

Title: Delightful Friends in Work for the Quantum Channel

Date: Jun 27, 2008 03:00 PM

URL: <http://pirsa.org/08060206>

Abstract:

# **Delightful friends in work for the quantum channel**

**Osamu Hirota**

**Research Center for Quantum Information Science**

**Tamagawa University**

## **Thanks**

**C.H.Bennett**

**G.M.D'Ariano**

**C.A.Fuchs**

**A.S.Holevo**

**R.Jozsa**

**D.Leung**

**M.Ozawa**

**P.Shor**

**J.Smolin**

**T.Usuda**

**S.J.van Enk**

**H.P.Yuen**



**K.Gillespie**

**D.Bombay**

**and Perimeter Institute for Theoretical Physics**

**Special thanks**



**Kamakura, Great Buddha**



I would like to thank all the participants and I appreciate the kindness of Fuchs and Holevo, who organized such a nice meeting. This is an “all-star” meeting.

My role has been to level the ground for great scientists such as Bennett, Holevo, Shor, Yuen and so on, as well as to give young scientists opportunities of discussing with such leaders. So I founded the QCM&C. I prefer to play a supporting role.

I was surprised at this plan for my birthday party, and hesitated to accept it. However, Chris suggested me that I should view it as an enjoyable affair, with a good opportunity to enjoy the ambience of Perimeter Institute.

Now, those scientist whom I respect celebrated my birthday, which makes me very happy. I indeed enjoyed this meeting.

Here, I would like to introduce the people whom I encountered last 35 years.

# 3<sup>rd</sup> QCM&C 1996, Hakone Japan

Quantum communication meets  
quantum computing and processing

Quantum communication  
award has started

**Third International Conference  
on Quantum Communication & Measurement**  
量子通信国際会議

**QCM-96**  
Date: September 25 to 30, 1996  
Place: Fuji-Hakone land Japan

**Organizers**  
O. Hirota (Osaka University) A. S. Holevo (Moscow State University) C. M. Caves (University of New South Wales) H. P. Yuen (Yale University) L. Accardi (University of Rome)

**Subjects**  
1. Quantum information theory 2. Quantum computers 3. Quantum cryptography  
4. Quantum communication systems 5. Generations of nonclassical light 6. Atom optics  
7. Quantum measurement theory 8. Quantum probability

**Invited Speakers**

1. J. Benford (University of Colorado)	7. K. Saito (University of Tsukuba)	13. M. Ochiai (University of Tsukuba)	19. A. Galbraith (University of Toronto)
2. P. Benioff (University of California)	8. A. Koblitz (University of Tsukuba)	14. B. Peber (University of Tsukuba)	20. P. Julier (University of Toronto)
3. K. Blum (University of California)	9. K. Kikuchi (University of Tsukuba)	15. R. C. Flanagan (University of Tsukuba)	21. S. Guha (University of Toronto)
4. L. D. Bakula (University of California)	10. L. L. Chang (University of Tsukuba)	16. P. Hsu (University of Tsukuba)	22. S. J. Kim (University of Toronto)
5. M. Bell (University of California)	11. B. H. Kolner (University of Tsukuba)	17. S. Hasegawa (University of Tsukuba)	23. S. J. Kim (University of Toronto)
6. S. Brann (University of California)	12. S. T. Phipps (University of Tsukuba)	18. N. Yamamoto (University of Tsukuba)	24. S. J. Kim (University of Toronto)

**Committee Members**

1. M. Bell (University of California)	11. S. T. Phipps (University of Tsukuba)	21. S. J. Kim (University of Toronto)
2. S. Brann (University of California)	12. S. T. Phipps (University of Tsukuba)	22. S. J. Kim (University of Toronto)
3. K. Blum (University of California)	13. M. Ochiai (University of Tsukuba)	23. S. J. Kim (University of Toronto)
4. L. D. Bakula (University of California)	14. B. Peber (University of Tsukuba)	24. S. J. Kim (University of Toronto)
5. M. Bell (University of California)	15. R. C. Flanagan (University of Tsukuba)	25. S. J. Kim (University of Toronto)
6. S. Brann (University of California)	16. P. Hsu (University of Tsukuba)	26. S. J. Kim (University of Toronto)
7. K. Saito (University of Tsukuba)	17. S. Hasegawa (University of Tsukuba)	27. S. J. Kim (University of Toronto)
8. A. Koblitz (University of Tsukuba)	18. N. Yamamoto (University of Tsukuba)	28. S. J. Kim (University of Toronto)
9. K. Kikuchi (University of Tsukuba)	19. A. Galbraith (University of Toronto)	29. S. J. Kim (University of Toronto)
10. L. L. Chang (University of Tsukuba)	20. P. Julier (University of Toronto)	30. S. J. Kim (University of Toronto)

**Local arrangement committee**  
1. M. Bell (University of California) 2. S. Brann (University of California) 3. K. Blum (University of California) 4. L. D. Bakula (University of California) 5. M. Bell (University of California) 6. S. Brann (University of California) 7. K. Blum (University of California) 8. L. D. Bakula (University of California) 9. M. Bell (University of California) 10. S. Brann (University of California) 11. K. Blum (University of California) 12. L. D. Bakula (University of California)

主催: 玉川大学  
協賛: 東京通信理工学研究所、情報処理学会、量子通信研究会  
協賛: フジ・ハコネランド株式会社

Address of Conference Office:  
Research Institute of Tamagawa University,  
1-1-1 Tamagawa, Machi, Machi, Tokyo 210, Japan  
Tel: 0427-74-4411  
http://www.rim.tamagawa.ac.jp

3<sup>rd</sup> QCM&C 1996, Hakone Japan

Landauer suggested me to invite Bennett





3<sup>rd</sup> QCM&C 1996, Hakone Japan





3<sup>rd</sup> QCM&C 1996, Hakone Japan



3<sup>rd</sup> QCM&C 1996, Hakone Japan



3<sup>rd</sup> QCM&C 1996, Hakone Japan





3<sup>rd</sup> QCM&C 1996, Hakone Japan



President of Tamagawa University

Chris is looking for food.

3<sup>rd</sup> QCM&C 1996, Hakone Japan





3<sup>rd</sup> QCM&C 1996, Hakone Japan

Scientists prefer a chat with young staff.





After 3<sup>rd</sup> QCM&C 1996, Hakone Japan

Holevo suggested to invite Kitaev.



(Shrine nearby University)

Kitaev

# Shikao Ikehara

First Ph.D from Norbert Wiener  
in MIT

“Proof of Prime number theorem  
based on Tauber theorem”

He suggested to attend the summer school in MIT at  
1975.

In this seminar, I met **H.P. Yuen** who gave a lecture of  
quantum communication theory  
and two-photon coherent state (Squeezed state).

August, 1975 is my memorial day

池原先生に捧ぐ



故 池原止文夫博士

明治37年4月11日 大阪に生る。

マサチューセッツ工科大学卒業、Ph. D. 理学博士

大阪大学理学部講師

東京工業大学理学部数学科教授、名誉教授

昭和59年 他界

専門：解析的数論、フーリエ解析、サイバネティクス

研究業績：素数分布における池原-Wienerの定理

Wiener非線形理論の実用化問題

Slaterと共に分子の結合力の解析

教育業績：サイバネティクスの普及

日本の工科大学の基準案の作成

アルプライト留学委員長

晩年、江戸の量子通信理論研究者の育成に尽力

1977, San Diego

C.W.Helstrom





1978

In Poland

R.S. Ingarden introduced me  
Quantum thermodynamics in  
East Europe



We made a plan to organize a new type of conference on quantum communication. A “new” means discussion and collaboration among mathematics, physics, information, and electronics at the same place.

CNRS accepted our proposal, and first conference was held in Paris.

Paris, 1990





## First Conference of QCM&C in Paris: 1990

(Quantum aspect of optical communications)





Holevo promised us to collaborate for developing this new conference.

1<sup>st</sup> QCM&C 1990



1<sup>st</sup> QCM&C 1990

A new collaboration started.





## 2<sup>nd</sup> QCM&C 1994 Nottingham, UK

Quantum measurement and  
mathematical physics  
were emphasized



Stratonovich,

Belavkin



## 2<sup>nd</sup> QCM&C 1994 Nottingham



# 4<sup>th</sup> QCM&C 1998, Northwestern U, USA

QCM&C meets  
quantum algorithm

and

experimental work

**4th International Conference on  
Quantum Communication  
Measurement & Computing**

**Northwestern University**  
Evanston, Illinois USA  
August 22-27, 1998

**Principal Organizers**  
Prem Kumar, *Northwestern University*  
G. Mauro D'Aranno, *University of Pavia, Italy*  
Osamu Hirota, *Tohoku University, Japan*  
Jeffrey H. Shapiro, *MIT*  
Horace P. Yuen, *Northwestern University*

**Subject Areas**

- Quantum information theory
- Quantum computing
- Quantum communication systems, cryptography
- New quantum effects and their experiments
- Generation and detection of nonclassical light
- Quantum noise, stochastic processes and filtering
- Quantum measurement theory

**International Advisory Board and Invited Speakers**

V. Anshu	University of Bonn, Germany	A.J. Shields	London Institute, Moscow
G.S. Agarwal	International Oceanic Bank	A. Shrivastava	Indian Institute of Technology
S. Barone	University of Bari, Italy	G. S. Shrover	University of Queensland
V.P. Belavkin	Norwegian University	J. Shynk	University of Waterloo
C.H. Bennett	IBM	M. Sjöqvist	Nagoya University
C.M. Caves	University of New Mexico	A. Sjöqvist	Department of Physics of Stockholm
F. De Martini	University of Rome, La Sapienza	E.S. Shtrikman	Yeshiva University
A. D'Almeida	University of Oregon	M. Sørensen	University of Oregon
S.R. Fehnberg	NYT	J.C. Spector	IBM, Almaden
J.D. Franson	Johns Hopkins University	S.E. Suckale	Boise State University
A. Furusawa	Osaka Institute of Technology	W. Strykowski	University of Wrocław
H.A. Haus	MIT	S. Suckale	University of Wrocław, Poland
A.S. Holevo	Radio-Mathematical Institute	P. Szepietowski	AGH-UST, Krakow
R. Hughes	LANL	M. Szwed	IBM, Almaden
S. Jafarizadeh	MIT	M.C. Teich	Boise State University
R. Jansz	University of Pittsburgh	P. Törmä	University of Cambridge
T.H. Kane	University of Maryland, College Park	D.P. Walls	University of Queensland
H.J. Kimble	California Institute of Technology	H. Wallner	Max-Planck Institute
A. Klyshko	Leningrad Institute, Moscow	L.-A. Wu	Chinese Academy of Sciences
P.L. Knight	Imperial College	S. Yamamoto	Osaka University
A. Lita	MIT	A. Zukowski	University of Wrocław
		P. Zoller	University of Innsbruck

**Local Organizing Committee**

W.L. Kruis	Northwestern University
A.K. Goyal	Northwestern University
J.E. Chiles	Indiana/Purdue University
M. Chiao	Tohoku University

**Conference Address:**  
QCM&C  
Northwestern University  
1445 South Sherman Road, Evanston, IL 60201-3114 USA  
Tel: 708/307-3336, Fax: 708/307-3337  
E-mail: qcm@northwestern.edu



## 2<sup>nd</sup> QCM&C 1994 Nottingham





# 4<sup>th</sup> QCM&C 1998, Northwestern U, USA

QCM&C meets  
quantum algorithm

and

experimental work

**4th International Conference on  
Quantum Communication  
Measurement & Computing**

**Northwestern University**  
Evanston, Illinois USA  
August 22-27, 1998

**Principal Organizers**  
Pram Kumar, *Northwestern University*  
G. Mauro D'Ariano, *University of Pavia, Italy*  
Osamu Hirota, *Tokyo University, Japan*  
Jeffrey H. Shapiro, *MIT*  
Horace P. Yuen, *Northwestern University*

**Subject Areas**

- Quantum information theory
- Quantum computing
- Quantum communication systems, cryptography
- New quantum effects and their experiments
- Generation and detection of nonclassical light
- Quantum noise, stochastic processes and filtering
- Quantum measurement theory





**International Advisory Board and Invited Speakers**

L. Accardi	University of Rome, Italy	A.J. Shields	London Institute, UK
G.S. Agarwal	University of Illinois, USA	A. Shrivastava	University of Jyväskylä, Finland
A. Aspect	University of Paris, France	G. Shtrom	University of Queensland, Australia
V.P. Belinfante	Northwestern University	J. Shynk	University of Toronto, Canada
C.H. Bennett	MIT	M. Shroff	Virginia University, USA
C.M. Caves	University of New Mexico	A. Shukla	Indian Institute of Technology, India
F. De Martini	University of Rome, La Sapienza	C.B. Smith	Applied University, UK
A. Demicheli	University of Padua, Italy	M. Sørensen	University of Oregon, USA
S.R. Friberg	MIT	J.C. Stein	MIT, USA
J.D. Franson	Johns Hopkins University	S.S. Slichter	State University, USA
S. Harshbarger	Oak Ridge National Laboratory	W. Strykowski	University of Wrocław, Poland
H.A. Haus	MIT	V. Stojanović	University of Maribor, Slovenia
A.S. Holevo	Radio Mathematical Institute, USSR	F. Steinhilber	INFN, Italy
R. Hughes	LLNL	M.C. Teich	Boston University, USA
S. Jovanović	MIT	P. Törmä	University of Cambridge, UK
R. Jones	University of Pittsburgh	D.E. Walls	University of Queensland, Australia
D.A. Kuan	University of Maryland, College Park	H. Wallner	Max-Planck Institute, Germany
H.J. Kimble	California Institute of Technology	L.-A. Wu	Chinese Academy of Sciences, China
A. Klyshko	Leningrad Institute, USSR	S. Yamamoto	Nagoya University, Japan
P.L. Knight	Imperial College, UK	A. Zangwill	University of Maryland, USA
A. Kurokawa	MIT	P. Zoller	University of Innsbruck, Austria

**Local Organizing Committee**

W.L. Kish	Northwestern University
A.K. Ekert	Northwestern University
J. K. O'Brien	Northwestern University
M. Oshita	Northwestern University

**Conference Address:**  
QCM  
Northwestern University  
2145 North Sheridan Road, Evanston, IL 60201-3144 USA  
Tel: 708/343-7000 Fax: 708/343-7000  
E-mail: qcm@northwestern.edu

4<sup>th</sup> QCM&C 1998, Northwestern U, USA



4<sup>th</sup> QCM&C 1998, Northwestern U, USA





4<sup>th</sup> QCM&C 1998, Northwestern U, USA



4<sup>th</sup> QCM&C 1998, Northwestern U, USA

P. Tombesi

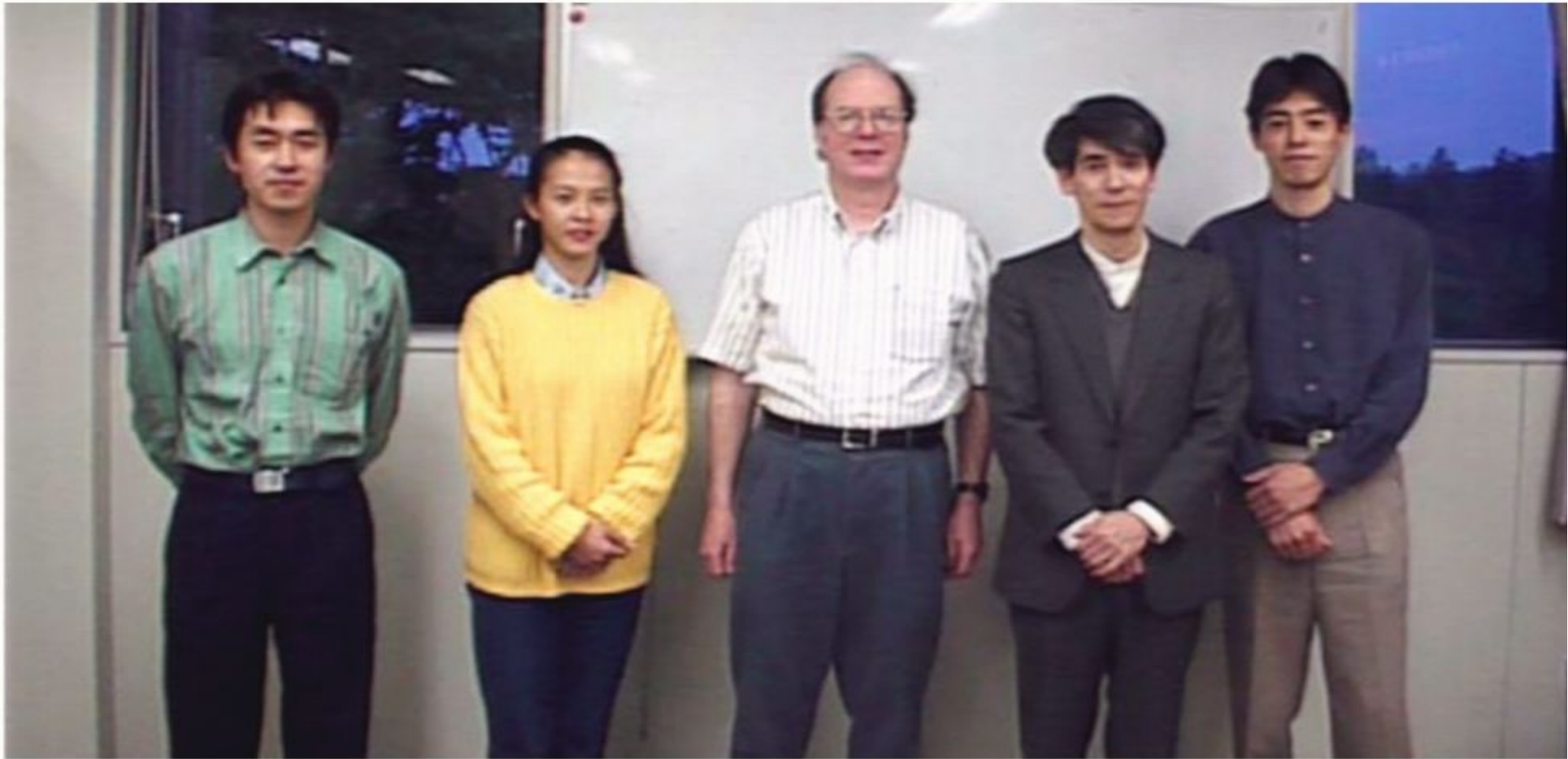








# Tamagawa University



E-mail each other





Sightseeing for a beaver and his dam.

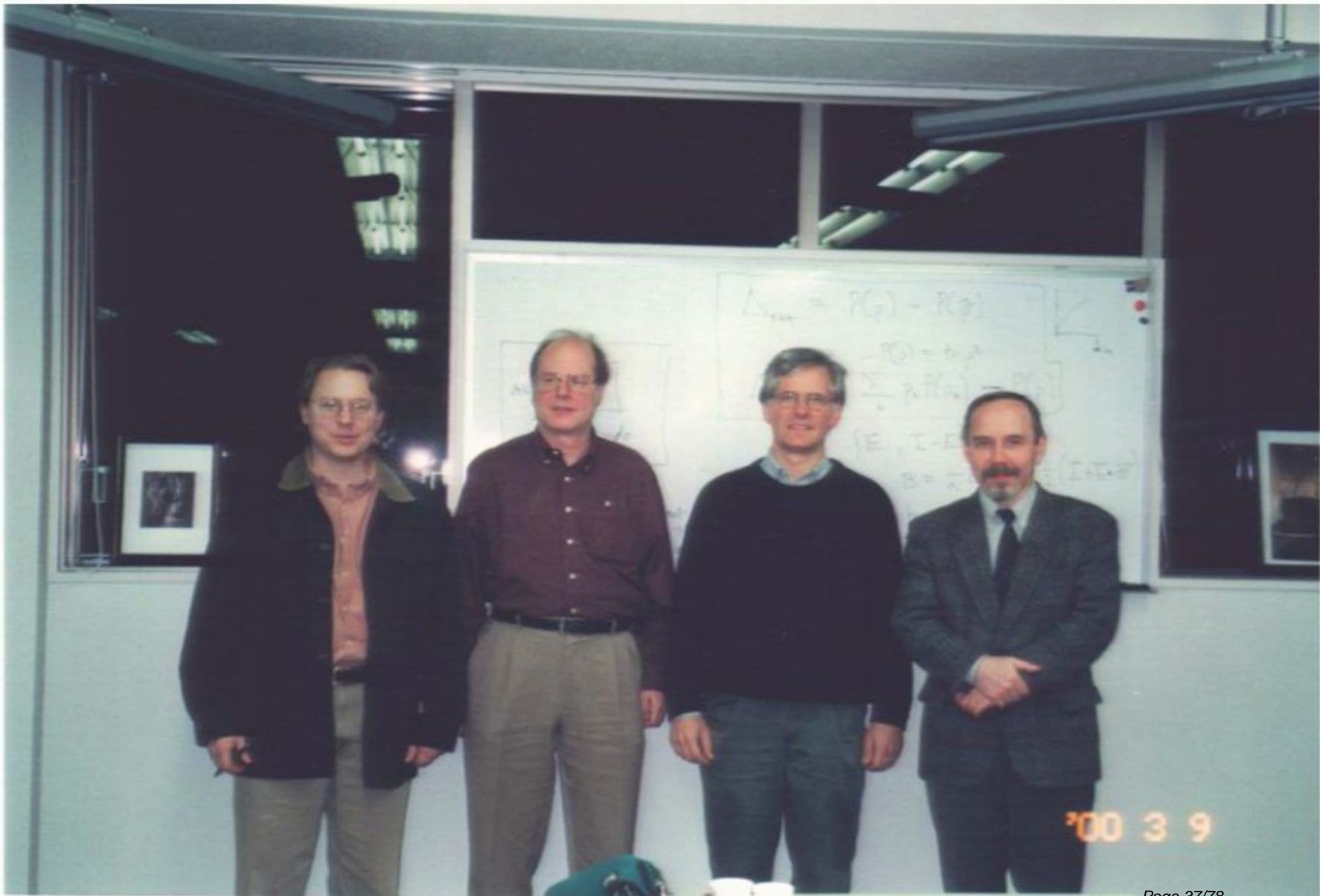




How to discuss in a lavatory.  
Japanese woman scientist reported  
there is also black board in a lady's.



Tamagawa University, 2000 March



Richard is assaulted by a thug.



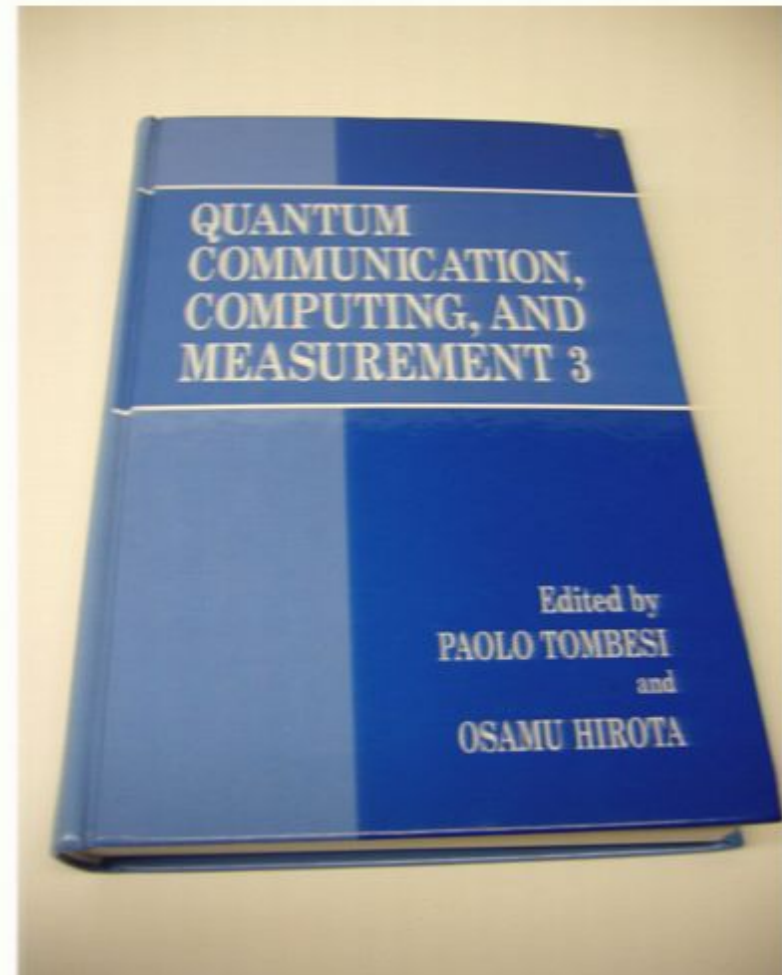


# My home



# 5<sup>th</sup> QCM&C 2000, Capri, Italy

QCM&C meets  
Entanglement



## 5<sup>th</sup> QCM&C 2000, Capri, Italy





# 5<sup>th</sup> QCM&C 2000, Capri, Italy



QIS meeting, 2001, Oiso Japan

Time machine ?

Serious scientists enjoy “egg plant-man”







Steven has a fear of heights  
at station of a ropeway.





Which is Chris?



# A pirate of Ohio ?





Bennett asked Minori, What did your bath speaks ?  
Bath said “water has grown hot”  
“please use a bath”

My home



Composed by ?.





## 6<sup>th</sup> QCM&C 2002, MIT USA















# Bennett 60<sup>th</sup> birthday party (2003, May)







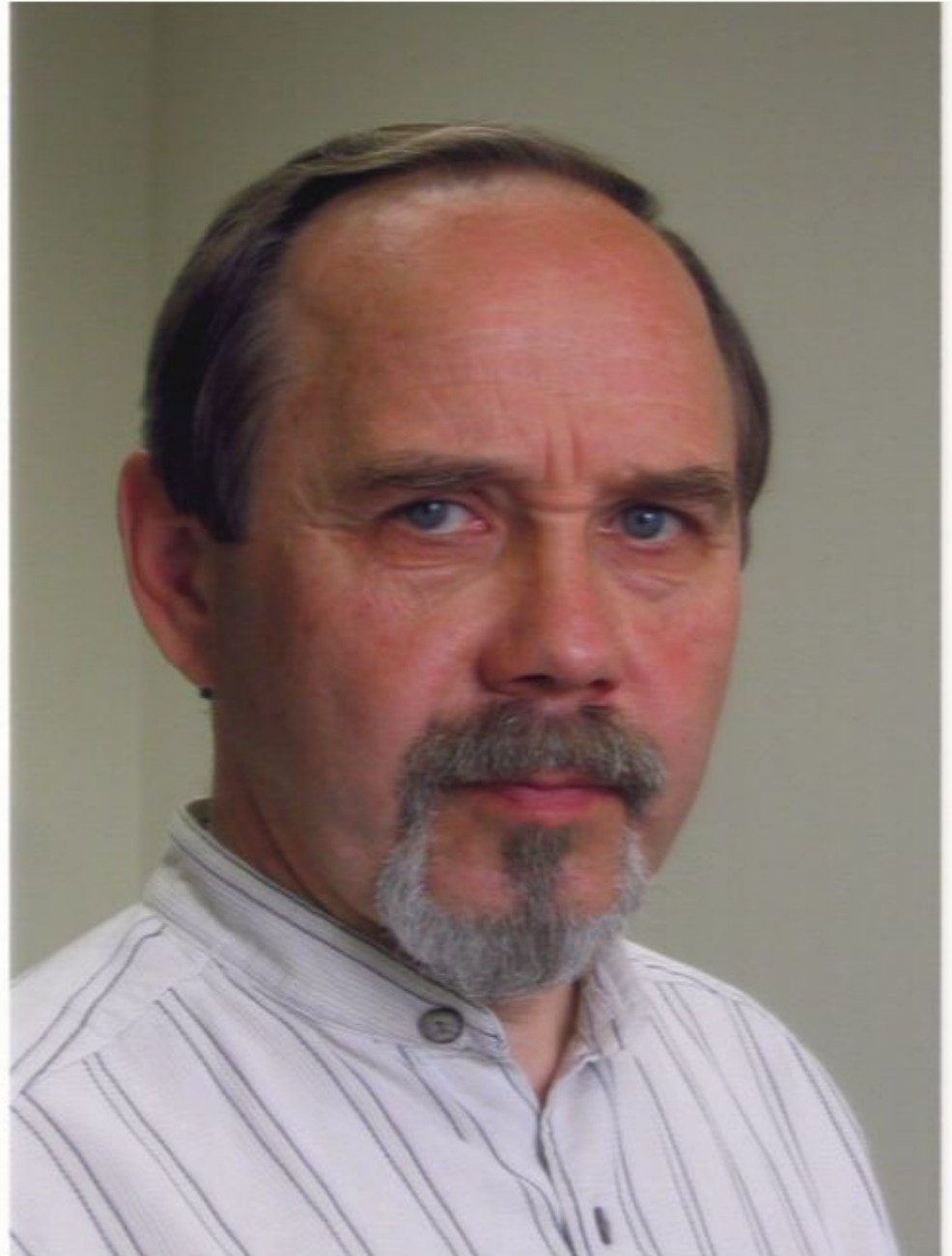




Holevo 60<sup>th</sup> birthday  
(2003, Sept)

Quantum Information,  
Statistics, Probability

Rinton Press



## Usuda organized small meeting for young researchers in Japan





Excellent collaboration  
by two Samurai

Lake Kawaguchi  
nearby Mt Fuji



# Tokyo University





KEY GENERATION

classical noise  
or quantum

$$I(\Sigma_\epsilon | K) > H(K)$$

$$H(K | \Sigma_\epsilon) > 0$$

KCQ: A N  
Quantum

Center for Physics  
Department

# 7<sup>th</sup> QCM&C 2004, Glasgow, UK





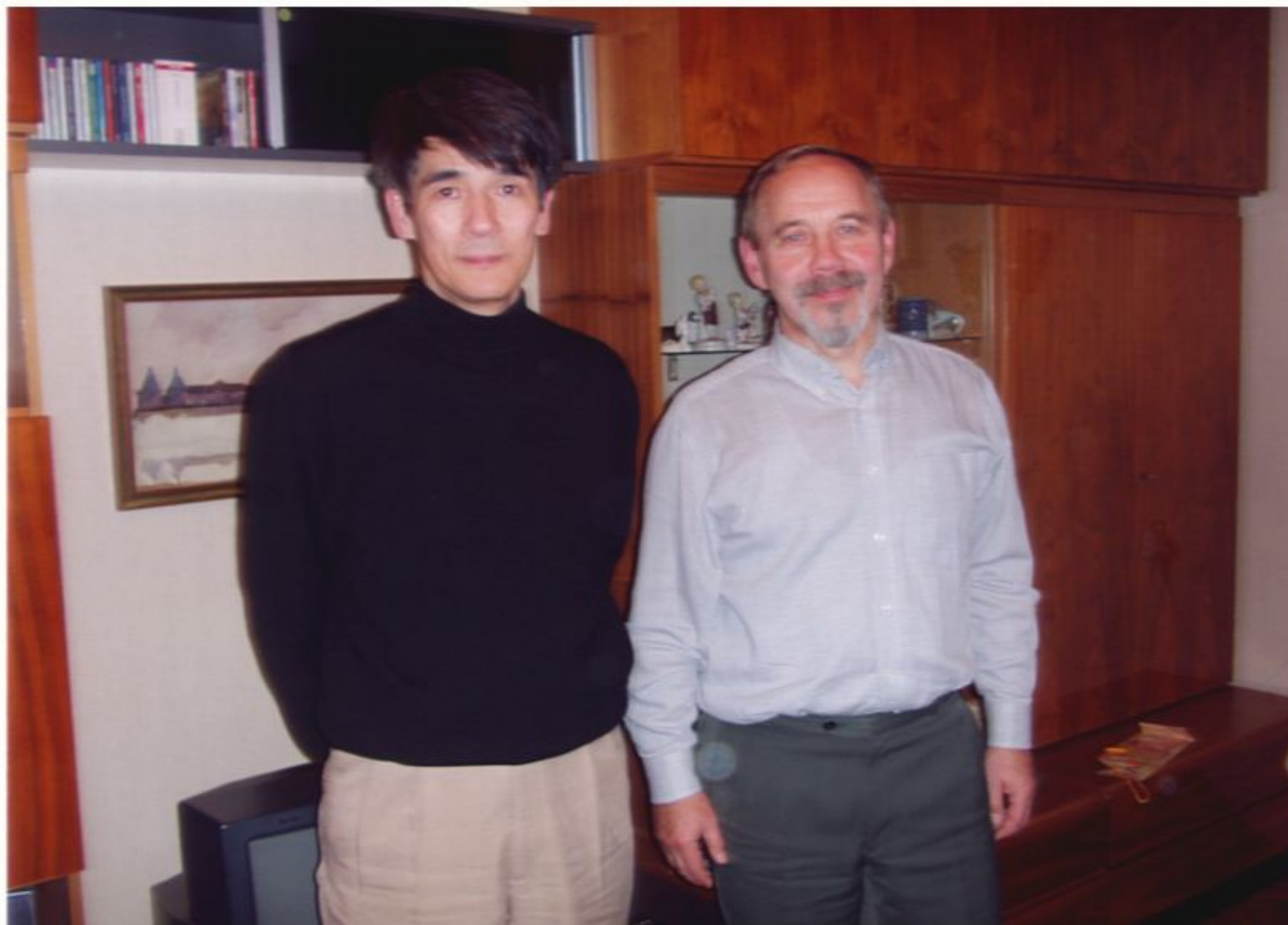


Moscow, 2004





in Holevo's new home



Kentaro Kato and his wife  
(Wedding ceremony in Taiwan, 2004)





# In Germany



# 8<sup>th</sup> QCM&C 2006, Tsukuba, Japan





# In Germany





# 8<sup>th</sup> QCM&C 2006, Tsukuba, Japan





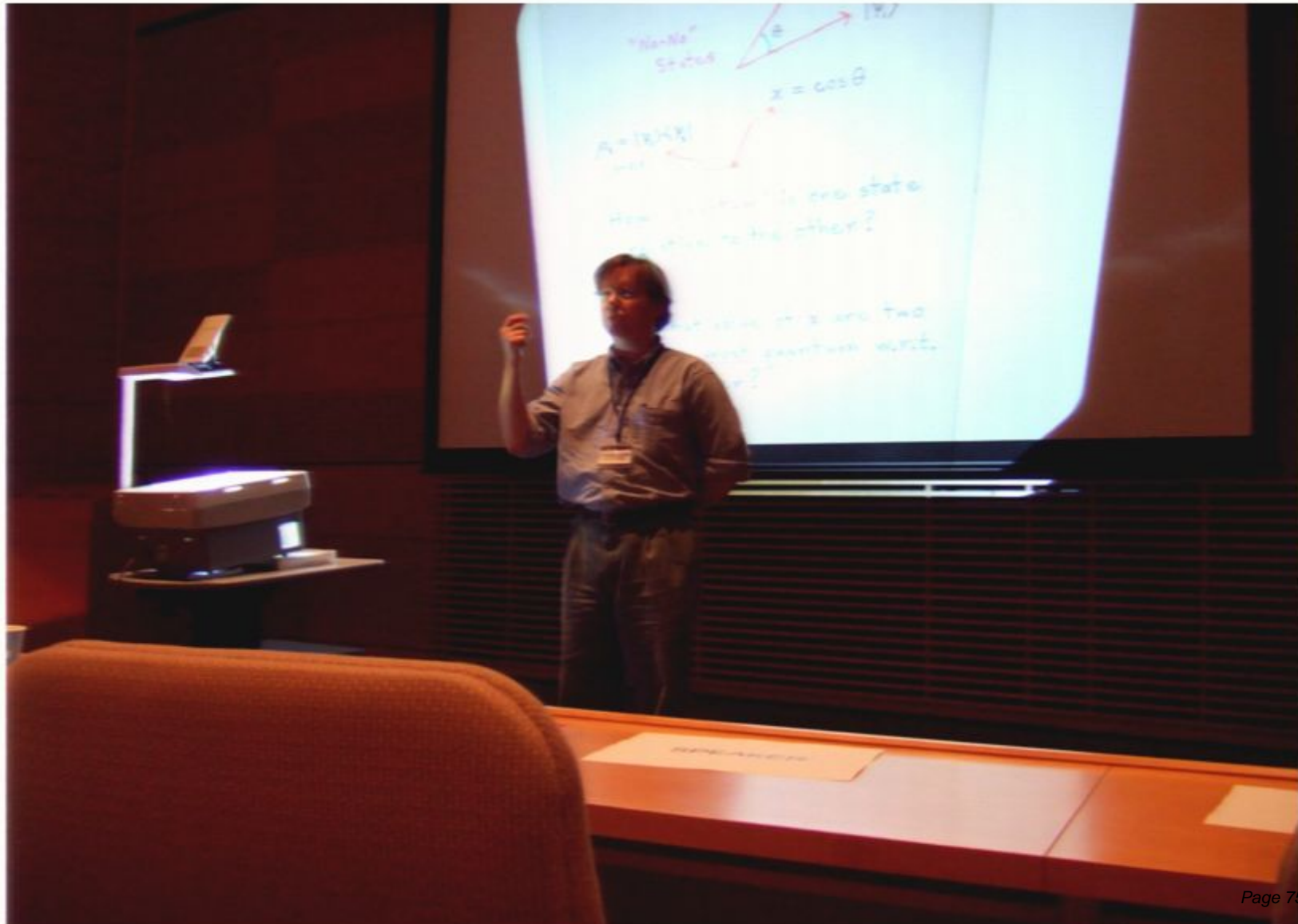








# What is quantum-ness ?



# Conclusion

I hope that everybody enjoyed episodes of great people.  
Again I would like to thank you all.

**C.H.Bennett**

**G.M.D'Ariano**

**C.A.Fuchs**

**A.S.Holevo**

**R.Jozsa**

**D.Leung**

**M.Ozawa**

**P.Shor**

**J.Smolin**

**T.Usuda**

**S.J.van Enk**

**H.P.Yuen**

During three days  
I had good time, and  
now I am very happy.



Chris Fuchs is one of my best friends. Finally I would like to thank him for his hospitality, and to thank Holevo for proposal of this meeting.

Chris Fuchs is one of my best friends. Finally I would like to thank him for his hospitality, and to thank Holevo for proposal of this meeting.

I enthusiastically applaud Fuchs and Holevo's hospitality.