
IYCr2014


SRs' Community in Asia Oceania
AOF
Synchrotron Radiation
Cheiron School
2007
2008
2009
2010
2011
2012
2013
Synchrotron Radiation Facilities
In Asia Oceania
BEPC
NSRL
SSRF
PLS II
PF AR
UVSOR
SPring-8
SAGA-LS
TLS TPS
SIAM
SSLS
INDUS I, II
AS

IUCr EC 2014-2017

M Cooper, M Dacombe, M Guss, R Kuzel, M Takata, W Depmeier, S Gracia-Granda
Front row: H Dabkowska, L Van Meervelt, M Hackert, M Glazer, G Desiraju

Sine Larsen
Copenhagen Univ.

Michele Zema
IUCr

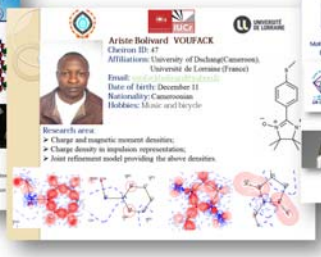
Claude Lecomte
Nancy Univ.

Richard Garrett
Chair of Commission on Synchrotron & XFEL Radiation

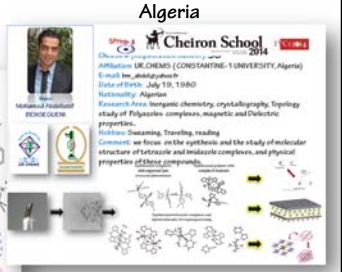
Students from IYCr/UNESCO

Mashikoane Wilson Mogodi
South Africa

Ariste Bolivard VOUFACK
Cameroon



Mohamed Abdellatif BENSEGUENI
Algeria



RIKEN

About International Year of Crystallography

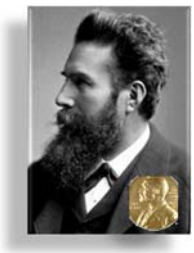
2014 international year of crystallography IUCr

- What Brings IYCr 2014 to Asia Oceania? -

Masaki Takata
JASRI / RSC Japan

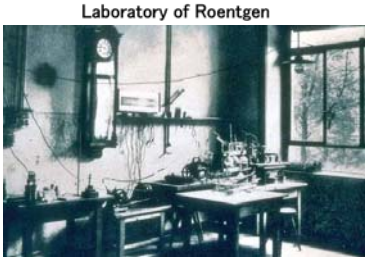
Why so many photon science facilities we have?

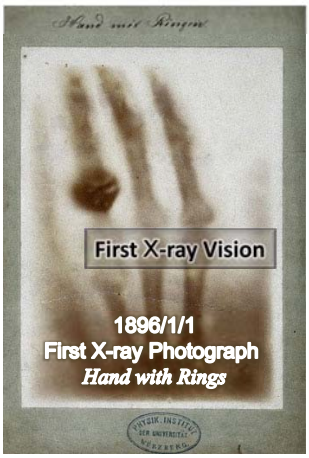
Serendipitous Discovery of Novel Light, X-ray(1895)



Wilhelm Konrad Roentgen
1901 Nobel Prize in Physics

Laboratory of Roentgen

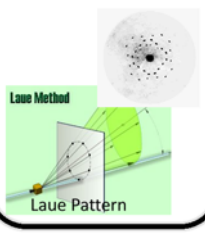


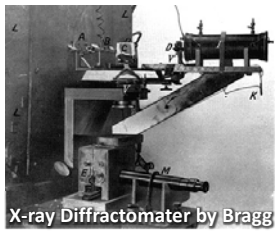


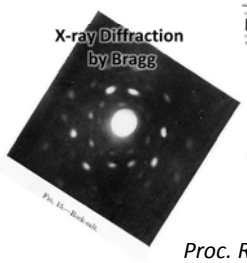
Nobel Prize Web Site **The Nobel Prize in Physics 1901**

The beginning of X-ray Crystallography
Discovery of X-ray Diffraction Phenomena

1879-1960
Max von Laue
1914 Nobel Prize

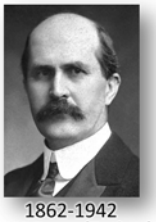






Proc. R. Soc. Lond. A 1913 **89**

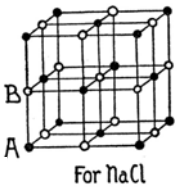
1915 Nobel Prize
First Crystal Structure Determination
NaCl Structure



1862-1942
W.H.Bragg(Father)、

1890-1971
W.L.Bragg(Son)

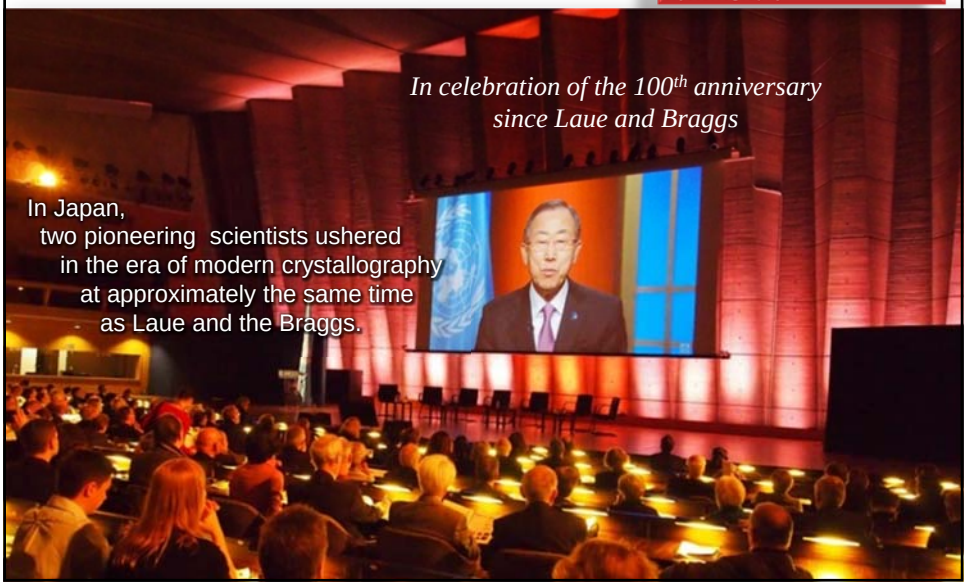
Crystal Structure
of NaCl



For NaCl
$AB = 2.8.10^{-8}$. cm.

Nobel Prize Web site **The Nobel Prize in Physics 1901**

International year of Crystallography Centennial Anniversary at UNESCO



In celebration of the 100th anniversary since Laue and Braggs

In Japan,
two pioneering scientists ushered in the era of modern crystallography at approximately the same time as Laue and the Braggs.

X-rays and Crystals; Letters to Nature from Bragg & Terada 1912～1913

W. H. Bragg

Torahiko Terada
RIKEN/Tokyo Imperial Univ.
1878-1935

X-rays and Crystals.

MESSRS. FRIEDRICH, KNIPPING AND LAUE recently published (*K. Bayer. Akad. der Wi* p. 303) some remarkable effects obtained b a fine stream of X-rays through a crystal (cidence upon a photographic plate. A arrangement of spots is found upon the pl of them so far removed from the central spot must be ascribed to rays which make large a the original pencil.

The positions of these spots seem to d simple numerical relations, and on the mode the crystal presents itself to the incident find that when the crystal (zincblende) is that the incident rays are parallel to an ed cube in the crystal the positions of the spo be found by the following simple rule. being assumed to be arranged in rectangula any direction which joins an atom to a neigh distance *na* from it, where *a* is the distance atom to the nearest neighbours and *n* is number, is a direction which a deflected (or pencil will take, and it will in doing so fo the spots. In other words, we have to se the cases in which the sum of three squares square, and we then recover the positions spots on the diagram. For example, pencils take the directions (1, 3, 6) (4, 1, 1 on. In a few cases the sum of the squa short of a perfect square, e.g. (5, 7, 11). case is it on the greater side; and there one direction (1, 5, 14) which ought by t be on the diagram and is not. Otherwise t quite successful.

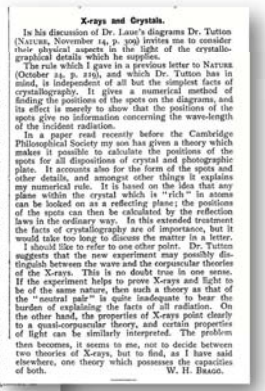
Until further experimental results are av is difficult to distinguish between various ex which suggest themselves. It is clear, how the diagram is an illustration of the arran the atoms in the crystal.

The rule has suggested itself to me as a consequence of an attempt to combine Dr. Laue's theory with a fact which my son pointed out to me, viz. that all the directions of the secondary pencils in this position of the crystal are "avenues" between the crystal atoms.

W. H. BRAGG.

Leeds, October 18.

Nature **90**(1912)219
Oct.24th 1912



X-rays and Crystals.

In his discussion of Dr. Laue's diagrams Dr. Tutton (NATURE, November 14, p. 309) invites me to consider their physical aspects in the light of the crystallographical details which he supplies.

The rule which I gave in a previous letter to NATURE (October 24, p. 219), and which Dr. Tutton has in mind, is independent of all but the simplest facts of crystallography. It gives a numerical method of finding the positions of the spots on the diagrams, and its effect is merely to show that the positions of the spots give no information concerning the wave-length of the incident radiation.

In a paper read recently before the Cambridge Philosophical Society my son has given a theory which makes it possible to calculate the positions of the spots for all dispositions of crystal and photographic plate. It accounts also for the form of the spots and other details, and amongst other things it explains my numerical rule. It is based on the idea that any plane within the crystal which is "rich" in atoms can be looked on as a reflecting plane; the positions of the spots can then be calculated by the reflection laws in the ordinary way. In this extended treatment the facts of crystallography are of importance, but it would take too long to discuss the matter in a letter.

I should like to refer to one other point. Dr. Tutton suggests that the new experiment may possibly distinguish between the wave and the corpuscular theories of the X-rays. This is no doubt true in one sense. If the experiment helps to prove X-rays and light to be of the same nature, then such a theory as that of the "neutral pair" is quite inadequate to bear the burden of explaining the facts of all radiation. On the other hand, the properties of X-rays point closely to a quasi-corpuscular theory, and certain properties of light can be similarly interpreted. The problem then becomes, it seems to me, not to decide between two theories of X-rays, but to find, as I have said elsewhere, one theory which possesses the capacities of both.

W. H. BRAGG.

Nature **90**(1912)360
Nov.28th 1912

X-Rays and Crystals.

In my former letter of March 18 (published in NATURE of April 10) I briefly pointed out that the transmitted beams of X-rays may be made visible by means of an ordinary fluorescent screen. The results of further experiments by visual method are favourable for the explanation suggested by Barkla and Bragg, in so far as the planes rich in molecules or atoms behave as reflecting planes for rays at grazing incidence.

A piece of colourless transparent fluorspar, crystallised in regular octahedron, and rock-salt in the form of a cube, were examined, with an incident beam of 1 cm. diameter. As already noticed, groups of transmitted beams are arranged on circular cones, always in contact with the incident beam, having their common vertex in the crystal, and *their axes fixed relative to it*, so that all the spots belonging to a certain cone converge into the central incident spot, as the axis corresponding to the cone approaches the incident beam. Moreover, the elongated spots are all directed towards the point of the cone diametrically opposite to the incident spot. By rotating the crystal about one of its principal axes, or about an axis bisecting the angle between two principal axes, the position of the axes of these cones was determined, leading to the result that all these axes correspond with the lines of intersection of several planes "rich in" reflecting particles, if we assume that these points are arranged in a simple space-lattice. The number of spots belonging to every cone may also be accounted for on this assumption. Even the brightness seems to conform with the "richness" of these points in the corresponding plane.

I was also able to reconstruct graphically the complete sets of spots shown in the photographs obtained by Laue, Friedrichs, and Knipping (Figs. 5 and 7) on the above assumption. Details of this will appear in the near future in the Proceedings of the Tokyo Mathematico-Physical Society.

T. TERADA.

Physical Institute, Tokyo, April 6.

Nature **91**(1913)213
May.1st 1913

X-Rays and Crystals.

On repeating the experiments of Laue, Friedrichs, and Knipping on the transmission of X-rays through crystals, I have found that the transmitted rays may easily be made visible by means of an ordinary [illegible], if we use a sufficiently large pencil [illegible] crystals are sufficiently transparent to [illegible]

[illegible] be used was a Müller-tube of 20 cm. [illegible] water-cooling; the current was sup[illegible] by influence machine with sixty plates. [illegible] the pencil of rays was 0·5–1·0 cm. [illegible] mined were borax, alum, mica, fluor[illegible], rock-crystal, cane-sugar, &c., the [illegible] from 4 mm. to 1 cm. The trans[illegible] numerous detached fluorescent spots [illegible]. If we rotate the crystal about [illegible]ular to the incident ray, the spots [illegible] across the central spot caused by the [illegible] we may choose the axis of rotation [illegible] these spots remain stationary while [illegible]ated.

[illegible]ched pencils are arranged, as it were, [illegible], which always touch the incident [illegible]perture of which varies continuously [illegible]tion of the crystal. With a plate of [illegible] observed which is situated as if it [illegible] image of the incident ray; but it is [illegible] we may call it "reflected," because [illegible] seen on the same side of the plate, [illegible]arly from the "image." Further [illegible] his direction are in progress.

T. TERADA.

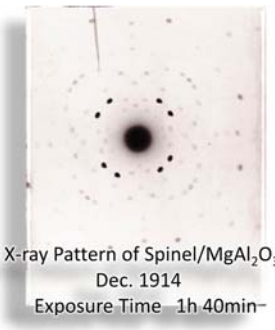
[illegible]ute, Imperial University, Tokyo, March 18.

Nature **91**(1913)135
Apr.10th 1913

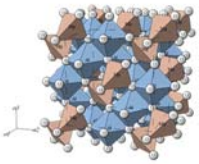
Beginning of X-ray Crystallography in Japan toward Space Group Theory

Shoji Nishikawa

1884-1952
RIKEN/Tokyo Imperial Univ.



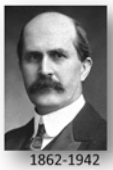
X-ray Pattern of Spinel/$MgAl_2O_3$
Dec. 1914
Exposure Time 1h 40min



Crystal Structure of $MgAl_2O_4$

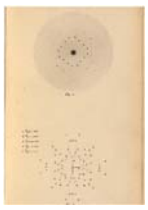
R W. G. Wyckoff
1897-1994

2014 international year of crystallography

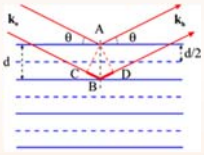


1862-1942 1890-1971
W. H. & W. L. Bragg
1915 Nobel Prize

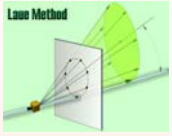
1879-1960
Max von Laue
1914 Nobel Prize

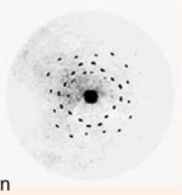


X-ray Diffraction

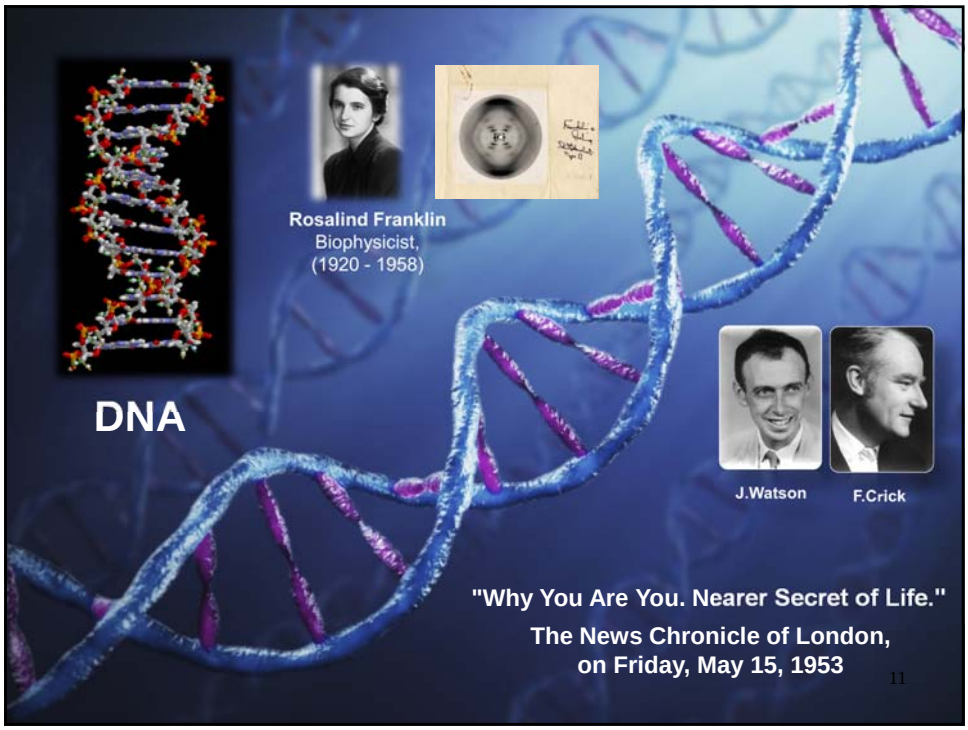


Bragg Thepry of X-ray Diffraction





Laue Pattern


DNA
Rosalind Franklin
Biophysicist,
(1920 - 1958)
J.Watson
F.Crick
"Why You Are You. Nearer Secret of Life."
The News Chronicle of London,
on Friday, May 15, 1953
11


History
T. Terada
X-rays & Crystals
in Nature 91(1913)135
Apr.10th 1913
X-Rays and Crystals.
On repeating the experiments of Laue, Friedricht, and Knipping on the transmission of X-rays through crystals, I have found that the transmitted rays may easily be made visible by means of an ordinary fluorescent screen, if we use a sufficiently large pencil of rays, and the crystals are sufficiently transparent to the incident ray.
The X-ray tube used was a Müller-tube of 20 cm. diameter, with water-cooling; the current was supplied by a Toepler influence machine with sixty plates. The diameter of the pencil of rays was 0·5-1·0 cm. The crystals examined were borax, alum, mica, fluorspar, rock-salt, rock-crystal, cane-sugar, &c., the thickness varying from 4 mm. to 1 cm. The transmitted rays show numerous detached fluorescent spots of elongated shape. If we rotate the crystal about an axis perpendicular to the incident ray, the spots move generally across the central spot caused by the incident ray, but we may choose the axis of rotation such that some of these spots remain stationary while the crystal is rotated.
Groups of detached pencils are arranged, as it were, on circular cones, which always touch the incident pencil, and the aperture of which varies continuously with the inclination of the crystal. With a plate of mica, a spot was observed which is situated as if it were the reflected image of the incident ray; but it is doubtful whether we may call it "reflected," because other spots are also seen on the same side of the plate, deviating considerably from the "image." Further experiments in this direction are in progress.
T. Terada.
Physical Institute, Imperial University, Tokyo,
March 18.
S. Nishikawa
Launch
CrSJ
Laue photograph of asbestos fiber
Pt white X-ray
(September, 19, 1913)
Nishikawa, S. and Ono, S.,
Proc. Math. Phys. Soc. Tokyo,
7, 131 (1913)
"Snow crystals are
letters sent from heaven."
U.Nakaya
Snow Crystal Science
1936
Nakaya's Daughters
Fujiko NAKAYA
Fujiko Nakaya
International Artist
Prof. Sakiko
Nakaya Olsen
(Geologist USA)

Organization / Partners

IYCr2014 Japan Initiative

Launched on 16th Sept. 2013 at Tokyo

Chairman

Vice Chairpersons

Chair of Committee for IUCr of SCJ*

Former President of IUCr

President of CrSJ§

President-elect of CrSJ§

Y. Ie	Vice President of SCJ*, Former president of The Physical Society of Japan
Y. Arakawa	Chair of Physical Science and Engineering Section of SCJ*
M. Tanaka	Former Vice President of IUCr
A. Takahara	Chair of Committee for Crystallography of SCJ*
Y. Furukawa	President of the Japanese Association for Crystal Growth,
M. Kawai	Executive Director of RIKEN
E. Muromachi	Director of Institute of National Institute for Materials Science
Y. Iwasawa	Former President of The Chemical Society of Japan
T. Tsukihara	Former President of CrSJ§
R. Kuroda	Member of SCJ*
Y. Fujii	Former President of The Japanese Society of Neutron Science
Y. Amemiya	Former President of Japanese Society for Synchrotron Radiation Research
M. Takata	Chair of National Committee for IUCr

*SCJ: Science Council of Japan

The 32 Supporting Scientific Associations

Action Policy

Three-Pronged Approach

To celebrate IYCr2014 in Japan

Engaging Diverse Communities

Outreach activities to involve, educate,
and captivate a wide variety of audiences
IYCr-themed programming at annual meetings of member societies

Building Public Awareness

Collaborations with new and existing partners in academy and industry
Events to last connections with culture and tradition in Japan
Social networking to communicate the role of crystallography
in past, present and future of our lives

Delivering the Message

IYCr Japan Initiative Web Page at http://www.iycr2014.jp/

Publications

国立科学博物館 National Museum of Nature and Science

milsil

(Bimonthly Magazine of
National Museum of Nature and Science)

1. **Dawning of Crystallography**
   by Emeritus Prof. Yuji Ohashi (Tokyo Inst. Tech.)
2. **X-ray and Neutron: Killer Tools of Crystallography**
   by Prof. Masaki Takata (RIKEN, Univ. of Tokyo)
3. **Discovery of Superconductors based on Crystallography**
   by Prof. Jun Akimitsu (Aoyama-Gakuin Univ.)

- **Crystallography has opened the door of Life Science**
  by Prof. So Iwata (Kyoto Univ.)
- **Unveiling the mechanism of photosynthesis**
  by Jian-Ren Shen (Okayama Univ.)
- **Crystals unveil the History of the Earth**
  by Emeritus Prof. Takehiko Yagi (Univ. of Tokyo)
- **Crystal Encapsulating Molecules**
  by Prof. Kazue Kurihara (Tohoku Univ.)
- **Materials Development and Potential of Crystal**
  by Emeritus Prof. Isamu Akasaki (Nagoya Univ.)
- **Electron Microscopy: Visualization of Atom in Crystal**
  by Prof. Sumio Iijima (Meijo Univ.)
- **Creation of Crystals**
  by Dr. Koichi Momma (National Museum of Nature and Science)

IYCr Special Features
on IYCr2014 "Crystal: 結晶",
(July 2013 -)

Dawning of Crystallography (Ohashi)

X-ray and Neutron (Takata)

Arts & Culture

Crystallography in Arts

MOA美術館 MOA MUSEUM OF ART

Joint Symposium with MOA Museum of Art Feb. 16th 2014

X-ray Crystallography uncovered the Mystery of National Treasure's Silver Waves

Silver-colored waves were reproduced through computer graphics after X-ray analyses of crystals on the painting.

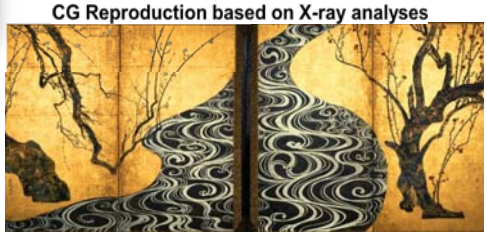
Izumi Nakai

Portable X-ray Powder Diffractometer
Developed by Nakai

National Heritage

Red and White Plum Blossoms

CG Reproduction based on X-ray analyses



Global Assistance

Collaboration with **A**sia-**O**ceania **F**orum of
Synchrotron **R**adiation **R**esearch(**AOFSRR**)

1. Joint Workshop with AOFSRR2014
   Chair: Shih-Lin Chang, Sept. 15-17 2014 in Taiwan
2. Special Assistance for IYCr/UNESCO
   with Cheiron School 2014
   Oct. 2014 @SPring-8

Invite 5 - 6 African Students
as
the **IYCr2014/UNESCO**
Scholarship
Supported by **AOFSRR**

Events

IYCr2014 Promotion and Recognition Activities

Ceremonies by IYCr2014 Japan Initiative

Jan. IYCr2014 Opening Ceremony (Tokyo)
Nov. IYCr2014 Memorial Symposium (Tokyo)
Dec. IYCr2014 Closing Ceremony (TBD)

Symposia, Special Lectures and Events by Associate Members

2013 Sept. Special Lecture at Symposium on *Macromolecules* (Kanazawa)
Oct. Pre-year Symposium at Annual Meeting of *The Crystallogr. Soc. Jpn.* (Kumamoto)
2014 Jan. Mini-Symposium at Annual Meeting of *The Jpn. Soc. Synchrotron Rad. Res.*(Hiroshima)
Mar. Annual Meeting of *The Chem. Soc. Jpn.* (Nagoya)
Annual Meeting of *The Pharmaceutical Soc. Jpn.* (Kumamoto)
Aug. Symposium at *Int. Union of Mater. Res. - Int. Conf. in Asia* (Fukuoka)
Nov. Annual Meeting of *The Jpn. Assoc. Crystal Growth* (TBD)
Annual Meeting of *The Crystallogr. Soc. Jpn.* (Tokyo)

Books, Journals and Magazines

IYCr2014 Feature Articles in "milsil"
(magazine of National Museum of Nature and Science)
Feature Articles in "*Chemistry Today*" (Kagakudojin)
Feature Articles in the journal of *the Crystallographic Society of Japan*
Feature Articles in the journal of *the Society of Polymer Science, Japan*
"Crystallography in Japan II" by *the Crystallographic Society of Japan*

Exhibitions

Mineral Collection,
National Museum of Nature and Science (Aug. - Oct., 2013)
"Crystals in Chemistry and Biology",
The Museum of Osaka University (Sep., 2014 – Feb. 2015)

Mineral Collection

National Museum of Nature and Science

Publicity

IYCr2014 Memorial Pamphlet " Crystal; 結晶"

Opening

IYCr 2014 Japan Opening Symposium

23rd January 2014 at Science Council of Japan

Program

1. **Opening Address of IYCr2014**
   Sumio Iijima(Chair of IYCr Japan Initiative)
2. **Outlook for IYCr2014**
   Takashi Onishi(Chair of Science Council Japan)
3. **Understanding of Human at Molecular Level and Crystallograohy for Drug Discovery**
   Yoshinori Fujiyoshi(Nagoya Univ.)
4. **Photo-sensitive Molecular Crystal**
   Masahiro Irie(Rikkyo Univ.)
5. **Discovery of New Melting Process of Ice**
   Hajime Sazaki(Hokkaido Univ.)
6. **Crystal Structure of Materials at the Core of Earth**
   Kei Hirose(Tokyo Institute Tech.)
7. **The Role of Crystallography in Discoveries of Superconductors**
   Jun Akimitsu(Aoyama Gakuin Univ.)
8. **Closing Remarks** Kazue Kurihara(Tohoku Univ.)

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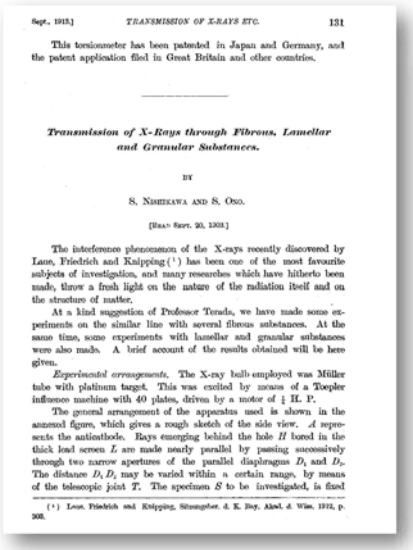
Proce Tokyo Math.-Phys. Soc.
2nd Ser. Vol. 7(1913 - 1914) No. 8, 131

Transmission of X-rays through Fibrous, Lamellar and Granular Substances

S. Nishikawa and S. Ono



Sept., 1913.] TRANSMISSION OF X-RAYS ETC. 131

This torsionmeter has been patended in Japan and Germany, and the patent application filed in Great Britain and other countries.

Transmission of X-Rays through Fibrous, Lamellar and Granular Substances.

BY

S. NISHIKAWA AND S. ONO.

[READ SEPT. 20, 1913.]

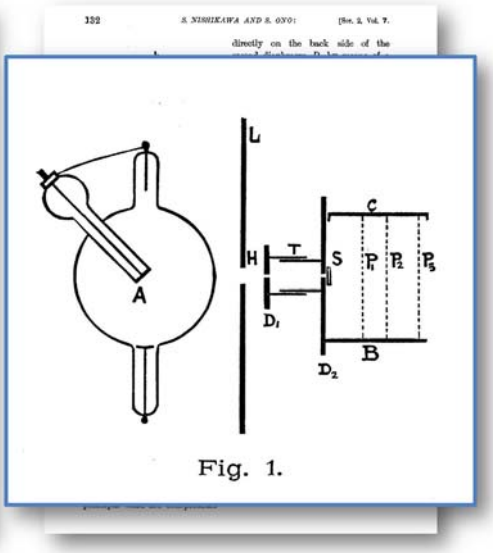
The interference phenomenon of the X-rays recently discovered by Laue, Friedrich and Knipping(1) has been one of the most favourite subjects of investigation, and many researches which have hitherto been made, throw a fresh light on the nature of the radiation itself and on the structure of matter.

At a kind suggestion of Professor Terada, we have made some experiments on the similar line with several fibrous substances. At the same time, some experiments with lamellar and granular substances were also made. A brief account of the results obtained will be here given.

Experimental arrangements. The X-ray bulb employed was Müller tube with platinum target. This was excited by means of a Toepler influence machine with 40 plates, driven by a motor of ¼ H. P.

The general arrangement of the apparatus used is shown in the annexed figure, which gives a rough sketch of the side view. *A* represents the anticathode. Rays emerging behind the hole *H* bored in the thick lead screen *L* are made nearly parallel by passing successively through two narrow apertures of the parallel diaphragms D_1 and D_2. The distance $D_1 D_2$ may be varied within a certain range, by means of the telescopic joint *T*. The specimen *S* to be investigated, is fixed

(1) Laue, Friedrich und Knipping, Sitzungsber. d. K. Bay. Akad. d. Wiss. 1912, p. 303.



132 S. NISHIKAWA AND S. ONO: [Ser. 2, Vol. 7.

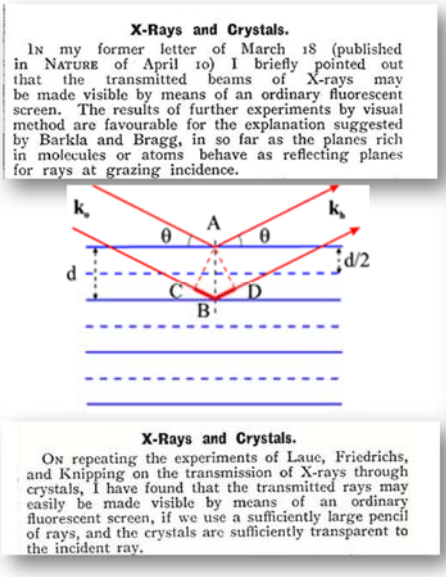
directly on the back side of the

Fig. 1.

Proce Tokyo Math.-Phys. Soc.
2nd Ser. Vol. 7(1913 - 1914) No. 8, 131

Transmission of X-rays through Fibrous, Lamellar and Granular Substances

S. Nishikawa and S. Ono



X-Rays and Crystals.

IN my former letter of March 18 (published in NATURE of April 10) I briefly pointed out that the transmitted beams of X-rays may be made visible by means of an ordinary fluorescent screen. The results of further experiments by visual method are favourable for the explanation suggested by Barkla and Bragg, in so far as the planes rich in molecules or atoms behave as reflecting planes for rays at grazing incidence.

X-Rays and Crystals.

ON repeating the experiments of Laue, Friedrichs, and Knipping on the transmission of X-rays through crystals, I have found that the transmitted rays may easily be made visible by means of an ordinary fluorescent screen, if we use a sufficiently large pencil of rays, and the crystals are sufficiently transparent to the incident ray.

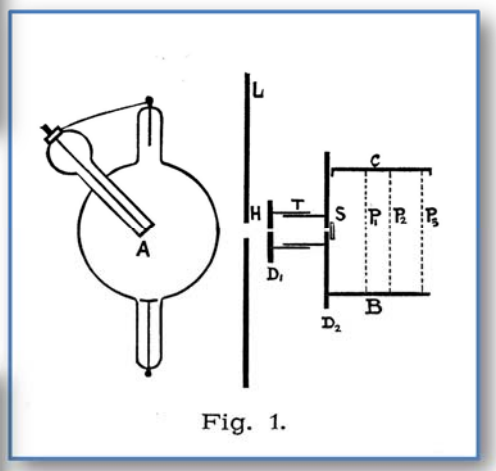
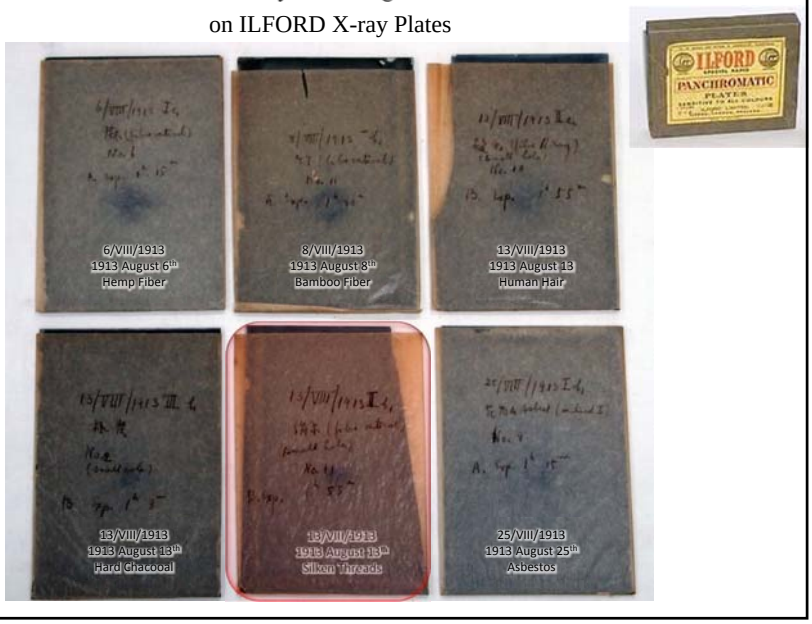


Fig. 1.

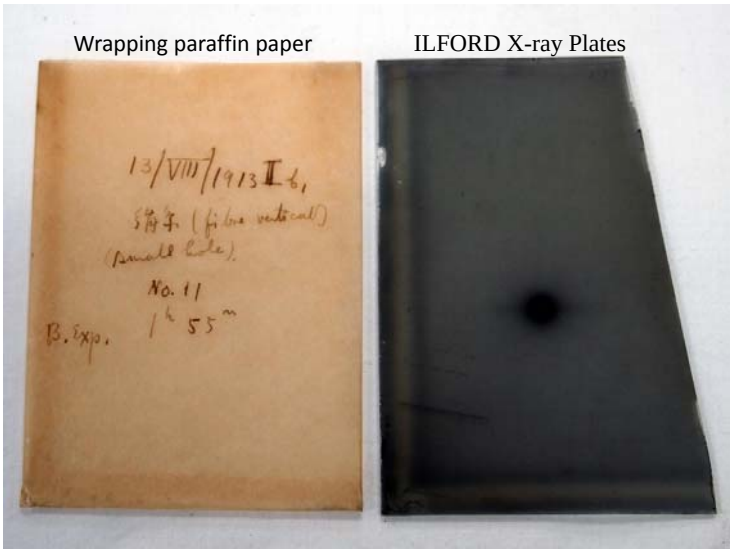
RIKEN Historical Materials Museum

Finding X-ray data (1913～) measured by Nishikawa

The World's First X-ray Scattering Data of Fibrous Materials on ILFORD X-ray Plates

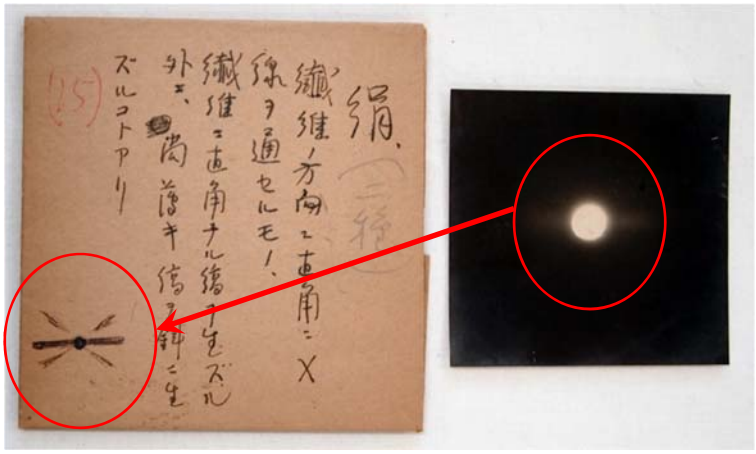


1913 August 13th X-ray Scattering from Silken Threads



提供:理化学研究所記念史料室

1913 August 13th X-ray sScattering from Silken Threads



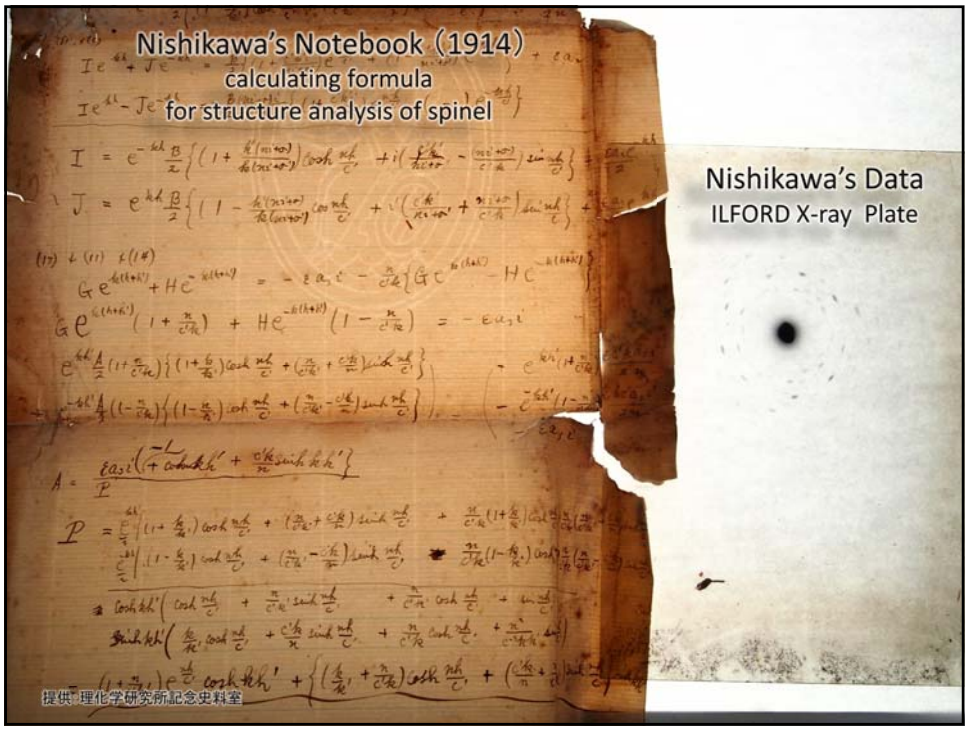
提供:理化学研究所記念史料室

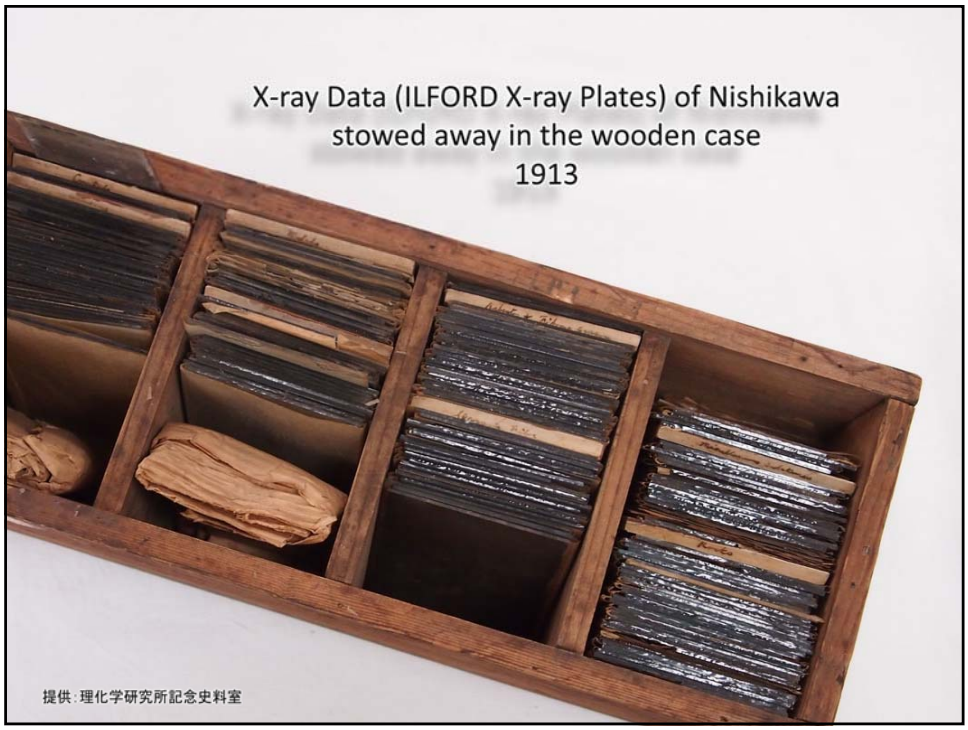
First Scientific Test of Gem by X-ray

The ruby ring owned by Dr. Nagaoka(RIKEN) / Imitation Gem(Rhinestone)
X-ray pattern judges that the gem is crystal or non crystal.
1913

Saturn model of the atom

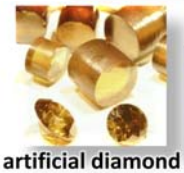
提供:理化学研究所記念史料室


Nishikawa's Notebook（1914）
calculating formula
for structure analysis of spinel
Nishikawa's Data
ILFORD X-ray Plate
提供：理化学研究所記念史料室

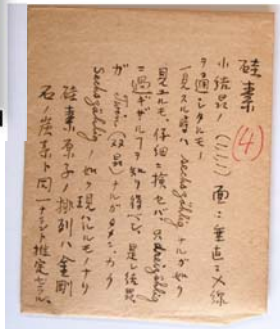

X-ray Data (ILFORD X-ray Plates) of Nishikawa
stowed away in the wooden case
1913
提供：理化学研究所記念史料室

Unique Development of X-ray crystallography in Japan

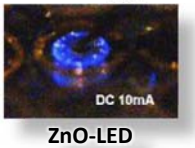
Foundation for Science & Technology in present-day
Steel Industry, Auto Industry, Electronics, Nanotechnology,
Soft Matters, etc.


artificial diamond


NEOMAX




Energy Saving Tire



ZnO-LED


Superconductor


Flat Panel Display
IGZO

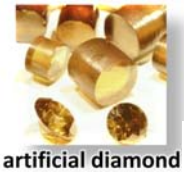

Battery


Blue diode


Si Electronics

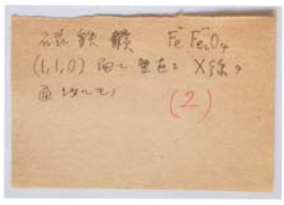
Unique Development of X-ray crystallography in Japan

Foundation for Science & Technology in present-day
Steel Industry, Auto Industry Electronics, Nanotechnology,
Soft Matters, etc.

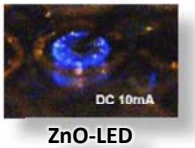

artificial diamond


NEOMAX

Magnetite Ore Analysis




Energy Saving Tire

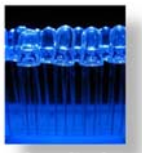


ZnO-LED


Superconductor


Flat Panel Display
IGZO


Battery


Blue diode


Si Electronics

Unique Development of X-ray crystallography in Japan

Foundation for Science & Technology in present-day
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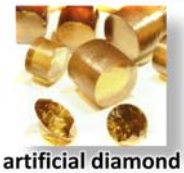
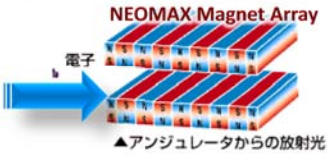

artificial diamond

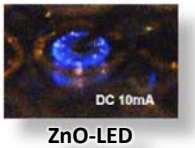
Magnetite Ore Analysis

Light Source Technology
Undulator


NEOMAX




Energy Saving Tire

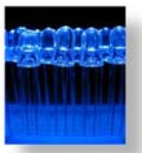


ZnO-LED


Superconductor


Flat Panel Display
IGZO


Battery


Blue diode


Si Electronics

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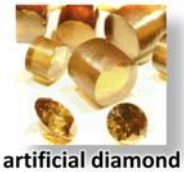
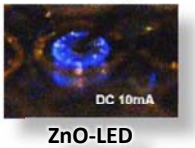

artificial diamond


NEOMAX


Energy Saving Tire

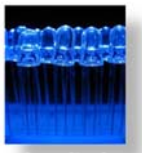


ZnO-LED


Superconductor


Flat Panel Display
IGZO

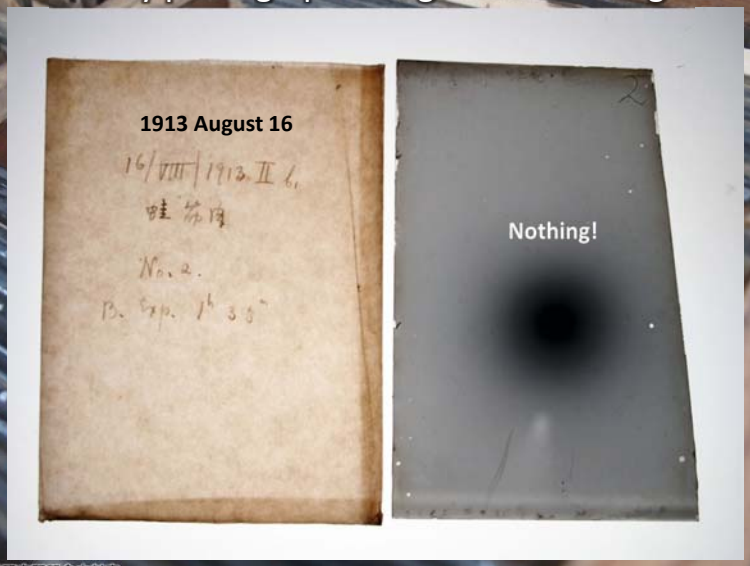

Battery


Blue diode


Si Electronics

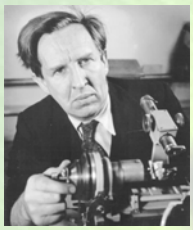
Another Finding in Nishikawa's Wooden Case

X-ray photograph of leg muscle of Frog



提供:理化学研究所記念史料室

A story accepted as history:
Who is the first challenger of X-ray experiment of frog muscle?



J.D.Bernal
1901-1971

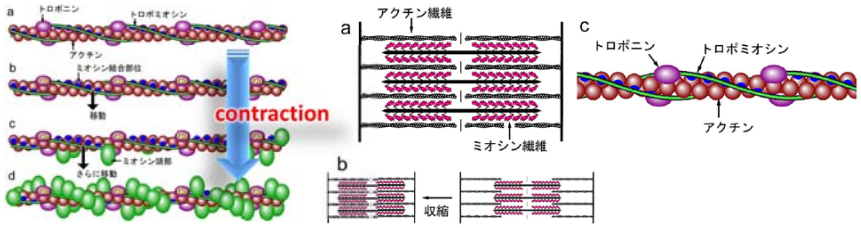
Dr. J.D. Bernal in UK challenged the X-ray experiment of muscle contraction in the late 1920s and described as "Crazy Experiment".

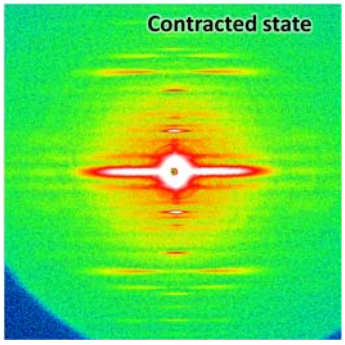
Crazy experiments were always being done. Bernal took an X-ray photograph of the leg of a live frog stimulated by an induction motor to see whether the contraction made any difference to the X-ray pattern. The experiment is only now within the technical capabilities of science using the X-rays from a synchrotron. The frog was released, seemingly unharmed, and the patterns were quite indistinguishable.

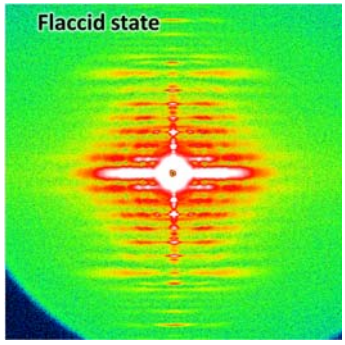
J.D.Bernal"The Sage of Science"

Nishikawa challenged the X-ray experiment of frog muscle more than 10 years before, in 1913.

Present day: X-ray data of frog muscle contraction using SPring-8







Scientists from Nishikawa Lab. developed X-ray Physics and Photon Science

Torahiko Terada
1878-1935
(RIKEN/ U of Tokyo)

Shoji Nishikawa
1884-1952
(RIKEN/U of Tokyo)

1MeV EM

Ryoji Uyeda
1911-1997
(Nagoya Univ.)

Kenichi Shinohara
1905-95
(RIKEN/Kyusyu Univ.)

Kazutake Koura
1921-
(U.of Tokyo)

Seishi Kikuta
(U. of Tokyo)

Tetsuya Ishikawa
(RIKEN)

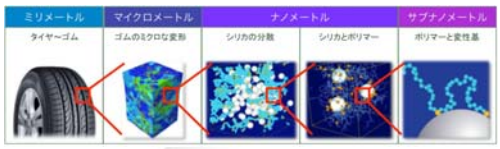
Photon Factory
(KEK) 1983～

1978～

Norio Kato
1923-2002
(Nagoya Univ.)

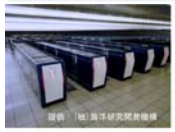
Molecular Design for Energy Saving Tire

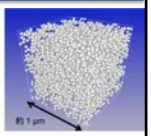
Sumitomo Rubber Industries Ltd.



Sophisticated Analysis at FSBL, SPring-8

Multi-Scale Simulation of Rubber Molecule Dynamics by Super Computer





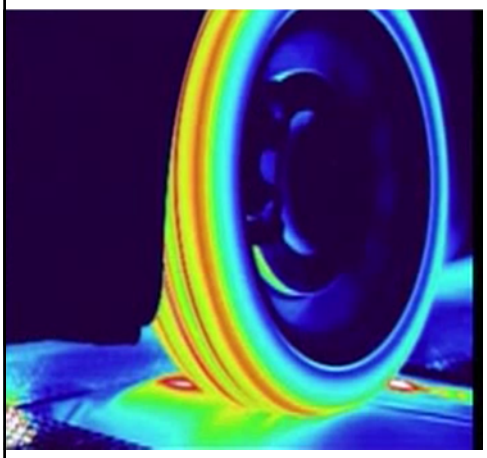
President Ikeda presents new energy saving tire. 1st Dec. 2011

Achieving Improvement
6%: fuel efficiency
39 %: traction performance!

“EnerSave” Premium Performance

Existing Tire

エナセーブ PREMIUM



Lower Energy Loss

DUNLOP FALKEN GOODYEAR 住友ゴムグループ

6% Energy Saving; Estimation of Economic /Social Effect

Fuel Saving : If all vehicles in Japan fit the energy saving tire.

gasoline 53,214,000 kl
diesel oil 25,660,000 kl
LPG 2,067,000 kl

◆ Consumer Cost

6% saving

▲ gasoline 3,192,840 kl
▲ diesel oil 1,539,600 kl
▲ LPG 124,020 kl

平成23年度 自動車燃料消費量 年報(国土交通省刊) より 試算

gasoline 511 M€
diesel oil 212 M€
LPG 92 M€

800M€/year Saving

gasoline 1.60 €/l
diesel oil 1.38 €/l
LPG 0.74 €/l

Estimation of Greenhouse Gas Emission Reduction through Life Cycle

PCR (Automobile) TBR (Autotruck, Autobus)

タイヤのLCCO2 算定ガイドライン 2012年 日本自動車タイヤ協会 より

40

Green Project Contract Beamlines (BL28XU, BL36XU)

*National Initiative Project by the New Energy and Industrial Technology Development Organization (**NEDO**), Administrative Agency Supported by the Ministry of Economy, Trade and Industry.*

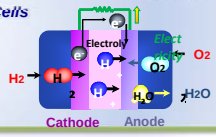
The R&D NEDO Project of the Pinpoint XAFS method by JASRI' ($ 0.2M) : 2008 ~2010

BL36XU: Catalytic Reaction Dynamics for Fuel Cells
(The University of Electro-Communications)

Prof. Y. Iwasawa

Mission: In-situ analysis of Polymer Electrolyte Fuel Cells using Nano-sec. Time & Spatially-resolved XAFS

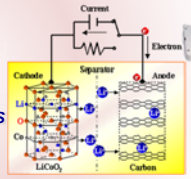
Construction : Sep. 2010 ~
Commissioning: Oct. 2012



BL28XU: Advanced Basic Science for Battery Innovation
(Kyoto University RISING)

Prof. Z. Ogumi

Mission: In-situ analysis of Batteries using High Resolution Time & Spatially-resolved XRD and XAFS



Letter to Ellis Franklin,
no date, possibly summer 1940
whilst Rosalind was an undergraduate at Cambridge.

Rosalind Franklin

"You look at science (or at least talk of it) as some sort of demoralising invention of man, something apart from real life, and which must be cautiously guarded and kept separate from everyday existence. But science and everyday life cannot and should not be separated.
Science, for me, gives a partial explanation for life. In so far as it goes, it is based on fact, experience and experiment."

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Pioneers in Crystallography

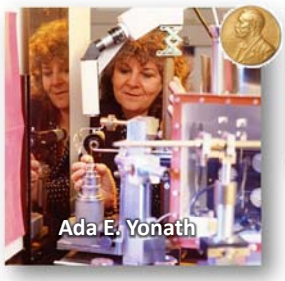
IYCr2014

Noble Prize (1964)

IUCr President (1972- 75)

A British biochemist, credited with the development of protein crystallography

Pioneering molecular biologist who shed light on how enzymes, nature's catalysts, do their work



Noble Prize (2009)

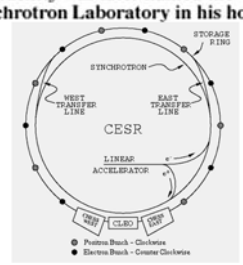
Structure & Function of Ribosome

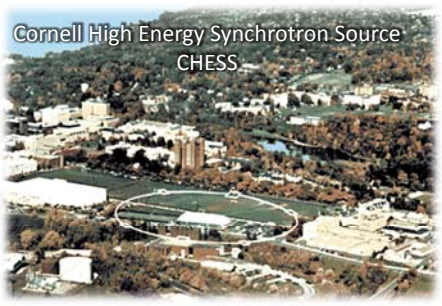
Sine Larsen

Copenhagen Univ.,
Director of MAX IV Lab. (2011)
IUCr President (2009–11)

Russ Hamilton

In 1967, Robert R. Wilson takes a bicycle inspection tour of the newly constructed synchrotron under Robison Alumni Fields, one of the particle accelerators he designed. The facility was later named the Wilson Synchrotron Laboratory in his honor.





45

Nothing at all

R.R. Wilson's Congressional Testimony, April 1969

Senator John Pastore

On April 17, 1969, Robert R. Wilson testified in front of Congress' Joint Committee on Atomic Energy as part of the Atomic Energy Comission(AEC) Authorizing Legislation for FY 1970.

Director R.R. Wilson

SENATOR PASTORE. Is there anything connected in the hopes of this accelerator that in any way involves the security of the country?

DR. WILSON. No, sir; I do not believe so.

SENATOR PASTORE. Nothing at all?

DR. WILSON. Nothing at all.

SENATOR PASTORE. It has no value in that respect?

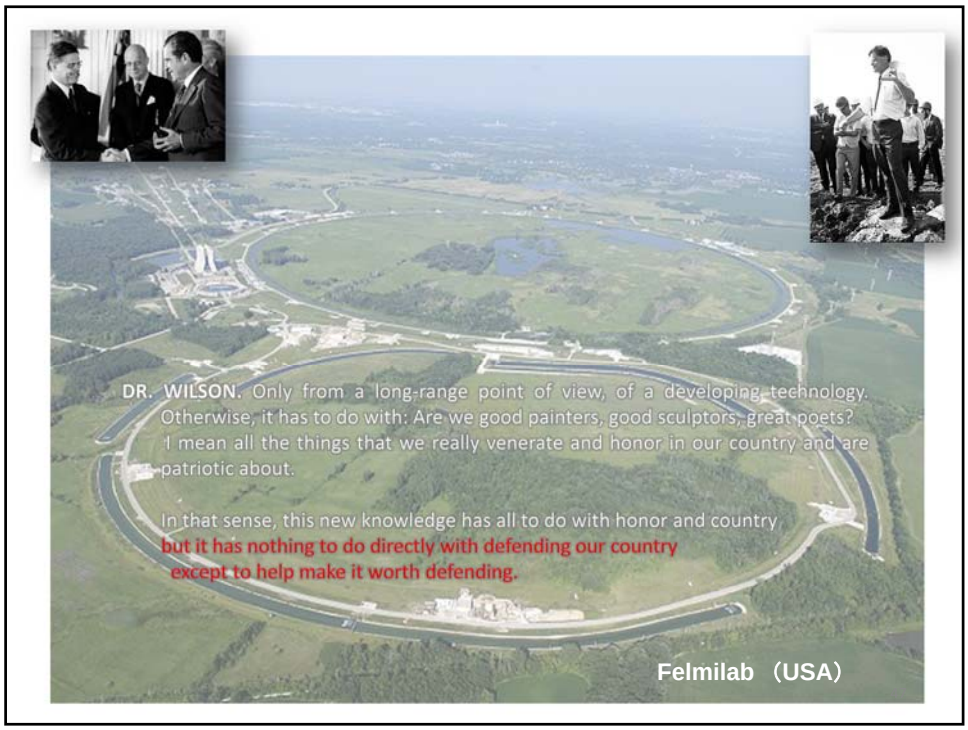
DR. WILSON. It only has to do with the respect with which we regard one another, the dignity of men, our love of culture. It has to do with those things.
It has nothing to do with the military. I am sorry

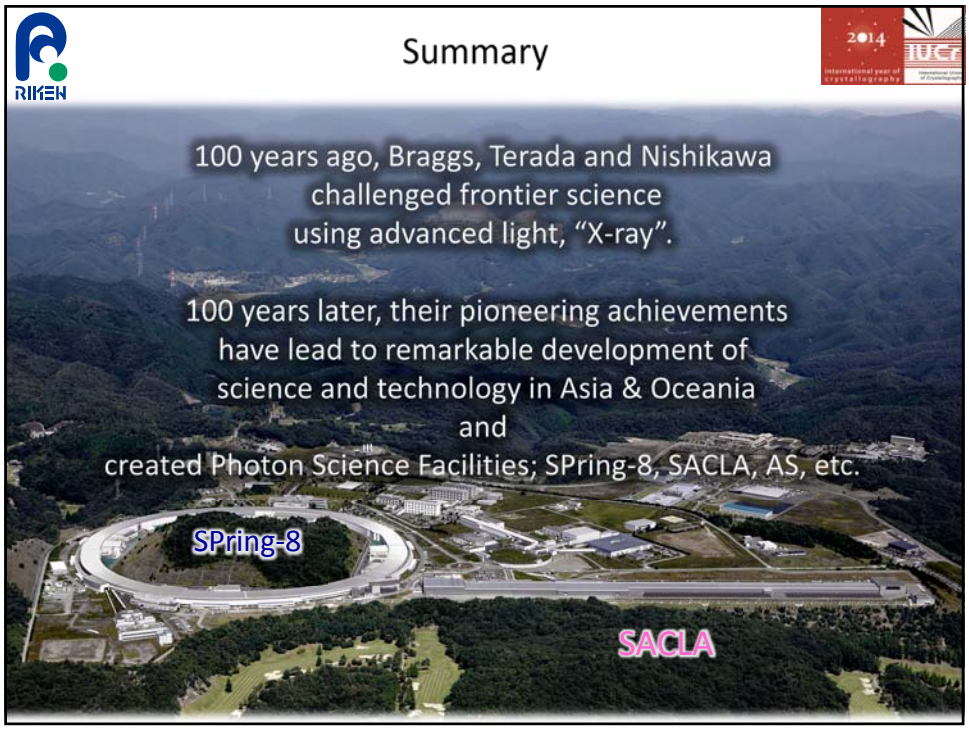
SENATOR PASTORE. Don't be sorry for it.

DR. WILSON. I am not, but I cannot in honesty say it has any such application.

SENATOR PASTORE. Is there anything here that projects us in a position of being competitive with the Russians, with regard to this race?

46


DR. WILSON. Only from a long-range point of view, of a developing technology. Otherwise, it has to do with: Are we good painters, good sculptors, great poets? I mean all the things that we really venerate and honor in our country and are patriotic about.
In that sense, this new knowledge has all to do with honor and country
but it has nothing to do directly with defending our country
except to help make it worth defending.
Felmilab （USA）


RIKEN
Summary
2014
100 years ago, Braggs, Terada and Nishikawa
challenged frontier science
using advanced light, “X-ray”.
100 years later, their pioneering achievements
have lead to remarkable development of
science and technology in Asia & Oceania
and
created Photon Science Facilities; SPring-8, SACLA, AS, etc.
SPring-8
SACLA

Epilogue

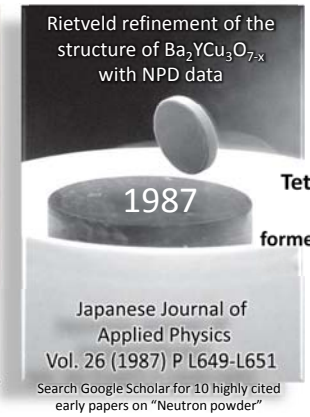
Father and Son Nishikawa

A Bold Decision by T.Nishikawa in 1987

Physicist
Crystallographer

Shoji Nishikawa
1884-1952

提供：理化学研究所資料室



Search Google Scholar for 10 highly cited early papers on "Neutron powder"

High Energy
Physicist

Tetsuji Nishikawa
1990-2001
former director-general of KEK

S. Nishikawa
with Nobel laureate
Niels Bohr

T. Nishikawa
with Nobel laureate
Y. Nanbu
@ Groundbreaking of KEK

Memorial Name Plate of Sir William Bragg
Adelaide Walk of Fame, South Australia