- In his early work under Prof. Kenzo Tanaka, he observed diffraction-contrast patterns (by his "universal electron diffraction microscope") in an MoO_3 image, which he called "feather-like" and "wave-like", which (without realizing it) were likely one of the first observations of dislocations (Hashimoto, 1954).
- Observed whisker growth in a home-made TEM and a Shimadzu microscope, both with gas reaction chambers (Hashimoto, 1960), and calculated TEM images by dynamical diffraction theory (Hashimoto, Mannami, Naiki,1961).
- Studied the nucleation of dendritic tungsten oxide crystals (Hashimoto, Kumao et al., 1970).
- Visualized single atoms by dark-field electron microscopy (Hashimoto et al.,1973).
- Directly observed movement of atoms around lattice imperfections in gold crystals using TV systems, in collaboration with Prof. Y. Takai et al. (Hiashimoto, 1981).
- Designed a 400 kV analytical atomic-resolution electron microscope in collaboration with JEOL (Hashimoto et al., 1986).

EM organizaations:

- Served as President of the Japanese Society of Electron Microscopy (JSEM) in 1978.
- Served as President of IFSEM 1982-1986; devised a way to accept of both China and Taiwan at IFSEM.
- Organized the first Chinese-Japanese Electron Microscopy Seminar in Dalian, China with Professors Kehin Kuo and Kazuo Ogawa. The 10th and final one was coordinated by Hashimoto and Fang-Hua Li in 1999.
- Organized the third Asia-Pacific Conference on Electron Microscopy (APCEM), in 1984 which was thereby reinstated. A symposium in his honor was held at the 8th APCEM in Kanazawa, in 2004.
- Established the Committee of Asia-Pacific Societies of Electron Microscopy (CAPSEM) and was elected him as the first President. Helped electron microscopists in various countries and communities, including China and Thailand, to establish their electron microscopy societies, in collaboration with Gareth Thomas.

Atomic bomb:

Here Hashimoto is describing how he survived the atomic bomb in Hiroshima. The Institute was over a mile from ground zero and was in a sturdy brick building. He sustained personal injury, but he was able to protect his lab equipment from the ensuing firestorm by water reservoirs that he had placed by the windows. The vaporization of the water prevented fires inside the lab.

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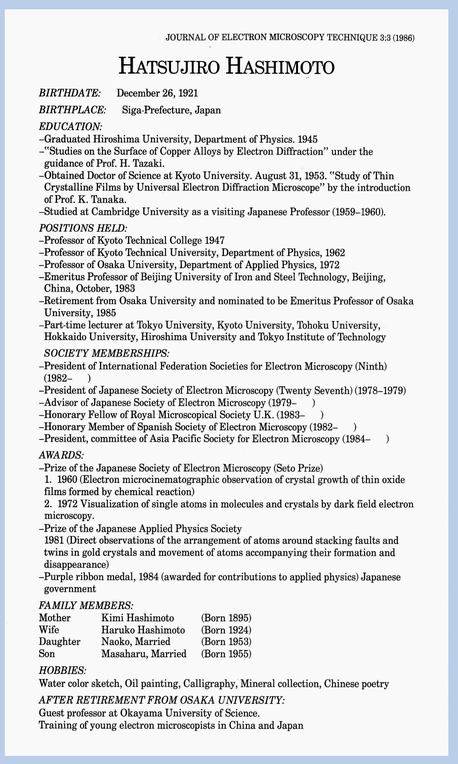
This summary is from the 1986 Festschrift in JEMT (Vol 3, Number 1). Not listed there is the fact that Prof. Hashimoto was the 1988 MSA Distinguished Scientist in Physics. Also not listed is the Hashimoto Medal, established by IFSM, which is awarded yearly to an outstanding investigator in HREM.



JOURNAL OF ELECTRON MICROSCOPY TECHNIQUE 3:3 (1986)

HATSUJIRO HASHIMOTO

BIRTHDATE: December 26, 1921

BIRTHPLACE: Siga-Prefecture, Japan

EDUCATION:
–Graduated Hiroshima University, Department of Physics. 1945
–"Studies on the Surface of Copper Alloys by Electron Diffraction" under the guidance of Prof. H. Tazaki.
–Obtained Doctor of Science at Kyoto University. August 31, 1953. "Study of Thin Crystalline Films by Universal Electron Diffraction Microscope" by the introduction of Prof. K. Tanaka.
–Studied at Cambridge University as a visiting Japanese Professor (1959–1960).

POSITIONS HELD:
–Professor of Kyoto Technical College 1947
–Professor of Kyoto Technical University, Department of Physics, 1962
–Professor of Osaka University, Department of Applied Physics, 1972
–Emeritus Professor of Beijing University of Iron and Steel Technology, Beijing, China, October, 1983
–Retirement from Osaka University and nominated to be Emeritus Professor of Osaka University, 1985
–Part-time lecturer at Tokyo University, Kyoto University, Tohoku University, Hokkaido University, Hiroshima University and Tokyo Institute of Technology

SOCIETY MEMBERSHIPS:
–President of International Federation Societies for Electron Microscopy (Ninth) (1982–)
–President of Japanese Society of Electron Microscopy (Twenty Seventh) (1978–1979)
–Advisor of Japanese Society of Electron Microscopy (1979–)
–Honorary Fellow of Royal Microscopical Society U.K. (1983–)
–Honorary Member of Spanish Society of Electron Microscopy (1982–)
–President, committee of Asia Pacific Society for Electron Microscopy (1984–)

AWARDS:
–Prize of the Japanese Society of Electron Microscopy (Seto Prize)
1. 1960 (Electron microcinematographic observation of crystal growth of thin oxide films formed by chemical reaction)
2. 1972 Visualization of single atoms in molecules and crystals by dark field electron microscopy.
–Prize of the Japanese Applied Physics Society
1981 (Direct observations of the arrangement of atoms around stacking faults and twins in gold crystals and movement of atoms accompanying their formation and disappearance)
–Purple ribbon medal, 1984 (awarded for contributions to applied physics) Japanese government

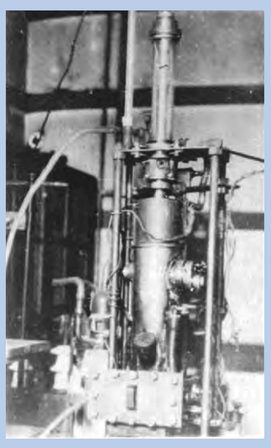
FAMILY MEMBERS:

Mother	Kimi Hashimoto	(Born 1895)
Wife	Haruko Hashimoto	(Born 1924)
Daughter	Naoko, Married	(Born 1953)
Son	Masaharu, Married	(Born 1955)

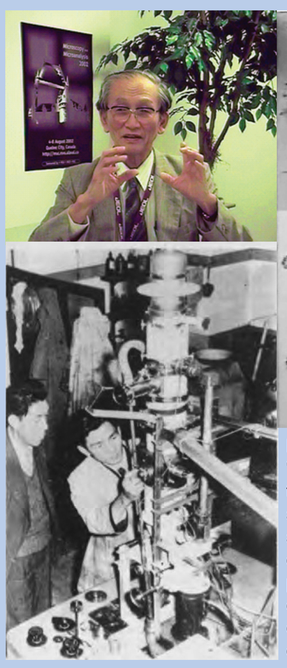
HOBBIES:
Water color sketch, Oil painting, Calligraphy, Mineral collection, Chinese poetry

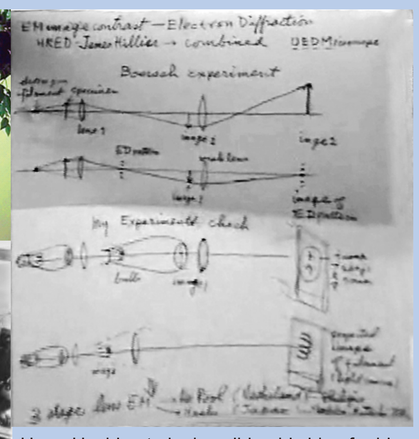
AFTER RETIREMENT FROM OSAKA UNIVERSITY:
Guest professor at Okayama University of Science.
Training of young electron microscopists in China and Japan

Early electron diffraction work



Hashimoto's first instrument was built completely by himself from unused shell casings and brass blocks. It's purpose was electron diffraction, a speciality in Japan at the time (during the war, he had used electron diffraction to study defects in battle-ship cooling piping).





Here, Hashimoto is describing his idea for his "universal electron diffraction microscope". At the interview, he drew this diagram of how, by analogy to light, he realized that by adding a lens and changing its position (strength), he could obtain the image corresponding to a diffraction pattern. He was aware that James Hillier had done something similar for the RCA EMU, but he did not know that Jan LePoole also had the idea of adding extra lenses (e.g. the Philips EM100).

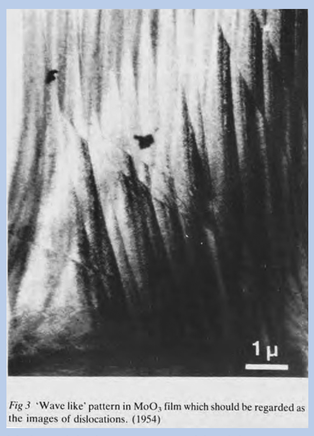
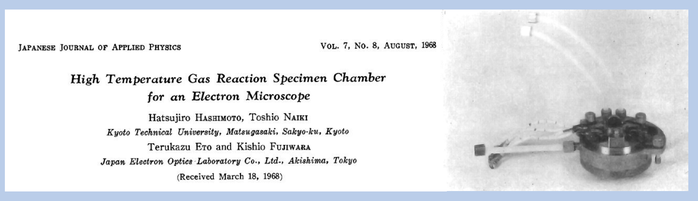


Fig 3 'Wave like' pattern in MoO_3 film which should be regarded as the images of dislocations. (1954)

Using this instrument, Hashimoto (1954) became one of the few who (in retrospect) were the first to observe dislocations, even prior to the well-known work at Cambridge in 1956.

Crystal growth and dynamic experiments

A longstanding interest was the behavior of (especially crystalline) material in a reaction chamber, showing growth in real timeThis required not only an environmental chamber in the TEM but also rapid, time-resolved imaging (as mentioned below). In 1960, he demonstrated electron microcinematographic observation of crystal growth of thin oxide films formed by chemical reaction.



JAPANESE JOURNAL OF APPLIED PHYSICS VOL. 7, NO. 8, AUGUST, 1968

High Temperature Gas Reaction Specimen Chamber for an Electron Microscope

Hatsujiro HASHIMOTO, Toshio NAIKI
Kyoto Technical University, Matsugasaki, Sakyo-ku, Kyoto
Terukazu ETO and Kishio FUJIWARA
Japan Electron Optics Laboratory Co., Ltd., Akishima, Tokyo
(Received March 18, 1968)

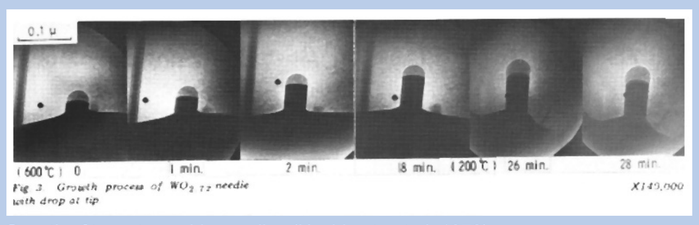


Fig. 3. Growth process of $WO_{2.72}$ needle with drop at tip X140,000

Growth of tungsten oxide needles (Hashimoto et al.,1970)

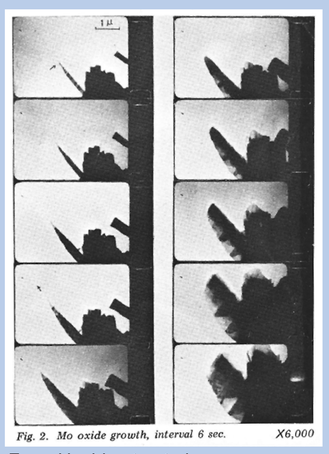
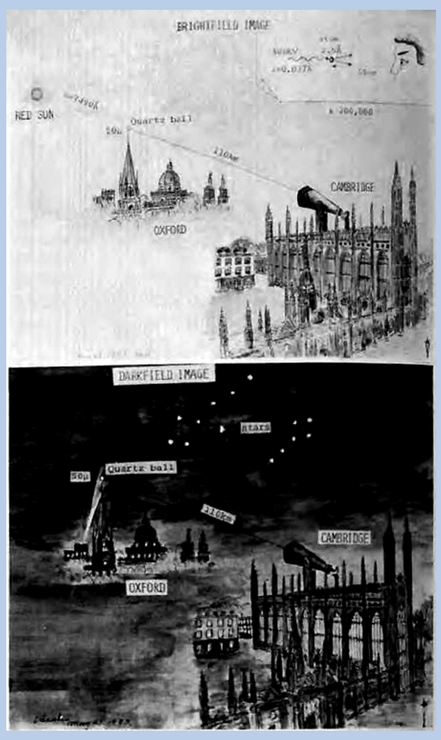


Fig. 2. Mo oxide growth, interval 6 sec. X6,000

From Hashimoto et al., JEOL News 8-3(1970)17.

Dark-field imaging of atoms



Hashimoto drew this figure for the Proceedings of the RMS (September 1983) to explain the difficulty and the possibility of imaging atoms. This would be equivalent to visualizing a 50-micrometer ball on a tower at Oxford from Cambridge, 110 km away. He shows how the contrast can be improved by oblique dark-field illumination (althougth with reduced intensity).

JAPAN. J. APPL. PHYS. **10** (1971) 1115–1116

Images of Thorium Atoms in Transmission Electron Microscopy

Hatsujiro HASHIMOTO, Akihiro KUMAO, Kinnosuke HINO
Department of Physics, Kyoto Technical University, Sakyo-ku, Kyoto
Haruo YOTSUMOTO and Akinari ONO
Application Laboratory, JEOL. Nakagami, Akishima, Tokyo
(Received May 27, 1971)

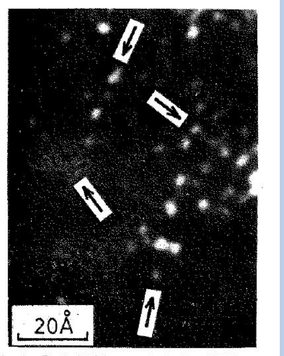


Fig. 1. Dark field image of thorium-BTCA supported on graphite crystal. Arrows indicate the linear array of spots.

Here, Hashimoto is describing how he was able to image individual Thorium atoms, making use of the improved contrast of dark-field TEM.

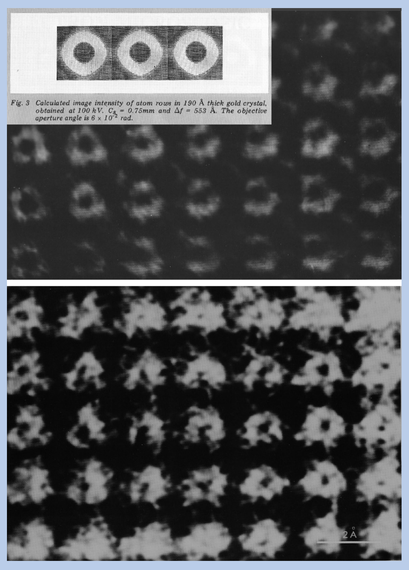
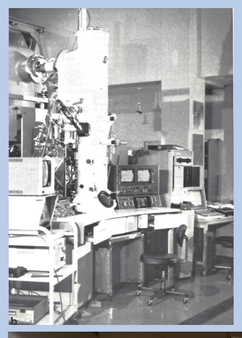


Fig. 3 Calculated image intensity of atom rows in 190 Å thick gold crystal, obtained at 100 kV. C_s = 0.73mm and Δf = -553 Å. The objective aperture angle is 6 x 10^{-3} rad.

Hashimoto also developed the method of "aberration-free imaging" of crystalline specimens (Hashimoto, 1977, 1998), which reveals atomic fine structure beyond the formal resolution of the electron microscope.

An improved HREM



Hashimoto was a consistent supporter of high voltage TEM, and was involved in the 1 MeV Atomic-Resolution Microscope for Gareth Thomas at Berkeley. He collaborated with JEOL in the mid 1980s to build a 400 keV analytical HREM with special features.

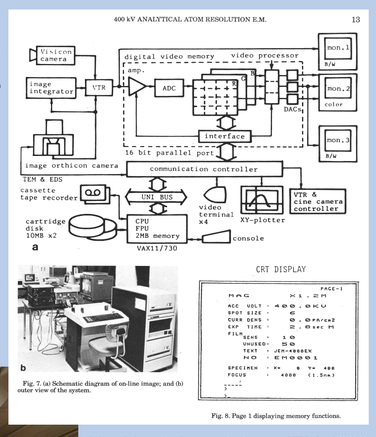
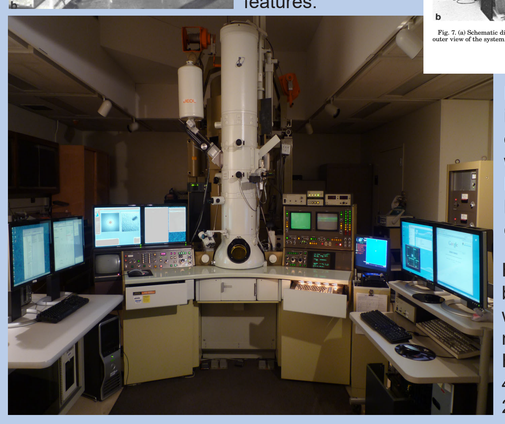


Fig. 7. (a) Schematic diagram of on-line image; and (b) outer view of the system.

Fig. 8. Page 1 displaying memory functions.



Hashimoto's prototype JEM-4000 included video recording for fast dynamic imaging, for example within an environmental chamber. For short-exposure frames a beam current higher than 1 A / cm2 could be used

Hashimoto's 400 keV TEM became the JEOL JEM-4000, which was widely used in both materials and biological sciences. Here is a fully-equipped JEM-4000FX that is still in operation in 2018.

International EM advocacy

Hashimoto devoted considerable effort toward promoting HREM, especially in China and also as President of the Japanese, Asia-Pacific, and International (IFSEM/IFSM) societies. He was organizer or co-organizer of numerous meetings.

At the symposium in his honor at the 8th APCEM in Kanazawa, 2004.

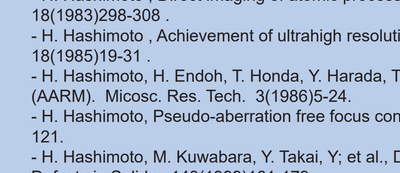
IFSEM 1990 in Seattle.

IFSM 2006 in Sapporo.

Artistic endeavors

When travelling to meetings Hashimoto always carried his sketchbook. 205 such images were subsequently self-published in a book:
Scenery in the World Seen by a Microscopist – journey through sketch for 23 years was published in 1999 (ISBN4-9980747-1-7 C0071), to celebrate his seventy-seventh birthday.

Guilin, China (1980).



Summer Palace Garden, Beijing (1981)

View of Mt. Ranier (1998)

View of Cambridge (1975)

Along the Yellow River towards Bingling Temple (1993)

Festschrifts

Special Issue

High Resolution and High Voltage Electron Microscopy

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The papers published here also appear in the book High Resolution and High Voltage Electron Microscopy, published by Alan R. Liss Inc., New York, 1986.

This publication is dedicated to Dr. Hatsujiro Hashimoto, of Osaka University, who retired in 1985.

Alan R. Liss, Inc., New York

Journal of Electron Microscopy Technique

Volume 3, Number 1, 1986

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1986, J. Microsc.

COLLECTION OF PAPERS DEDICATED TO PROFESSOR HATSUJIRO HASHIMOTO ON THE OCCASION OF HIS 70th BIRTHDAY

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M. Shiojiri — *Kyoto Institute of Technology*
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1994, Ultramicroscopy

Acknowledgements

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