Brief biography

Masatsugu Sei Suzuki

Department of Physics, SUNY at Binghamton (or simply, Binghamton University)
(Date: August 07, 2023, revised)

Date of birth:	January 21, 1949 (74 years old)	
Birth place:	Jisoin, Kudoyama-cho, Ito-gun, Wakayama-ken, Japan	
Parents:	Masayuki Suzuki (Father. He was forced to go to Indonesia in the world war II. He almost died there, but finally came back to Japan after the end of war) and Masako Suzuki (Mother)	
Spouse	Itsuko S. Suzuki (伊津子)	(Ochanomizu University, Toshiba)
Children	Natsuko Anne Suzuki (奈津子)	(daughter, Cornell University)
	Sawako Phyllis Suzuki (佐和子)	(daughter, Cornell University)

Fig.1 Jisoin-temple near my birth-place, Jisonin, Kudoyama-cho, Wakayama-ken, Japan. This place is located at the foot of Koya-san. When I was very young, I used to play baseball with my friends inside the temple.

Address of the Binghamton University:

4400, Vestal Parkway East, Binghamton, NY, 13902-6000, USA
((**Office**))

Department of Physics,
Undergraduate Program Director
Binghamton University (SUNY at Binghamton)

Full Professor
E-mail address: suzuki@binghamton.edu
Ph.D. Physics (1977) from University of Tokyo, Tokyo, Japan

鈴木正継 （すずき　まさつぐ）、Japanese name]

Fig.2 Picture of Masatsugu Sei Suzuki (myself) at my office of Binghamton University (Binghamton NY, USA). Spring in 2019. Inside the Smart Energy Building which was newly built around 2016.

Fig.3 Dr. Itsuko Sato Suzuki (left, my wife) and Masatsugu Sei Suzuki (myself, right) at the College Town near the campus of Cornell University, Ithaca, NY, USA in 2019. Our daughter lived at the College Town when she was an undergraduate student of Cornell University.

Fig.4 Dr. Itsuko Sato Suzuki (right, my wife) and Masatsugu Sei Suzuki (left) at the graveyard-site of Prof. John Bardeen and Mrs. Jane Bardeen at Madison, Wisconsin, USA, January 2019. Two N letters are seen on the tombstone. It may mean that Prof. Bardeen got Nobel Prize in Physics twice (1956, discovery of transistor and BCS theory of superconductivity in 1972). When we visited our daughter at Madison, Wisconsin, we found this graveyard site. We also found the graveyard site of Prof. John H. Van Vleck close to the graveyard site of Prof. Bardeen. Note that I met Prof. John Bardeen in 1984 at the University of Illinois at Urbana-Champaign.

((EDUCATION))

Kudoyama Elementary School

Kudoyama-cho, Ito-gun, Wakayama-ken, Japan

1955-1961

Kudoyama Middle School

Kudoyama-cho, Ito-gun, Wakayama-ken, Japan

1961-1964

Ito High School

Koyaguchi-cho, Ito-gun, Wakayama-ken, Japan

1964 - 1967

Yokohama National University (Undergraduate, Electrical Engineering)

Yokohama, Japan

1967 – 1971

Prof. Yasuo Gondo **(Academic advisor)**

At the senior, I had measured magnetic striction of ferromagnetic permalloy deposited on the thin glass substrate, under the instruction of Prof. Yasuo Gondo.

Prof. Gondo was an excellent physicist, and had a lot of research papers on the magnetism, in particular on ferromagnetic thin films. Prof. Kei-ichi Kakuno was a research associate at that time. Dr. Tadashi Ikeda (Hitachi, Tokyo) was my colleague of the same laboratory at the same age

Yokohama National University (Master Degree, Electrical Engineering)

1971-1973

Yokohama, Japan

Prof. Tokio Ohta **(Academic advisor)**

(Former president of Yokohama National University, Author of Solar-hydrogen energy systems, e-book, Pergamon Press, 2013, died on June 09, 2009).

I had measured the thermoelectric power of niobium and tantalum at low temperatures, under the instruction of Prof. Tokio Ohta. Prof. Ohta was a great physicist. His interest changed from the field of solid state physics to solar-hydrogen energy system (as application), when I was still at his research laboratory. Unfortunately, Prof. Ohta died on 2009. Hopefully, the dream of Prof. Ohta (hydrogen as new energy) may come true soon.

Thanks to both Prof. Gondo and Prof. Ohta, I changed my minds. I decided to do research (experiments) on the physics, rather than the engineering. So that, I moved from Yokohama, Japan, to Tokyo, to get a Ph.D. in physics from University of Tokyo.

I realized that both Paul A.M. Dirac (relativistic electron theory, Dirac equation) and John Bardeen (electrical engineering at the University of Wisconsin, Madison, Princeton Unicersity, Ph.D. in physics, Invention of transistor; BCS theory of superconductivity) started to study electrical engineering, before changing their major field from the electrical engineering to physics. The mathematics (Laplace transform, Fourier transform, AC circuit theory) which we learn in the electrical engineering is rather different from that in physics. However, I now realize that it is very

useful to our understanding of physics (for example, plane wave representation of Maxwell' equation, statistical thermodynamics, Green's function).

One of my favorite textbooks was "Introductory Circuit Theory (Ernst A. Guillemin, MIT). Thanks to this book, I enjoyed the mathematics (complex function) using the complex plane since then. Recently I realized that Prof. Guillemin graduated from the University of Wisconsin, Madison (electrical engineering) in 1922/1923, when Prof. Arnold Sommerfeld stayed at Madison, and gave the Carl Schurz Memorial Professor of Physics lectures at Madison. Surprisingly, Prof. Guillemin got a Ph.D. in physics in the University of Munich under the instruction of Prof. Sommerfeld (University of Munich).


s

Fig.5 Photo of Prof. Tokio Ohta and his students, taken after the seminar of Ohta laboratory (Yokohama National University) in 1972. Prof. Tokio Ohta (sitting in the right side) and the author (M.S. sitting in the second from the left side).

University of Tokyo (Physics) Ph.D. in Physics
1973 - 1977
Tokyo, Japan

Prof. Sei-ichi Tanuma **(Academic advisor,** died on October, 02, 2007**)**

Ph. D. Thesis: Surface current effect in bismuth and a new method of observation for quantum magnet-oscillation, 1977).

This work was motivated by a paper of Mark Azbel (1963) on the static skin effect in strong magnetic field.

https://journals.jps.jp/doi/10.1143/JPSJ.44.1539
https://journals.jps.jp/doi/abs/10.1143/JPSJ.45.1645

I learned so many things from Prof. Tanuma (his thesis advisor was Prof. T. Fukuroi of Tohoku University, father of low temperature physics in Japan) and Prof. Hiroyoshi Suematsu (research associate of Prof. Tanuma). Prof. Tanuma was one of the best experimental physicists in Japan, studying on semi metals (bismuth, graphite, and antimony) under extremely low temperatures and strong magnetic field. He was a full professor of the Institute of Solid State Physics, University of Tokyo (Roppongi, Tokyo). Prof. Hiroyoshi Suematsu was a research associate at that time (full professor of the University of Tokyo). I had several colleagues (graduate students) in the Tanuma laboratory; Prof. Yoshichika Onuki (Ph.D. University of Tokyo, Osaka University, one year older than me, former president of Physical Society of Japan), Dr. Kohei Higuchi (NEC, Japan), Prof. Yoji Koike (Tohoku University), and Prof. Naoki Satoh (Tohoku University, Iwaki Meisei University). Topics of researches in Tanuma laboratory: the measurement of (a) de Haas-van Alphen effect in semi metals and metals, (b) Shubnikov-de Haas oscillation of magnetoresistance in semimetals and metals, and (c) Azbel-Kaner resonance in metals, under the strong magnetic fields and very low temperatures (liquid ^{4}He (1.2 K) and liquid ^{3}He (0.3 K)).

((**RESEARCH CARRIERS**))

Ochanomizu University (Department of Physics)

1977-1984
Tokyo, Japan
Research Associate of Ochanomizu University, Tokyo

Prof. Hironobu Ikeda (**Research Advisor**, died on October, 12, 1998)

After getting Ph.D. in Physics (University of Tokyo), I got a job (research associate) at the Ochanomizu University (one of two National universities only for women). I collaborated with Prof. Hironobu Ikeda (University of Tokyo, his thesis advisor was Prof. Kinshiro Hirakawa). We extensively studied the low dimensional magnetism of random spin systems, including graphite intercalation compounds, using neutron scattering. In 1990, Prof. Ikeda moved from Ochanomizu University to KEK Neutron Science Laboratory (High Energy Accelerator Research Organization, Tsukuba, Ibaraki, Japan). He continued to do his research on the low dimensional magnetism. Unfortunately, he died on October 12, 1998.

Collaborators

Prof. Hiroyoshi Suematsu (University of Tokyo, University of Tsukuba)
Prof. Ryusuke Nishitani (Kyusyu Institute of Technology)

Prof. Yasuo Endoh	(Tohoku University, Japan Atomic Energy Agency)
Prof. Hiroyuki Shiba	(University of Tokyo, Former president of the Physical Society of Japan)
Dr. Michael T. Hutchings	(Neutron scattering, Harwell, UK)
Prof. Motohiro Matsuura	(Osaka University, Kyoto Institute of Technology)
Prof. Youichi Murakami	(Osaka University, KEK)
Prof. Takemi Komatsubara	(Tohoku University)
Prof. Yoshihide Kimishima	(ISSP, University of Tokyo, Yokohama National University)
Prof. Toshinobu Tsuda	(Saitama University, NMR)
Prof. Hiroshi Yasuoka	(ISSP. University of Tokyo)

University of Illinois at Urbana-Champaign (Department of Physics)

1984-1985

Urbana, Illinois, USA

I met Prof. Hartmut Zabel at the International Symposium of Graphite Intercalation Compounds at Ponta Mousson, France, around 1982. I was very impressed with his enthusiasm on his researches at that time. So I decided to move from Tokyo to Urbana, Illinois. I worked with Prof. Zabel and his students (Drs. David G. Wiesler, Dan A. Neumann (NIST), Steve.E. Hardcastle, Paul Chow, and Paul F. Micheli (University of Missouri) at the University of Illinois at Urbana-Champaign, (a) on the magnetic neutron scattering of stage-2 $CoCl_2$ graphite intercalation compounds (2D XY spin system), and (b) the x-ray diffraction of alkali metal graphite intercalation compounds, in particular, the discommensurate domain-structure. In order to do neutron scattering at Oakridge National Laboratory, Dr. David Wiesler drived a university's car from Urbana, Illinois to Oakridge, Tennessee for 8 hours. That was an exciting experience for me. Around 1990, Prof. Zabel moved from Urbana to Ruhr University Bochum, Germany.

I also learned a lot of things from Prof. Simon C. Moss (University of Houston), in particular, the explanations of the experimental data of x-ray diffraction on alkali-metal graphite intercalation compounds. The name of the discommensuration domain structure may be coined by Prof. Simon Moss, from the analogy of sliding charge density waves proposed by William (Bill) L. McMillan (University of Illinois, died on August 30, 1984).

Collaborators

Prof. Hartmut Zabel	(University of Illinois at Urbana-Champaign, Ruhr University Bochum, Germany)
Prof. Simon C. Moss	(University of Houston, died on March 14, 2011)
Dr. David G. Wiesler	(University of Illinois at Urbana-Champaign, NIST)
Dr. Dan A. Neumann	(NIST)

Schlumberger-Doll Research

1985-1986

Ridgefield, Connecticut, USA

I moved from Urbana, Illinois to Ridgefield, Connecticut. I was impressed with nice environment of town Ridgefield which is close to Danbury (Head quarter of Union Carbide there). I collaborated with Dr. Noboru Wada (his thesis advisor was Prof. Stuart A. Solin of University of Chicago, post-doctoral research with Prof. Miles V. Klein of University of Illinois at Urbana-Champaign) and Dr. Stanley Whittingham (distinguished chemist on intercalation compounds, Oxford University, Stanford University, Exxon). I had studied experimentally the phase transition on water layer hydration states in Na- and Ca-intercalated into vermiculite. I left the Schlumberger-Doll in 1986, and got a job (physics, assistant professor of SUNY at Binghamton). Dr. Whittingham also joined the Chemistry Department of SUNY at Binghamton in 1989 as a full professor. Amazingly, he got a Nobel Prize in Chemistry in lithium-ion battery in 2019. That was one of the most exciting news for me and all people of Binghamton University.

Fig.6 Picture of Prof. M. Stanley Whittingham (Department of Chemistry, Binghamton University). Nobel laureate in chemistry, 2019.

Collaborators

Prof. Noboru Wada	(Colorado School of Mines, Toyo University, Japan)
Prof. M. Stanley Whittingham	(Nobel laureate in Chemistry, 2019)
Dr. Daniel Hines	(Schlumberger-Doll, Michigan State University)
Dr. Kei-ichi Koga	(ISSP, Institute of Solid State Physics, University of Tokyo)

Dr. Isamu Oguro (ISSP, University of Tokyo)
Prof. Hironori. Nishihara (ISSP, University of Tokyo, Ryukoku University, Japan)

State University of New York at Binghamton

1986 - present
Binghamton, NY, USA

Department of Physics, SUNY at Binghamton (Binghamton University)
Full Professor, Undergraduate Program Director

Fig.7 Fall leaves. View of Campus of Binghamton University, Binghamton, NY, USA

Dr. Itsuko S. Suzuki joined my research laboratory in 1989. when she moved from Toshiba, Japan to Vestal, NY. She got a Ph.D. in Physics from Ochanomizu University. Her Ph.D. Advisor was Prof. Fumiaki Shibata (Statistical Mechanics, Ochanomizu University). She changed her research field from theory of statistical mechanics to experiments on graphite intercalation compounds.

I learned a lot of things from Prof. Burr (my colleague, his thesis advisor was Prof. Raymond Orbach, UCLA), how to measure the DC magnetic susceptibility using his old-type but very nice equipment (magnetic force measurement under a inhomogeneous magnetic field). We studied on the magnetic properties of random-mixture graphite intercalation compounds, and magnetic bi-intercalation compounds. Later we got SQUID (superconducting quantum interference device) magnetometer at my laboratory thanks to Prof. Whittingham (we got NSF grant for the purchase

of SQUID). We studied the aging dynamics of spin glass in random mixture graphite intercalation compounds by using SQUID magnetometer.

I met Dr. Jűrgen Walter (his thesis advisor was Prof. Hanns P. Boehm, University of Munich, Germany) around 2002, at the International Symposium of Graphite Intercalation Compounds, Okazaki, Japan. I heard from him that he succeeded in preparing metal atoms (other than alkali metals), intercalated between the graphite layers. I collaborated with him on studying the physical properties of metals (Bi, Rh, Pd, Sn, Ta), sandwiched between graphite layers. I used the word, metal-graphite (MG). For example, when Bi atoms are intercalated into graphite, we called it as Bi-metal graphite (MG). Unfortunately, people might be confused about the name, since they might be confused with graphite metal. We measured the magnetic susceptibility (AC and DC) of these MG's, using a SQUID (superconducting quantum interference device) magnetometer (5 Tesla). We found exciting results, including the superconductivity in Bi, Pd, Ta, and Sn.

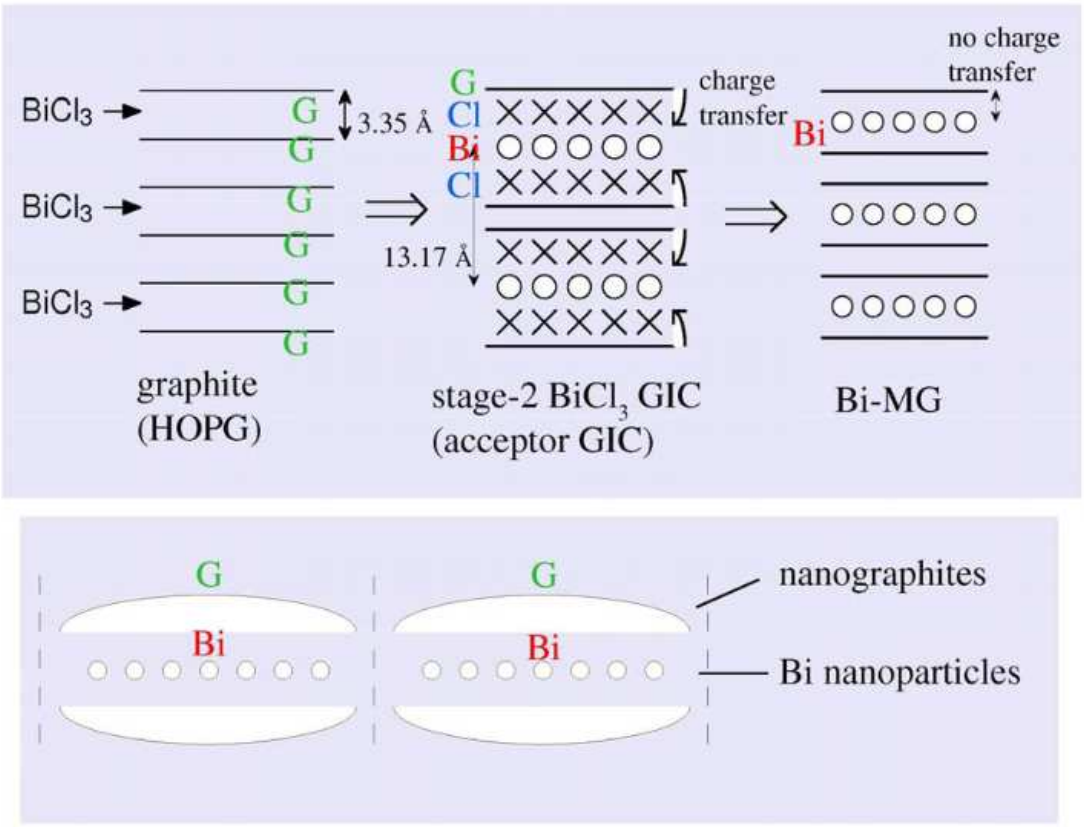

Fig.8 Schematic diagram of the sandwich structure (G – Bi – G) in Bi-MG. This method of sample preparation was ingeniously invented by Dr. Jürgen Walter (his Ph.D. advisor was Prof. Hanns P. Boehm, University of Munich), when he was at the Osaka University, Japan.

I met Prof. Hikaru Kawamura (Osaka University, former president of the Physical Society of Japan) at the Cornell University around 1986. I learned a lot of things from him, including the spin frustration effect in the antiferromagnetic triangular lattice. Prof. Kawamura moved from Ithaca, NY to University of Maryland College Park together with Prof. Michael E. Fisher.

((**Book**))

T. Enoki, M. Endo, and M. Suzuki, Graphite Intercalation Compounds and Applications (Oxford University Press, 2003).

https://oxford.universitypressscholarship.com/view/10.1093/oso/9780195128277.001.0001/isbn-9780195128277

Collaborators

Dr. Itsuko S. Suzuki	(Department of Physics, Binghamton University, Ochanomizu University, Tokyo, Ph.D. advisor; Prof. Fumiaki Shibata)
Prof. Charles R. Burr	(Department of Physics, Binghamton University, UCLA, advisor; Prof. Raymond Orbach)
Prof. Eric J. Cotts	(Department of Physics, Binghamton University)
Prof. Bruce White	(Department of Physics, Binghamton University)
Prof. M. Stanley Whittingham	(Department of Chemistry, Binghamton University, Oxford University)
Prof. Noboru Wada	(Toyo University, Japan)
Prof. C.J. Zhong	(Department of Chemistry, Binghamton University)
Dr. Jürgen Walter	(preparation of metal inserted in graphene sheets, Osaka University, Japan. Ph.D. in University of Munich, Germany)
Prof. Masao Ohashi	(Department of Chemistry, Binghamton University, Prof. Whittingham's group. Tokuyama College of Technology)
Prof. Osamu Itoh	(Tohoku University)
Dr. Peter Y. Zavalij	(University of Maryland, College Park)
Dr. Natalia Chernova	(Department of Chemistry, Binghamton University, Prof. Whittingham's group)
Prof. Yoji Koike	**(**Tohoku University, Sendai, Japan)
Prof. Hiroyoshi Suematsu	(University of Tokyo, Tokyo, Japan)
Prof. Toshiaki Enoki	(Tokyo Institute of Technology, Tokyo, Japan)
Prof. Hirohiko Satoh	(Tokyo Institute of Technology)

Prof. Morinobu Endo	(Shinsyu University, Japan)
Prof. Ko Sugihara	(Massachusetts Institute of Technology, Boston, USA, Nihon University, Tokyo, Japan)
Dr. Gene Dresselhaus	(MIT)
Prof. Mildred Dresselhaus	(MIT)
Dr. Keiko Matsubara	(Nihon University)
Prof. Motohiro Matsuura	(Osaka University, Kyoto Institute of Technology, Japan, study of spin glass-like behavior in magnetic GIC's)
Prof. Hiroshi Yasuoka	(Institute of Solid State Physics, University of Tokyo)
Prof. Hironori Nishihara	(Ryukoku University, Japan)
Prof. Hikaru Kawamura	(Osaka University, Cornell University (working with Prof. Michael E. Fisher), former president of Physical Society of Japan)
Prof. Seiji Miyashita	(University of Tokyo, 2D XY spin system)
Dr. David G. Wiesler	(National Institute of Standard Technology, NIST, Gaithersburg, Maryland)
Dr. Nick Rosov	(NIST)
Dr. William Kamitakahara	(NIST)
Dr. Arthur Moore	(Union Carbide, we got a lot of high quality HOPG from him)

Students of my laboratory (alphabetical order)

Lyubov Anisimova	(from Russia, Superconductivity with Mathematica)
Kristine DeVries	
Sharbani I. Fullem	(SQUID measurement of super-spin glass)
C.J. Hsieh	
T.-Yu. Huang	(Electrical resistivity of stage-1 $CoCl_2$ GIC)
Mitchel Johnson	(Physics teacher of Endicott high school, Endicott, NY)
Kardiawarman	(from Indonesia, Superconductivity of $YBa_2Cu_3O_{7,}$ SUNY at Albany)
Michael J. Kellicut	
Floyd Khemai	
Nick Kim	(Study on stage-2 $CrCl_3$ graphite intercalation compound)
Chaoli Lee	(c-axis resistivity measurement of GIC)
Robert Lee	(Superconductivity of Bi-MG)

Thomas Mellin
Jaime Morrilo
Seth A. Newman
Ross Niver
Brian Olson
Tedmann M. Onyango (From Kenya)
Emil C. Piscani (Corning, NY)
Samuel M. Sampere (Syracuse University)
Louis Santodonato (University of Tennessee, Oakridge National Laboratory)
Michael J. Schauber
Takehiko Shima (from Japan)
Kazuhisa Suzuki (from Japan)
Catherine Beth Vartuli (University of Florida)
Ian Vabnick
Mildred Yeh (Cornell University)
Wei Zhang

Institute of Molecular Science

1991 (Sabbatical stay from Binghamton University)
Okazaki, Japan

I have known Prof. Yusei Maruyama when I was a research associate at the Ochanomizu University (1978-1983). I met him again at the March Meeting of American Physical Society around 1990. My wife (Itsuko) and I stayed at Institute of Molecular Science, Okazaki, Japan for 4 months, as my sabbatical stay form Binghamton University. Dr. Itsuko S. Suzuki and I have measured the physical properties of our samples (GIC's) by using so many excellent instruments at the institute.

Collaborator

Prof. Yusei Maruyama (Ochanomizu University, Institute of Molecular Science, died on October 30, 2014)

((**EDUCATIONAL ACTIVITY**))

The Study of fundamental physics with the use of Mathematica (2011 -)

Full Professor and Undergraduate Program Director of Department of Physics, Binghamton University

At 2009, I suffered from a cancer of lymphoma. After two years, I completely recovered from the sickness. During these times, I lost the opportunity to do my research, no graduate student and no grant money of research from the outside. Because of no grant for the purchase of liquid helium, we could not maintain the operation of SQUID magnetometer. So, I changed my direction (by 180 degrees) of career from experimental physics to studying of fundamental physics with the use of Mathematica.

While teaching classes, I have been very carefully preparing lectures notes on general physics, modern physics, quantum mechanics, mathematical physics, statistical thermodynamics, computational physics (Mathematica), Senior Laboratory, which are mainly for the undergraduate physics students. You can find the lectures notes

http://bingweb.binghamton.edu/~suzuki/index.html

I am now teaching Phys.421 (Quantum Mechanics I, Fall semester) and Phys.422 (Quantum mechanics II, Spring semester). While teaching these courses, I try to understand quantum mechanics more deeply. In solid state physics, we study the BCS theory for the superconductivity. We know that the formation of the Cooper pairs is essential to the occurrence of superconductivity below a transition temperature. When I learned about the quantum entanglement and quantum teleportation. it occurred to me that the Cooper pair of electrons with spin-up up and spin-down states may be related to the quantum entanglement. Even if the two electrons are separated by long distance (such a macroscopic size of the system), they are somehow communicated to each other. I think that we need to understand such a strange behavior in terms of quantum mechanics, if it is possible.

((**Richard P. Feynman**))

"**I think I can safely say that nobody understands quantum mechanics.**" It is one of the most repeated quotes of Richard Feynman (11 May 1918 – 15 February 1988, Nobel laureate in physics, 1965), and is undoubtedly an unusual phrase coming from the mouth of a physicist. But the words make sense when you understand how Feynman's fine mental gears worked, a man who was, in addition to one of the most renowned figures of theoretical physics of all time, one of the most popular scientists of the twentieth century.

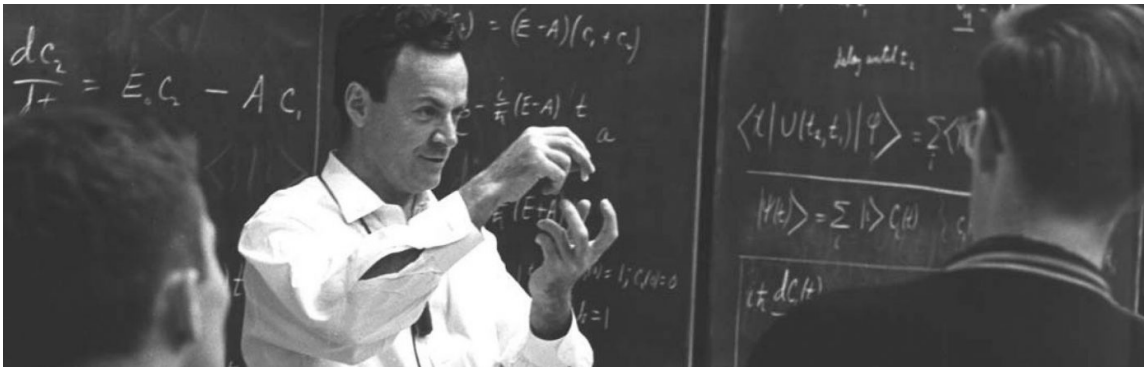

Fig.9 Photo of Prof. Richard P. Feynman (1965 Nobel laureate in Physics) who taught physics (Feynman path integral) in California Institute of Physics in 1960's).
https://www.bbvaopenmind.com/en/science/leading-figures/richard-feynman-the-physicist-who-didnt-understand-his-own-theories/

Image of the Duality of wave and particle (quantum mechanics)

Fig.10 Ukiyoe. Katsushika Hokusai. Fugaku 36 kei. Kanagawa-oki. Nami-ura. Mount Fuji is seen at the background. 浮世絵。葛飾北斎。富嶽３６景。神奈川沖一浪裏。

https://en.wikipedia.org/wiki/The_Great_Wave_off_Kanagawa

There are 23 people getting on three boats (according to Japanese experts). They had nice experience of quantum mechanical world with the duality of wave and particle. This is my favorite picture. I bought a copy of this picture at the Smithsonian Museum in Washington, DC. I put the copy at my office.

((**Note**))

This is the first time for me to write a brief biography. The purpose of this note is just to introduce myself who I am. I may misunderstand some of the situations above decribed. Once those are found, I am willing to revise it.