

# Alain Aspect's Curriculum Vitae

Updated July 2019

## PRESENT POSITION

- Augustin Fresnel Professor at Institut d'Optique Graduate School
- Professor at Ecole Polytechnique
- Senior fellow of the Institute of Advanced Studies and adjunct professor at City University, Hong Kong
- Distinguished scientist emeritus at CNRS

## PERSONAL DATA

Born June 15, 1947 in Agen (Lot et Garonne, France)

Married (Annie Aspect), two children

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Telephone : office : 33 (0)1 64 53 31 03 (assistant Nicole Tcherniavski)

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## EDUCATION

1965-69 Studies at Ecole Normale Supérieure de Cachan and Université d'Orsay.

1969 'Agrégation' in Physics

1969-1971 Master thesis (Thèse 3<sup>ème</sup> cycle), Orsay: "Fourier spectroscopy by holography"

1974-1983 PhD, Orsay: "Three experimental tests of Bell's inequalities with entangled photons"

## POSITIONS HELD

1969-71 Assistant lecturer, Orsay University

1971-74 Teacher as voluntary service overseas in Yaoundé (Cameroon)

1974-85 Lecturer (Maître assistant), Ecole Normale Supérieure de Cachan

1985-92 Collège de France senior scientist (sous-directeur de laboratoire), associated with the chair of atomic physics held by C. Cohen-Tannoudji

1992- 2012 CNRS Senior scientist (directeur de recherche), at Laboratoire Charles Fabry de l'Institut d'Optique: head of the Atom Optics group.  
Professor at Institut d'Optique and Ecole Polytechnique, Palaiseau

## RESEARCH TOPICS, MAIN RESULTS

- 1969-1971    **COHERENT OPTICS** (S. Lowenthal advisor, at Institut d'Optique)
- Fourier transform spectroscopy by holography
- 1974-1985    **NON CLASSICAL PROPERTIES OF LIGHT AS TESTS OF THE FOUNDATIONS OF QUANTUM MECHANICS** (with P. Grangier, J. Dalibard, at Institut d'Optique)
- Tests of Bell's inequalities with pairs of entangled photons
  - Production of heralded single photons and test of the wave particle duality with single photons
- 1985-1992    **LASER COOLING OF ATOMS** (with C. Cohen-Tannoudji at ENS Paris and College de France)
- Blue molasses (with J. Dalibard, C. Salomon)
  - Atom channeling in a standing wave (with J. Dalibard, C. Salomon)
  - Laser cooling below the one photon recoil by Velocity Selective Coherent Population Trapping (with E. Arimondo)
- 1992-        **ATOM OPTICS and ULTRA-COLD ATOMS** (with C. Westbrook, P. Bouyer, L. Sanchez-Palencia, at Institut d'Optique)
- Atomic mirrors: role of roughness; van der Waals-Casimir force
  - Atom lasers: ABCD matrices,  $M^2$  parameter, guided atom laser
  - First realization of Bose Einstein Condensation of metastable helium He\* (still the only metastable atom BEC)
  - Quantum atom optics with He\*: Hanbury Brown and Twiss effect for bosons and fermions; correlated atom pairs, Hong Ou and Mandel effect; two particle interference effect
  - Quantum transport and Anderson localization of matter waves in disordered optical potentials

## PUBLICATIONS

More than 200 articles in international journals: more than 20 papers cited more than 100 times, (ISI web of science data).

**The three papers on Bell's inequality tests** have been selected as the "Physical Review Milestone Letters" of the year 1981: <http://prl.aps.org/50years/milestones> .

1. Aspect A., Grangier P., Roger G., Phys. Rev. Lett., 47 (1981) p.460:  
"Experimental tests of realistic local theories via Bell's theorem"
2. Aspect A., Grangier P., Roger G., Phys. Rev. Lett., 49 (1982) p.91:  
"Experimental realization of Einstein-Podolsky-Rosen gedankenexperiment;  
a new violation of Bell's inequalities"
3. Aspect A., Dalibard J., Roger G., Phys. Rev. Lett., 49 (1982) p.1804:  
"Experimental test of bell's inequalities using time-varying analyzers"

The main idea of the third experiment above had been proposed in

A. Aspect, "Proposed Experiment To Test Separable Hidden-Variable Theories," Physics Letters A 54 (2), 117-118 (1975).

A. Aspect, "Proposed Experiment To Test Nonseparability Of Quantum-Mechanics," Physical Review D 14 (8), 1944-1951 (1976).

**The paper on laser cooling below the one photon recoil** has been selected as: <http://prl.aps.org/50years/milestones> .

Aspect A., Arimondo E., Kaiser R., Vansteenkiste N., Cohen-Tannoudji C., phys. Rev. Lett., 61 (1988) p.826: "Laser cooling below the one-photon recoil energy by velocity-selective coherent population trapping"

**The paper on production and characterization of heralded single photons**, and test of wave particle duality, belongs to "the most cited papers" of EuroPhysics Letters:

<http://iopscience.iop.org/0295-5075/page/Most%20Cited%20Articles>

Grangier P., Roger G., Aspect A., Europhys. Lett., 1 (1986) p.173-179:  
"Experimental evidence for a photon anticorrelation effect on a beam splitter: a new light on single-photon interferences"

### **Selection of papers in the last decade**

- W. Guerin, J. F. Riou, J. P. Gaebler, V. Josse, P. Bouyer, and A. Aspect, Guided quasicontinuous atom laser, Physical Review Letters 97 (2006)
- D. Clement, A. F. Varon, M. Hugbart, J. A. Retter, P. Bouyer, L. Sanchez-Palencia, D. M. Gangardt, G. V. Shlyapnikov, and A. Aspect, Suppression of

- transport of an interacting elongated Bose-Einstein condensate in a random potential, *Physical Review Letters* 95 (2005)
- M. Schellekens, R. Hoppeler, A. Perrin, J. V. Gomes, D. Boiron, A. Aspect, and C. I. Westbrook, Hanbury Brown Twiss effect for ultracold quantum gases, *Science* 310 (2005) 648.
  - T. Jeltès, J. M. McNamara, W. Hogervorst, W. Vassen, V. Krachmalnicoff, M. Schellekens, A. Perrin, H. Chang, D. Boiron, A. Aspect, and C. I. Westbrook, Comparison of the Hanbury Brown-Twiss effect for bosons and fermions, *Nature* 445 (2007) 402.
  - Perrin, H. Chang, V. Krachmalnicoff, M. Schellekens, D. Boiron, A. Aspect, and C. I. Westbrook, Observation of atom pairs in spontaneous four-wave mixing of two colliding Bose-Einstein condensates, *Physical Review Letters* 99 (2007)
  - V. Jacques, E. Wu, F. Grosshans, F. Treussart, P. Grangier, A. Aspect, and J. F. Roch, Experimental realization of Wheeler's delayed-choice gedanken experiment, *Science* 315 (2007) 966.
  - J. Billy, V. Josse, Z. C. Zuo, A. Bernard, B. Hambrecht, P. Lugan, D. Clement, L. Sanchez-Palencia, P. Bouyer, and A. Aspect, Direct observation of Anderson localization of matter waves in a controlled disorder, *Nature* 453 (2008) 891.
  - J. C. Jaskula, M. Bonneau, G. B. Partridge, V. Krachmalnicoff, P. Deuar, K. V. Kheruntsyan, A. Aspect, D. Boiron, and C. I. Westbrook, Sub-poissonian number differences in four-wave mixing of matter waves, *Physical Review Letters* 105 (2010) 190402.
  - F. Jendrzejewski, A. Bernard, K. Müller, P. Cheinet, V. Josse, M. Piraud, L. Pezze, L. Sanchez-Palencia, A. Aspect, and P. Bouyer, Three-dimensional localization of ultracold atoms in an optical disordered potential, *Nature Physics* 8 (2012) 398.
  - F. Jendrzejewski, K. Müller, J. Richard, A. Date, T. Plisson, P. Bouyer, A. Aspect, and V. Josse, Coherent Backscattering of Ultracold Atoms, *Physical Review Letters* 109 (19) (2012).
  - R. Lopes, A. Imanaliev<sup>1</sup>, A. Aspect<sup>1</sup>, M. Cheneau<sup>1</sup>, D. Boiron<sup>1</sup> & C. I. Westbrook<sup>1</sup>, Atomic Hong–Ou–Mandel experiment, *Nature* (2015)
  - P. Dussarrat, M. Perrier, A. Imanaliev, R. Lopes, A. Aspect, M. Cheneau, D. Boiron, and C. I. Westbrook, "Two-Particle Four-Mode Interferometer for Atoms," *Physical Review Letters* 119 (17) (2017).

## BOOKS

- G. Grynberg, A. Aspect, C. Fabre, "[An Introduction to Quantum Optics: From the Semi-classical Approach to Quantized Light](#)" (revised with help of F. Bretenaker and A. Browaeys), 2010, Cambridge University Press (CUP).
- F. Bardou, J.-P. Bouchaud, A. Aspect and C. Cohen-Tannoudji, « Lévy Statistics and Laser Cooling: How Rare Events Bring Atoms to Rest », CUP (2002).
- A. Aspect, author of the chapter "Bell's theorem: the naïve view of an experimentalist", in "Quantum [un]speakables, from Bell to Quantum information", R.A. Bertlmann and A. Zeilinger edit. (Springer 2002). Available at <http://arxiv.org/abs/quant-ph/0402001> .
- A. Aspect, "John Bell and the second quantum revolution": introduction to the second edition of "Speakable and Unspeakable in Quantum Mechanics", J.S. Bell, Cambridge University Press (2004).
- A. Aspect, in "Demain la Physique", (ed. O. Jacob 2004; revised 2009), author of the chapter: « Une nouvelle révolution quantique ».

## MOOC (Massive Online Open Course)

- Quantum Optics 1 : Single photons (2017-) : <https://www.coursera.org/learn/quantum-optics-single-photon>
- Quantum Optics 2 : Two photons and more : <https://www.coursera.org/learn/quantum-optics-two-photons>

## CD AUDIO

<http://devivevoix.com/sciences/einstein-et-les-revolutions-quantiques-alain-aspect>

## DISTINGUISHED MEMBERSHIP OR FELLOWSHIP

1995 /2002	Académie des Sciences (France): corresponding member / member
2000	Académie des Technologies (France): founding member
2008	National Academy of Sciences (USA): Foreign Associate
2009	Austrian Academy of Sciences: corresponding member abroad
2015	Académie Royale des Sciences, des Lettres, et des Beaux-Arts de Belgique: associé étranger
2015	Royal Society (London): Foreign Member
2018	Accademia Nazionale dei Lincei (Italy): foreign member
2002	Optical Society of America Fellow
2005	American Physical Society Fellow
2010	European Optical Society fellow

## AWARDS

- 1983 Prix Servan de l'Académie des Sciences, France
- 1985 Commonwealth Award for Science and Invention, USA
- 1987 International Commission for Optics Award
- 1991 Holweck Prize (Société Française de Physique and Institute of Physics)
- 1999 Max Born Award of the Optical Society of America, USA
- 1999 Humboldt-Gay Lussac Prize, Germany
- 2000 Carnegie trust centenary professor, U. of Strathclyde, Scotland
- 2005 CNRS Gold Medal, France <http://www2.cnrs.fr/en/394.htm> ou <http://www2.cnrs.fr/presse/communiqu/781.htm>
- 2007 iXcore research foundation laureate
- 2009 European Physical Society Quantum Electronics Prize: <http://qeod.epsdivisions.org/QEOD%20Prizes/eps-quantum-electronics-prize>
- 2010 Wolf prize in Physics: <http://www.wolffund.org.il/index.php?dir=site&page=winners&cs=285>
- 2010 ERC Advanced grant
- 2011 Médaille grand vermeil de la Ville de Paris
- 2011 Herbert Walther award (OSA and DPG): [http://www.osa.org/en-us/awards\\_and\\_grants/awards/award\\_description/walther/](http://www.osa.org/en-us/awards_and_grants/awards/award_description/walther/)
- 2012 Einstein medal of the Albert Einstein Society: <http://www.einstein-bern.ch/index.php?lang=en&show=medaille>
- 2013 Ives medal / Quinn prize of the OSA: [http://www.osa.org/awards\\_and\\_grants/awards/award\\_description/ivesquinn/](http://www.osa.org/awards_and_grants/awards/award_description/ivesquinn/)
- 2013 Tommasoni prize, University of Rome La Sapienza: <http://www.phys.uniroma1.it/DipWeb/tommasoni/prizes.html>
- 2013 Niels Bohr Gold Medal of Danish Academy of Engineers / Niels Bohr Institute / Royal Danish Society of Sciences and Letters: <http://bohr2013.nbi.ku.dk/english>
- 2013 Balzan Prize in Quantum Information: <http://www.balzan.it/fr/laureats/alain-aspect>
- 2013 Unesco-Niels Bohr Gold medal
- 2015 Galileo Ferraris Prize (INRM, Torino)

## **DISTINGUISHED LECTURESHIP**

- 1992 Loeb lecturer, Harvard University, USA
- 2000 Carnegie centennial professor, University of Strathclyde, Scotland
- 2002 Klosk lecturer, New York University, USA
- 2006 Norman Hascoe distinguished lecturer, UConn, USA
- 2006 Yale University distinguished lecturer in quantum information physics
- 2006 Wenner-Gren distinguished lecturer, Sweden
- 2009 Lecturer at the "Troisième cycle de la physique en Suisse romande"
- 2009 Asher Peres memorial lecturer, Technion, Israel
- 2009 University of Toronto distinguished lecturer
- 2010 Elliott W. Montroll lecturer, U of Rochester
- 2010 Schrödinger lecturer, Imperial College, London
- 2010 Wright lecturer, Geneva
- 2011 Session chair and contributor to the centennial Solvay Conference in Physics on "The Theory of The Quantum World"
- 2012 Lecturer of the "XX Jornadas de Optica Cuàntica y Fudamentos de Mecànica Cuàntica", University of Bilbao
- 2012 Invited professor at the Joint Quantum Institute of University of Maryland and National Institute of Standard and Technology
- 2012 [Rochester lecturer, University of Durham](#)
- 2014 Hans Jensen lecture, University of Heidelberg
- 2015 Max von Laue Kolloquium of the Physikalische Gesellschaft zu Berlin
- 2015 McPherson Lecture at McGill University, Montreal
- 2015 Yearly Physics Lecture, University of Innsbruck
- 2016 Balzan lecture, Lugano
- 2017 Spanish Royal Physics Society Lecture, Madrid
- 2017 France-Hong Kong distinguished lecture, Hong Kong
- 2017 Andrew Carnegie Lecture, University of Glasgow
- 2018 Rosenthal lecture, Yale University

## **INDUSTRY CONNECTIONS**

- 1998-2010 Independent member of the board of Essilor
- 2006-2008 Member of the scientific advisory board of France Telecom
- 2010-2018 Member of the scientific advisory board of Safran
- 2018- Member of the scientific advisory board of Quandela (a start up on single photons sources)
- 2018 Member of the quantum scientific advisory board of ATOS
- 2019 Co-founder of Pasqal (a start up on Rydberg atoms programmable quantum simulators)

## **HONORARY DEGREES**

- 2006 Honorary doctor of the Ecole Polytechnique and University of Montreal
- 2008 Honorary doctor of the Australian National University, Canberra
- 2008 Honorary doctor of the Herriot-Watt University, Edimburgh
- 2010 Honorary doctor of the University of Glasgow
- 2011 Honorary doctor of Technion (Haifa)
- 2014 Honorary doctor of the University of Waterloo, Canada
- 2018 Honorary doctor of City University Hong-Kong

## **DECORATIONS**

- 2005 Chevalier de la Légion d'Honneur
- 2011 Officier de l'Ordre National du Mérite
- 2011 Commandeur des palmes académiques (teaching decoration)
- 2014 Officier de la Légion d'Honneur