

## Reinhold Blümel

Department of Physics, Wesleyan University,  
265 Church Street, Middletown, CT 06459-0155  
Phone: 860-685-2032, E-mail: [rblumel@wesleyan.edu](mailto:rblumel@wesleyan.edu)

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| Table of Contents:                         | Page  |
|--|-------|
| I. Curriculum Vitae .....                  | 1–2   |
| II. Honors, Awards and Prizes .....        | 2     |
| III. Funding Experience .....              | 3–4   |
| IV. Structured List of Publications .....  | 4–14  |
| V. Invited Talks .....                     | 14–16 |
| VI. Colloquium Presentations .....         | 16    |
| VII. Visiting Scientist Appointments ..... | 16–17 |
| VIII. Teaching Experience .....            | 17–21 |

### I. Curriculum Vitae

#### a) Personal:

February 4, 1957:

Born in Augsburg, Germany.

January 2, 1992:

Marriage with Lynn A. Westling

#### b) Education:

November 1990:

Habilitation, Technical University Munich.

The most advanced academic degree  
in the German educational system. It certifies excellence in  
teaching and research.

December 1983:

Ph.D. in Physics (summa cum laude),  
Technical University Munich.

#### c) Professional Experience:

July 2002 – present:

Professor of Physics, Wesleyan University.

January 1999 – June 2002:

Associate Professor of Physics, Wesleyan University.

October 1995 – December 1998:

Visiting Lecturer, University of Freiburg.

October 1994 – May 1995:

Consultant, Institute for Plasma Research,  
University of Maryland.

July 1991 – September 1994:  
Adjunct Associate Professor, University of Delaware.

September 1989 – June 1991:  
Senior research associate with Professor W. P. Reinhardt,  
University of Pennsylvania.

January 1987 – August 1989:  
Research associate with Professor H. Walther,  
Max-Planck-Institute for Quantum Optics, Munich.

January 1985 – December: 1986  
Research assistant with Professor K. Dietrich,  
Technical University Munich.

January 1984 – December: 1984  
Post-Doctoral fellow with Professor U. Smilansky.  
The Weizmann Institute, Rehovot, Israel.

## **II. Honors, Awards and Prizes**

January 1983: MINERVA Prize.  
Funding for a three-months stay at  
the Weizmann Institute of Sciences

February 1991: HEISENBERG Scholarship  
This prestigious fellowship rewards outstanding accomplishments  
in scientific research.  
Less than five scholarships per year are awarded in physics  
based on a nation-wide contest.  
In funding (\$250,000), duration (5 years) and scope this scholarship  
is comparable to a Mac Arthur “genius award”.

October 2000: PECASE Award  
The Presidential Early Career Award for Scientists and Engineers (PECASE)  
was established by President Clinton in 1996.  
It consists of \$500,000 in research funding over a time period of 5 years.  
“The Presidential Award is the highest honor bestowed by the US government  
on outstanding scientists and engineers beginning their independent careers.”  
(W. J. Clinton).

May 2003 – May 2005: President of TAMOC  
TAMOC (Theoretical Atomic, Molecular and Optics Community) is a pro-  
fessional organization of theoretical physicists of the Division of Atomic,  
Molecular and Optical Physics (DAMOP) of the American Physical Society.  
TAMOC acts as a liaison between Congress, U.S. funding agencies, U.S. uni-  
versities and the scientists it represents.

September 2003: Fellow of the American Physical Society  
Only a maximum of 1/2 of one percent of the current membership of the  
American Physical Society is elected Fellows per year.

### III. Funding Experience

June 1988:

Project: Nonlinear Dynamics  
Funding Agency: Volkswagen Foundation.  
Grant Volume: \$90,000  
Grant Period: 3 years.

September 1988:

Project: Chaotic Scattering  
Funding Agency: German-Israeli Foundation.  
Grant Volume: \$200,000  
Grant Period: 3 years.

February 1991:

Project: Heisenberg Scholarship  
Funding Agency: German Research Council  
Grant Volume: \$300,000  
Grant Period: 5 years.

January 1992:

Project: Wave Chaos  
Funding Agency: U. Delaware Research Foundation  
Grant Volume: \$20,000  
Grant Period: 3 years.

May 1997:

Project: Ray Splitting  
Funding Agency: German Research Council  
Grant Volume: \$54,000  
Grant Period: 2 years.

December 1997:

Project: Wave Chaos  
Funding Agency: Federal Department for Science and Research  
Grant Volume: \$30,000  
Grant Period: 1 year.

October 1997:

Project: Artificial Atoms  
Funding Agency: German Research Council  
Grant Volume: \$80,000  
Grant Period: 3 years.

July 1999:

Project: Ray Splitting  
Funding Agency: National Science Foundation  
Grant Volume: \$80,000  
Grant Period: 2 years.

June 2000 – May 2003:

Project: Certificate Program in Computational Sciences  
Funding Agency: Wesleyan Fund for Innovations  
Grant Volume: \$38,000  
Grant Period: 3 years.

July 2001 – June 2006:

Project: CAREER/PECASE: Classical and quantum dynamics of trapped charged particles  
Funding Agency: National Science Foundation  
Grant Volume: \$500,000  
Grant Period: 4 years + one year (2005/2006) no-cost extension.

## IV. Structured List of Publications

### A. Refereed Papers

- 1) R. Blümel and U. Smilansky, “Quantum Mechanical Suppression of Classical Stochasticity in the Dynamics of Periodically Perturbed Surface-State-Electrons”, *Phys. Rev. Lett.* **52**, 137–140 (1984).
- 2) R. Blümel and U. Smilansky, “Suppression of Classical Stochasticity by Quantum Mechanical Effects in the Dynamics of Periodically Perturbed Surface-State Electrons” *Phys. Rev.* **A30**, 1040–1051 (1984).
- 3) R. Blümel, R. Meir and U. Smilansky, “Continuous vs. Discrete Quasi-Energy Spectrum in the Quantal Description of a Simple Parametric Resonator”, *Phys. Lett.* **103A**, 353–356 (1984).
- 4) R. Blümel and R. Meir, “Effect of Continuum-Continuum-Interaction on the Ionization Rate of a Model Atom”, *J. Phys.* **B18**, 2835–2841 (1985).
- 5) E. R. Marshalek and R. Blümel, “Mixed Alignment in the Osmium-Iridium Region”, *Phys. Rev. Lett.* **55**, 370–373 (1985).
- 6) R. Blümel and U. Smilansky, “Ionization of Surface-State Electrons by Microwave Fields: Quantum Treatment”, *Phys. Rev.* **A32**, 1900–1902 (1985).
- 7) R. Blümel, S. Fishman and U. Smilansky, “Excitation of Molecular Rotation by Periodic Microwave Pulses – A Testing Ground for Anderson Localization”, *J. Chem. Phys.* **84**, 2604–2614 (1986).
- 8) R. Blümel and K. Dietrich, “Pion Condensates in Excited States of Finite Nuclei and of Nuclear Matter”, *Nucl. Phys* **A454**, 691–719 (1986).
- 9) R. Blümel and U. Smilansky, “Microwave Ionization of Hydrogen Atoms Below the Classical Chaos Border”, *Physica Scripta* **35**, 15–19 (1987).
- 10) R. Blümel and K. Dietrich, “Excited States of Light  $N=Z$  Nuclei with a Specific Spin-Isospin Order”, *Nucl. Phys.* **A471**, 453–468 (1987).
- 11) R. Blümel and U. Smilansky, “Microwave Ionization of Highly Excited Hydrogen Atoms”, *Zeitschrift für Physik* **D6**, 83–105 (1987).

- 12) R. Blümel and U. Smilansky, “Localization of Floquet States in the rf Excitation of Rydberg Atoms”, *Phys. Rev. Lett.* **58**, 2531–2534 (1987).
- 13) R. Blümel and U. Smilansky, “Classical Irregular Scattering and its Quantum Mechanical Implications”, *Phys. Rev. Lett.* **60**, 477–480 (1988).
- 14) R. Blümel, J. Goldberg and U. Smilansky, “Features of the Quasienergy Spectrum of the Hydrogen Atom in a Microwave Field”, *Zeitschrift für Physik* **D9**, 95–103 (1988).
- 15) R. Blümel, J. M. Chen, E. Peik, W. Quint, W. Schleich, Y. R. Shen and H. Walther, “Phase Transitions of Stored Laser-Cooled Ions”, *Nature* **334**, 309–313 (1988).
- 16) R. Blümel, G. Jaeckel and U. Smilansky, “Ionization of High- $n$  H-atoms by Bichromatic Microwave Fields”, *Phys. Rev.* **A39**, 450–453 (1989).
- 17) R. Blümel, R. Graham, L. Sirko, U. Smilansky, H. Walther and K. Yamada, “Microwave Excitation of Rydberg Atoms in the Presence of Noise”, *Phys. Rev. Lett.* **62**, 341–343 (1989).
- 18) R. Blümel and U. Smilansky, “A Simple Model for Chaotic Scattering, II. Quantum Mechanical Theory”, *Physica* **D36**, 111–136 (1989).
- 19) R. Blümel and U. Smilansky, “Ionization of Excited Hydrogen Atoms by Microwave Fields: A Test Case for Quantum Chaos”, *Physica Scripta* **40**, 386 (1989).
- 20) R. Blümel, C. Kappler, W. Quint and H. Walther, “Chaos and Order of Laser Cooled Ions in a Paul-Trap”, *Phys. Rev.* **A40**, 808–823 (1989).
- 21) R. Blümel and U. Smilansky, “Random Matrix Description of Chaotic Scattering: Semi-classical Approach”, *Phys. Rev. Lett.* **64**, 241–244 (1990).
- 22) R. Blümel and K. Dietrich, “Bound states of a neutron in the cylindrically symmetric magnetic field of a current carrying wire”, *Phys. Lett.* **A139**, 236–240 (1989).
- 23) R. Blümel and U. Smilansky, “Quantenmechanik des irregulären Streuens”, *Phys. Bl.*, **45**, 379–381 (1989).
- 24) R. Blümel and U. Smilansky, “Ionization of Hydrogen Rydberg Atoms in Strong Mono- and Bichromatic Microwave Fields”, *Journal of the Optical Society of America* **B7**, 664–679 (1990).
- 25) R. Blümel, C. Hillermeier and U. Smilansky, “Classical and Quantum Dynamical Regimes in the Bound Space Projected Dynamics of Strongly Driven H Rydberg Atoms”, *Z. Phys.* **D15**, 267–280 (1990).
- 26) R. Blümel and K. Dietrich, “Quantum States of Neutrons in the Magnetic Field of a Rectilinear Current”, *Phys. Rev.* **A43**, 22–28 (1991).
- 27) R. Blümel, “Hetero Charged Ion Clusters in a Paul Trap”, *Z. Phys.* **D16**, 293–297 (1990).
- 28) R. Blümel, “Quantenchaos-Theorie besteht Mikrowellentest”, *Phys. Bl.* **46**, 359–360 (1990).
- 29) R. Blümel, E. Peik, W. Quint and H. Walther, “Phase Transitions of Stored Laser-Cooled Ions”, *Acta Physica Polonica* **A78**, 419–432 (1990).

- 30) R. Blümel, A. Buchleitner, R. Graham, L. Sirko, U. Smilansky, and H. Walther, “Dynamical Localization in the Microwave Interaction of Rydberg Atoms: The Influence of Noise”, *Phys. Rev.* **A44**, 4521–4540 (1991).
- 31) R. Blümel, I. H. Davidson, W. P. Reinhardt, H. Lin, and M. Sharnoff, “Quasilinear Ridge Structures in Water Surface Waves”, *Phys. Rev.* **A45**, 2641–2644 (1992).
- 32) C. F. Hillermeier, R. Blümel, and U. Smilansky, “Ionization of H Rydberg Atoms: Fractals and Powerlaw Decay”, *Phys. Rev.* **A45**, 3486–3502 (1992).
- 33) R. Blümel, B. Dietz, C. Jung, and U. Smilansky, “On the transition to chaotic scattering”, *J. Phys.* **A25**, 1483–1502 (1992).
- 34) Y. C. Lai, C. Grebogi, R. Blümel, and M. Ding, “Algebraic Decay and Phase-Space Metamorphoses in Microwave Ionization of Hydrogen Rydberg Atoms”, *Phys. Rev.* **A45**, 8284–8287 (1992).
- 35) R. Blümel and J. Mehl, “Quantum Chaos”, *J. Stat. Phys.* **68**, 311–319 (1992).
- 36) R. Blümel and U. Smilansky, “Symmetry Breaking and Localization in Quantum Chaotic Systems”, *Phys. Rev. Lett.* **69**, 217–220 (1992).
- 37) Y. C. Lai, R. Blümel, E. Ott, and C. Grebogi, “Quantum Manifestations of Chaotic Scattering”, *Phys. Rev. Lett.* **68**, 3491–3494 (1992).
- 38) Y. C. Lai, M. Ding, C. Grebogi, and R. Blümel, “Algebraic Decay and Fluctuations of Decay Exponent in Hamiltonian Systems”, *Phys. Rev.* **A46**, 4661–4669 (1992).
- 39) R. Blümel, “On the integrability of the two-ion Paul-trap in the pseudo potential approximation”, *Phys. Lett.* **A174**, 174–175 (1993).
- 40) R. Blümel, Comment on “Regular and Chaotic Motions in Ion Traps, a Nonlinear Analysis of Trap Equations”, *Phys. Rev.* **A48**, 854–855 (1993).
- 41) Y. C. Lai, C. Grebogi, R. Blümel, and I. Kan, “Crisis in Chaotic Scattering”, *Phys. Rev. Lett.* **71**, 2212–2215 (1993).
- 42) M. Thaha, R. Blümel and U. Smilansky, “Symmetry Breaking and Localization in Quantum Chaotic Systems”, *Phys. Rev.* **E48**, 1764–1781 (1993).
- 43) M. Moore and R. Blümel, “Quantum Manifestations of Order and Chaos in the Paul-Trap”, *Phys. Rev.* **A48**, 3082–3091 (1993).
- 44) J. W. Emmert, M. Moore and R. Blümel, “Prediction of a deterministic melting transition of two-ion crystals in a Paul trap”, *Phys. Rev.* **A48**, 1757–1760 (1993).
- 45) R. Blümel, “Quantum chaotic scattering with CsI molecules”, *Chaos*, **3**, 683–690 (1993).
- 46) M. Thaha and R. Blümel, “Nonuniversality of the Localization Length in a Quantum Chaotic System”, *Phys. Rev. Lett.* **72**, 72–75 (1994).
- 47) R. Blümel, “Microwave Ionization of Hydrogen Rydberg Atoms: Resonance Analysis and Critical Fields”, *Phys. Rev.* **A 49**, 4787–4793 (1994).
- 48) R. Blümel and B. Esser, “Quantum Chaos in the Born-Oppenheimer Approximation”, *Phys. Rev. Lett.* **72**, 3658–3661 (1994).
- 49) R. Blümel, “Sensitivity and Chaos in Quantum Systems”, *Nuc. Phys.* **A572**, 9–16 (1994).

- 50) R. Blümel, “Exponential Sensitivity and Chaos in Quantum Systems”, *Phys. Rev. Lett.* **73**, 428–431 (1994).
- 51) A. Haffmans, R. Blümel, P. M. Koch, and L. Sirko, “Prediction of a New Peak in Two-Frequency Microwave “Ionization” of Excited Hydrogen Atoms”, *Phys. Rev. Lett.* **73**, 248–251 (1994).
- 52) M. G. Moore and R. Blümel, “Prediction of an Alignment Transition Region of Two-ion Crystals in a Paul trap”, *Phys. Rev.* **A50**, R4453–R4456 (1994).
- 53) R. Blümel, “Cooling-induced melting of ion crystals in a Paul trap”, *Phys. Rev.* **A51**, 620–624 (1995).
- 54) R. Blümel, “The dynamic Kingdon trap: A novel design for the storage and crystallization of laser-cooled ions”, *Appl. Phys.* **B60**, 119–122 (1995).
- 55) R. Blümel, “Dynamic Kingdon trap”, *Phys. Rev.* **A51**, R30–R33 (1995).
- 56) R. Blümel and B. Esser, Reply Comment to “Quantum Chaos in the Born-Oppenheimer Approximation”, *Phys. Rev. Lett.* **74**, 1485 (1995).
- 57) R. Blümel and B. Esser, “Type II Quantum Chaos”, *Z. Phys.* **B98**, 119–131 (1995).
- 58) R. Blümel, “An introduction to chaos in dynamic ion traps, *Physica Scripta* **T59**, 126–130 (1995).
- 59) R. Blümel, “Nonlinear Dynamics of Trapped Ions”, *Physica Scripta* **T59**, 369–379 (1995).
- 60) M. G. Moore and R. Blümel, “An Improved Pseudo Potential for the Two-Ion Paul Trap”, *Physica Scripta* **T59**, 429–433 (1995).
- 61) M. G. Moore and R. Blümel, “Prediction of Deterministic Melting Regions of Two and Three Laser-cooled Ions in a Paul Trap”, *Physica Scripta* **T59**, 434–437 (1995).
- 62) R. Blümel, “Genuine electromagnetic wave chaos”, *Phys. Rev.* **E51**, 5520–5523 (1995).
- 63) R. E. Ryan, L. A. Westling, R. Blümel, and H. J. Metcalf, “Two-photon spectroscopy: A technique for characterizing diode-laser noise”, *Phys. Rev.* **A52**, 3157–3169 (1995).
- 64) R. Blümel, Reply on “Sensitivity and Chaos in quantum systems”, *Phys. Rev. Lett.* **75**, 582 (1995).
- 65) R. E. Prange, E. Ott, T. M. Antonsen, B. Georgeot, and R. Blümel, “Smoothed Density of States for Problems with Ray-Splitting”, *Phys. Rev.* **E53**, 207–213 (1996).
- 66) R. Blümel, T. M. Antonsen, Jr., B. Georgeot, E. Ott, and R. E. Prange, “Ray Splitting and Quantum Chaos”, *Phys. Rev. Lett.* **76**, 2476–2479 (1996).
- 67) R. Blümel, T. M. Antonsen, Jr., B. Georgeot, E. Ott, and R. E. Prange, “Ray Splitting and Quantum Chaos”, *Phys. Rev.* **E53**, 3284–3302 (1996).
- 68) R. Blümel, “Existence of an Ericson Regime in Stretched Helium”, *Phys. Rev.* **A54**, 5420–5422 (1996).
- 69) R. Blümel and A. Kohler, “Strahlenspalung und Quantenchaos”, *Phys. Bl.* **52**, 1243–1245 (1996).
- 70) L. Sirko, P. M. Koch, and R. Blümel, “Experimental identification of non-Newtonian orbits produced by ray splitting in a dielectric-loaded microwave cavity”, *Phys. Rev. Lett.* **78**, 2940–2943 (1997).

- 71) A. Kohler, G. H. M. Killesreiter, und R. Blümel, “Ray Splitting in a Class of Chaotic Triangular Step Billiards”, *Phys. Rev.* **E56**, 2691–2701 (1997).
- 72) Sz. Bauch, A. Błędowski, L. Sirko, P. M. Koch, and R. Blümel, “Signature of non-Newtonian orbits in ray-splitting cavities”, *Phys. Rev.* **E57**, 304–315 (1998).
- 73) R. Blümel, E. Bonneville and A. Carmichael, “Chaos and bifurcations in ion traps of cylindrical and spherical design”, *Phys. Rev.* **E57**, 1511–1518 (1998).
- 74) R. Alheit, X. Z. Chu, M. Hofer, M. Holzki, G. Werth, and R. Blümel, “Nonlinear Collective Oscillations of an Ion Cloud in a Paul Trap”, *Phys. Rev.* **A56**, 4023–4031 (1997).
- 75) A. Kohler and R. Blümel, “Annular Ray-Splitting Billiard”, *Phys. Lett.* **A238**, 271–277 (1998).
- 76) M. A. N. Razvi, X. Z. Chu, R. Alheit, G. Werth and R. Blümel, “Fractional frequency collective parametric resonances of an ion cloud in a Paul trap”, *Phys. Rev.* **A58**, R34–R37 (1998).
- 77) A. Kohler and R. Blümel, “Weyl formulas for quantum ray-splitting billiards”, *Ann. Phys. (N.Y.)* **267**, 249–280 (1998).
- 78) B. Reusch and R. Blümel, “Crystallized Vortex Crystals”, *Eur. Phys. J. D* **3**, 123–127 (1998).
- 79) H. Primack and R. Blümel, “Diagnostic Criterion for Crystallized Beams”, *Phys. Rev. E* **58**, 6578–6583 (1998).
- 80) A. Kohler and R. Blümel, “Signature of Periodic Lateral-Ray Orbits in a Rectangular Ray-Splitting Billiard”, *Phys. Lett. A* **247**, 87–92 (1998).
- 81) A. Kohler and R. Blümel, “Test of semiclassical amplitudes for quantum ray-splitting systems”, *Phys. Rev. E* **59**, 7228–7230 (1999).
- 82) H. Primack und R. Blümel, “Suppression of synchrotron radiation due to beam crystallization”, *Eur. Phys. J.* **A3**, 299–301 (1998).
- 83) H. Primack and R. Blümel, “Synchrotron Radiation of Crystallized Beams”, *Phys. Rev. E* **60**, 957–967 (1999).
- 84) Y. Hlushchuk, A. Kohler, Sz. Bauch, L. Sirko, R. Blümel, M. Barth, and H.-J. Stöckmann, “Autocorrelation function of level velocities for ray-splitting billiards”, *Phys. Rev. E* **61**, 366–370 (2000).
- 85) L. Sirko, Sz. Bauch, Y. Hlushchuk, P. M. Koch, R. Blümel, M. Barth, U. Kuhl, H.-J. Stöckmann, “Observation of dynamical localization in a rough microwave cavity”, *Physics Letters A* **266**, 331–335 (2000).
- 86) R. Blümel and P. E. Smaldino, “Induction accelerator for crystalline beams”, *Phys. Lett. A* **260**, 495–501 (1999).
- 87) T. Schneider and R. Blümel, “Bose-Einstein condensation of Bosonic Thomson atoms”, *J. Phys. B* **32**, 5017–5031 (1999).
- 88) R. Blümel, P. M. Koch, and L. Sirko, “Ray-splitting Billiards”, *Foundations of Physics* **31**, 269–281 (2001).

- 89) Y. Dabaghian, R. V. Jensen and R. Blümel, “Exact trace formulae for a class of one-dimensional ray-splitting systems”, *Phys. Rev. E* **63**, 066201, pp. 1–6 (2001).
- 90) N. Savytsky, A. Kohler, Sz. Bauch, R. Blümel, and L. Sirko, “Parametric correlations of the energy levels of ray-splitting billiards”, *Phys. Rev. E* **64**, 036211, pp. 1–5 (2001).
- 91) R. Blümel and Y. Dabaghian, “Combinatorial identities for binary necklaces from exact ray-splitting trace formulas”, *J. Math. Phys.* **42**, 5832–5839 (2001).
- 92) Yu. Dabaghian, R. V. Jensen and R. Blümel, “One-dimensional quantum chaos: Explicitly solvable cases”, *Pis'ma Zh. Éksp. Theor. Fiz.* **74**, 258–262 (2001); *JETP Letters* **74**, 235–239 (2001).
- 93) R. Blümel, Y. Dabaghian and R. V. Jensen, “Explicitly solvable cases of one-dimensional quantum chaos”, *Phys. Rev. Lett.* **88**, 044101 pp. 1–4 (2002).
- 94) G. N. Rockwell, V. F. Hoffman, Th. Clausen and R. Blümel, “Realistic three-dimensional computations of microwave-ionization curves of hydrogen Rydberg atoms”, *Phys. Rev. A* **65**, 025401 (2002).
- 95) R. Blümel, Yu. Dabaghian and R. V. Jensen, “Exact, convergent periodic-orbit expansions of individual energy levels of regular quantum graphs”, *Phys. Rev. E* **65**, 046222, 1–10 (2002).
- 96) V. I. Savichev and R. Blümel, “Quasi-molecular resonances in muonic hydrogen charge-exchange reactions”, *Eur. Phys. J. D* **21** 3–12 (2002).
- 97) Yu. Dabaghian, R. V. Jensen and R. Blümel, “Spectra of regular quantum graphs”, *J. Exp. Theor. Phys.* **94**, 1201–1215 (2002); *Zh. Exp. Theor. Fiz.* **121**, 1399–1414 (2002).
- 98) V. I. Savichev and R. Blümel, “Quantum load-matching”, *Europhys. Lett.* **61**, 1–7 (2003).
- 99) T. Vorrath and R. Blümel, “Electronic structure of three-dimensional quantum dots”, *Eur. Phys. J. B* **32**, 227–235 (2003).
- 100) V. I. Savichev and R. Blümel, “Squeezing close to the stability boundaries of the Paul trap”, *Phys. Lett. A* **309**, 211–214 (2003).
- 101) C. Vaa, P. M. Koch and R. Blümel, “Ray-splitting correction to the Weyl formula: Experiment versus theory”, *Phys. Rev. Lett.* **90**, 194102 (2003), pp. 1–4.
- 102) Yu. Dabaghian and R. Blümel, “Solution of scaling quantum networks”, *Pis'ma v. ZhETF* **77**, 629–632 (2003); *JETP Lett.* **77**, 530–533 (2003).
- 103) I. Garrick-Bethell and R. Blümel, “Unexpected instabilities in the dynamic Kingdon trap”, *Phys. Rev. A* **68**, 031404(R) (2003), pp. 1–4.
- 104) Yu. Dabaghian and R. Blümel, “Explicit analytical solution for scaling quantum graphs”, *Phys. Rev. E* **68**, 055201(R) (2003), pp. 1–4.
- 105) I. Garrick-Bethell, Th. Clausen, and R. Blümel, “Universal instabilities of radio-frequency traps”, *Phys. Rev. E* **69**, 056222 (2004), pp. 1–15.
- 106) Yu. Dabaghian and R. Blümel, “Explicit spectral formulas for scaling quantum graphs”, *Phys. Rev. E* **70**, 046206 (2004), pp. 1–16.

- 107) Th. Clausen and R. Blümel, “Multiphoton classification of prethreshold structures in measured microwave ionization curves of hydrogen Rydberg atoms”, *Phys. Rev. A* **70**, 053411 (2004), pp. 1–9.
- 108) A. S. Bhullar, R. Blümel, and P. M. Koch, “Ray splitting with ghost orbits: explicit, analytical and exact solution for spectra of scaling step potentials with tunneling”, *J. Phys. A: Math. Gen.* **38**, L563–L569 (2005).
- 109) R. Blümel, “Solution of the finite quantum square-well problem”, *J. Phys. A: Math. Gen.* **38**, L673–L678 (2005).
- 110) C. Vaa, P. M. Koch and R. Blümel, “Weyl formula: Experimental test of ray-splitting and corner corrections”, *Phys. Rev. E* **72**, 056211 (2005), pp. 1–31.
- 111) A. S. Bhullar, R. Blümel, and P. M. Koch, “Ghost orbit spectroscopy”, *Phys. Rev. E* **73**, 016211 (2006), pp. 1–18.
- 112) R. Blümel, “Comment on ‘Quantum chaos in elementary quantum mechanics’ [Eur. J. Phys. **26** (2005) 423–439] by Yu Dabaghian and R. Jensen”, *Eur. J. Phys.* **27**, L1–L4 (2006).
- 113) R. Blümel and I. Garrick-Bethell, “Quantum mechanics of the dynamic Kingdon trap”, *Phys. Rev. A* **73**, 023411 (2006), pp. 1–5.
- 114) R. Blümel, “Explicit, exact and analytical solution of the compressed delta atom via quadratures and convergent binary necklace expansions”, in preparation for submittal to *The Journal of Physics A: Math. Gen.* (2006).

## **B. Books**

- 1) R. Blümel and W. P. Reinhardt, “Chaos in Atomic Physics”, (Cambridge University Press, Cambridge, 1997).

## **C. Contributions to Conference Proceedings**

- 1) R. Blümel, S. Fishman, M. Griniasti and U. Smilansky, “Localization in the Quantum Description of the Periodically Perturbed Rotor”, in “Quantum Chaos and Statistical Nuclear Physics”, *Lecture Notes in Physics* No. 263, eds.: T. H. Seligman and H. Nishioka, (Springer 1986), pp. 212–228.
- 2) R. Blümel and K. Dietrich, “Pion Condensation in Excited States of Light  $N=Z$  Nuclei with a Specific Spin-Isospin Order”, in “Windsurfing the Fermi Sea II”, edited by T. T. S. Kuo and J. Speth, (Elsevier Science Publishers B. V., 1987).
- 3) R. Blümel and U. Smilansky, “Excitation and Ionization of High- $n$  H-Atoms by monochromatic and bi-chromatic Microwave Fields”, in “The Structure of Small Molecules and Ions”, eds.: R. Naaman and Z. Vager, *Plenum Publ. Company* (1989), pp. 319–331.
- 4) R. Blümel, J. M. Chen, F. Diedrich, E. Peik, W. Quint, W. Schleich Y. R. Shen and H. Walther, “Phase Transitions of Stored Laser Cooled Ions”, in “Proceedings of the

- Eleventh International Conference on Atomic Physics”, (ELICAP), Paris, July 4–8, 1988 (World Scientific, 1989).
- 5) R. Blümel, J. M. Chen, F. Diedrich, E. Peik, W. Quint and H. Walther, “Phase Transitions of Stored Laser Cooled Ions”, in “Proceedings of the Workshop on Crystalline Ion Beams”, October 4–7, 1988, Wertheim, edited by R. W. Hasse, I. Hofmann and D. Liesen, GSI-89-10, report, April 1989, ISSN 0171-4546, pp. 194–230.
  - 6) R. Blümel, E. Peik, W. Quint and H. Walther, “Phase Transitions of Stored Laser Cooled Ions: A First Step Towards Crystallization in Storage Rings”, Proceedings of the 5th Int. Sympos. on Quantum Optics, Rotorua, Auckland, New Zealand, Feb. 13–17 (Springer, 1989).
  - 7) R. Blümel, R. Graham, L. Sirko, U. Smilansky, H. Walther and K. Yamada, “Localization Properties of Rydberg Atoms in the Presence of Noisy Mono-chromatic Microwave fields”, in “Fundamentals of Laser Interactions II”, Feb. 26 – March 4, edited by F. Ehlotzky (Springer, 1989).
  - 8) C. Hillermeier and R. Blümel, “Fractallike Structures and the Strongly Kicked H-Atom”, in “Fundamentals of Laser Interactions II”, Feb. 26 – March 4, edited by F. Ehlotzky (Springer, 1989).
  - 9) R. Blümel, “The Physics of Stored Laser Cooled Ion Clusters: Phase Transitions in a System with only a Few Degrees of Freedom”, in “Coherence and Quantum Optics VI”, Proceedings of the Sixth Rochester Conference on Coherence and Quantum Optics, June 26–28, edited by J. H. Eberly, L. Mandel and E. Wolf (Plenum Press, New York and London, 1989), ISBN 0-306-43485-7.
  - 10) R. Blümel, “A New Class of Ordered Structures in a Paul Trap: Classically Stable Clusters of Ions of Both Charge Signs”, in “OSA Proceedings on Nonlinear Dynamics in Optical Systems”, Vol. 7, edited by N. B. Abraham, E. Garmire, and P. Mandel (Afton, Oklahoma, June 4–8, 1990), pp. 594–597.
  - 11) R. Blümel, “Exotic Fractals and Atomic Decay”, Proceedings of the International School Enrico Fermi, Course CXIX, (North-Holland, Amsterdam, 1993), pp. 385–398.
  - 12) M. Moore and R. Blümel, “Quantum Manifestation of Chaos in the Paul-trap”, to be published in the proceedings of the Third Drexel Symposium on Quantum Nonintegrability (May 20–22, 1992), (Gordon and Breach, 1993).
  - 13) R. Blümel and R. Blümel, “Computer Aided Pulse Pattern Synthesis for VSI-Fed Machine Drives”, Proceedings of the PCIM, (Incom Ziroth and partner GmbH, Nürnberg, 1993).
  - 14) M. Thaha and R. Blümel, “Nonuniversality of the localization length in the symplectic kicked rotor model”, Proceedings of the ITAMP workshop on “Chaos in Quantum Mechanics – Experiment and Theory”, Sept. 30 – Oct. 2, 1993.
  - 15) R. Blümel, “Quantum Implications of Ray Splitting”, Acta Phys. Pol. **A93**, 7–10 (1998).
  - 16) R. Blümel, “Chaos and Order in Ion Traps and Storage Rings”, in *Trapped Charged Particles and Fundamental Physics*, edited by D. H. E. Dubin and D. Schneider, AIP Conference Proceedings **457**, 290–294 (1999).

- 17) R. Blümel, “Fractional Frequency Parametric Resonances in a Paul Trap”, in *Trapped Charged Particles and Fundamental Physics*, edited by D. H. E. Dubin and D. Schneider, AIP Conference Proceedings **457**, 329–333 (1999).
- 18) R. Blümel, “The Crystron: An Induction Accelerator for the Production of Crystalline Beams”, in AIP Conference Proceedings **498**, edited by J. J. Bollinger, R. L. Spencer and R. C. Davidson, pp. 345–349 (1999).
- 19) R. Blümel, “Ray splitting and chaos in electromagnetic resonators”, to be published in *Ultra-Wideband, Short-Pulse Electromagnetics 5*, edited by Paul D. Smith and Shane R. Cloude (Kluwer Academic, 2001).
- 20) T. Vorrath and R. Blümel, “Electronic Structure of three-dimensional quantum dots”, *Verhandl. DPG (VI)* **37**, 1/183 (2002).
- 21) R. Blümel, “Floquet Theory of the Quantum Dynamic Kingdon Trap”, AIP Conference Proceedings **606**, edited by Francois Anderegg, Lutz Schweikhard and C. Fred Driscoll (American Institute of Physics, 2002), pp. 509–512.
- 22) Yu. Dabaghian, R. V. Jensen and R. Blümel, “Integrability in 1D quantum chaos”, in *Proceedings of the Fourth International Conference on Dynamical Systems and Differential Equations*, 206–212 (2003).

#### **D. Articles in Books and Popular Journals**

- 1) R. Blümel and K. Dietrich, “On the Relationship between the Source of the Pion Field in a Nucleus and Certain Quasi-Spin Algebras” *Ann. Univ. Marie Curie Skłodowska*, XL-XLI (1987), pp. 39–50.
- 2) R. Blümel and U. Smilansky, “Quantum Mechanical Suppression of Chaos”, *Physics World* **3** (2), 30–34 (1990).
- 3) R. Blümel, “Quantum Chaotic Scattering”, in “Directions in Chaos”, Vol. 4, edited by D. H. Feng and J.-M. Yuan, (World Scientific, Singapore, 1992), pp. 397–457.
- 4) R. Blümel and W. P. Reinhardt, “Where is the Chaos in Two-Electron Atoms?”, in “Directions in Chaos”, Vol. 4, edited by D. H. Feng and J.-M. Yuan (World Scientific, Singapore, 1992), pp. 245–319.
- 5) R. Blümel and W. P. Reinhardt, “Stretched Helium: A Model for Quantum Chaos in Two-Electron Atoms”, to be published in “Quantum Chaos”, edited by G. Casati and B. V. Chirikov, (Cambridge Univ. Press, 1994).
- 6) R. Blümel, “Microwave Ionization of Hydrogen Rydberg Atoms: Chaos, Symmetry and Dynamical Localization”, in *Classical, Semiclassical and Quantum Dynamics in Atoms*, edited by H. Friedrich and B. Eckhardt, *Lecture Notes in Physics* **485**, p. 154–172 (1997).
- 7) T. Vorrath and R. Blümel, “Thomson-Atome”, *Physik in Unserer Zeit*, **31**, 115–120 (2000).

#### **E. Book Reviews**

- 1) “Quantum Signatures of Chaos”, by F. Haake (Springer, 1991), in *Foundations of Physics* **22**, 635–637 (1992).
- 2) “Chaos – The Interplay Between Stochastic and Deterministic Behaviour”, edited by P. Garbaczewski, M. Wolf and A. Weron (Springer, 1995), in *Contemp. Phys.* **38**, 88–89 (1997).
- 3) R. Blümel, Book review on “Theoretical Atomic Physics”, by H. Friedrich (Springer, 1998), in *Phys. Blätter* **55** (9), 80–81 (1999).

## **F. Published Abstracts**

- 1) R. Blümel, U. Smilansky, K.A.H. van Leeuwen, P.M. Koch, D. Richards and J.G. Leopold, “Ionization of Excited Hydrogen Atoms Below the Classical Threshold by a Microwave Field”, *Bull. Am. Phys. Soc.* **32**, 1264 (1987).
- 2) R. Blümel, R. Graham, L. Sirko, U. Smilansky, H. Walther, and K. Yamada, “Über den Einfluß von Rauschen auf die Quantendynamik von Rydbergatomen in starken Mikrowellenfeldern”, Section Q9, *Verhandl. DPG (VI)* **24**, 20 (1989).
- 3) R. Blümel and C. Kappler, “Chaos in der Paulfalle”, *Verhandl. DPG (VI)* **25**, 462 (1990), ISSN 0420-0195.
- 4) R. Blümel, “Hetero Charged Ion Clusters in a Paul Trap”, in “Technical Digest on Non-linear Dynamics in Optical Systems, 1990”, (Optical Society of America, Washington D.C., 1990) pp. 276–277, ISBN 1-55752-128-X.
- 5) R. Blümel, C. Kappler, W. Quint, and H. Walther, Erratum “Chaos and order of laser-cooled ions in a Paul-trap”, [*Phys. Rev.* **A40**, 808 (1989)], *Phys. Rev.* **A46**, 8034 (1992).
- 6) M. Thaha and R. Blümel, “Nonuniversality of Localization Length in a Quantum Chaotic System”, *Bull. Am. Phys. Soc.* **39**, 605 (1994).
- 7) R. Blümel, “Quantum Chaos in Few-Body Systems”, *Bull. Am. Phys. Soc.* **39**, No. 2, 1177 (1994).
- 8) R. Alheit, M. Hoefer, M. Holzki, G. Werth, und R. Blümel, “Nichtharmonische Resonanzen in der Paulschen Ionenfalle”, *Verhandlungen DPG* **3**, 203 (1997).
- 9) X. Chu, R. Blümel, R. W. Alheit, M. A. N. Razvi, B. Schäfer, and G. Werth, “Parametrische kollektive Resonanz bei gebrochenen Frequenzen in einer Paulfalle”, *Verhandl. DPG (VI)* **33**, 111 (1998).
- 10) R. Blümel and H. Primack, “Synchrotron Radiation of Crystallized Beams”, *Bull. Am. Phys. Soc.* **44**, 1304 (1999).
- 11) R. Blümel and H. Primack, “Diagnostic Criterion for Beam Crystallization”, *Bull. Am. Phys. Soc.* **44**, 1304 (1999).
- 12) A. Kohler and R. Blümel, “Classical and Quantum Chaos in Ray-Splitting Billiards”, *Bull. Am. Phys. Soc.* **44**, 1870 (1999).
- 13) R. Blümel, “Classical and Quantum Implications of Ray Splitting”, *Bull. Am. Phys. Soc.* **45**, 448 (2000).

- 14) Th. Clausen and R. Blümel, “Microwave Ionization of Hydrogen Rydberg Atoms: 3D Computations”, *Bull. Am. Phys. Soc.* **45**, 448 (2000).
- 15) T. Schneider and R. Blümel, “Grundzustandseigenschaften bosonischer Thomson-Atome”, *Verhandl. DPG (VI)* **35**, 943 (2000).
- 16) R. Blümel and Th. Clausen, “Wasserstoffionisation in starken Mikrowellenfeldern: Klassik, Semiklassik, Quantenmechanik”, *Verhandl. DPG (VI)* **35**, 1108–1109 (2000).
- 17) Th. Clausen and R. Blümel, “Prediction of sharp ionization features in microwave-driven hydrogen Rydberg atoms”, *Bull. Am. Phys. Soc.* **46(3)**, 81 (2001).
- 18) R. Blümel and I. Garrick-Bethell, “Quantum mechanics of the dynamic Kingdon trap”, *Bull. Am. Phys. Soc.* **46(3)**, 93 (2001).
- 19) C. Vaa, P. M. Koch and R. Blümel, “Measurement of the ray-splitting correction to the Weyl formula”, *Bull. Am. Phys. Soc.* **47(3)**, 107 (2002).
- 20) J. D. Wright, F. Stähle, H. Flores-Rueda, R. Blümel, and T. J. Morgan, “Classically Scaled Quantum Calculations for Direct Comparison with Experimental Scaled Energy Spectra”, *Bull. Am. Phys. Soc.* **47(3)**, 109 (2002).
- 21) R. Blümel, “Ray-splitting correction to the Weyl formula: Experiment versus theory”, *Bull. Am. Phys. Soc.* **49**, 359 (2004).
- 22) I. Garrick-Bethell, Th. Clausen, and R. Blümel, “Nonlinear Dynamics with Trapped Charged Particles”, *Bull. Am. Phys. Soc.* **49(3)**, 130–131 (2004).
- 23) R. Blümel, “Spectra of Stick Molecules”, *Bull. Am. Phys. Soc.* **50(3)**, 26 (2005).

## **V. Invited Talks at International Conferences**

- 1) “Ionization of H-atoms below the classical chaos border”, Adriatico Research Conference on Quantum Chaos, ITCP, Trieste, June 16–20, 1986.
- 2) “Excitation and Ionization of highly excited H-atoms: A test-case for Quantum Chaos”, Dynamics Days, Düsseldorf, June 10–13, 1987.
- 3) “Ionization of Rydberg atoms above and below the classical chaos border”, International Workshop on H-Ionization, Riga, June 1987.
- 4) “Rydberg atoms in strong microwave fields”, Third Gentner Symposium on Physics, Malente, Schleswig-Holstein, May 30 – June 3, 1988.
- 5) “Ionization of Rydberg atoms by noisy microwave fields”, International Symposium on “Atoms in strong fields”, Grainau, September 5–9, 1988.
- 6) “Few-body phase transitions in a Paul-trap – experimental and theoretical results”, International Workshop on Crystalline Ion Beams, Wertheim, October 4–7, 1988.
- 7) “Phase transitions of stored laser cooled ions”, Meeting of the American Optical Society, Santa Clara, Nov. 4, 1988.
- 8) “Excitation and ionization of Rydberg atoms by (noisy) mono- and bichromatic microwave fields”, Fundamentals of Laser Interactions II, Feb. 26 – March 4, 1989.

- 9) “The Physics of Laser Cooled Stored Ions: Phase Transitions in a System with only a Few Degrees of Freedom”, Sixth Rochester Conference on Coherence and Quantum Optics, June 26–28, 1989.
- 10) “Quantum Irregular Scattering”, Second Drexel Workshop on Quantum Nonintegrability, Dec. 6–9, 1989.
- 11) “Quantum Chaotic Scattering”, SIAM Conference on Dynamical Systems, May 7–12, 1990.
- 12) “A New Class of Ion Crystals in a Paul Trap”, International Conference on Nonlinear Dynamics in Optical Systems, June 4–8, 1990, Afton, Oklahoma.
- 13) “Quantum Chaotic Scattering”, Gordon Conference on Nuclear Chemistry, June 18–22, 1990, Colby-Sawyer College, New London, New Hampshire.
- 14) “From Hydrogen to Helium”, International Conference and Workshop on Quantum Aspects of Nonlinear Systems, Nordkirchen, Germany, July 15–20, 1990.
- 15) “Ion Crystals in a Paul Trap: Regular and Chaotic Dynamics”, Gordon Conference on Atomic Physics, August 12–17, 1990, Proctor Academy, New Hampshire.
- 16) “Quantum Chaotic Scattering”, Bad Honnef, Feb. 18–21, 1991.
- 17) “Exotic Fractals and Atomic Decay”, International School Enrico Fermi, Villa Monastero, Varenna, July 23 – August 2, 1991.
- 18) “Quantum Chaos”, Third Drexel Symposium on Quantum Nonintegrability, Philadelphia, Pennsylvania, May 20–22, 1992.
- 19) “Symmetry and Localization in Quantum Chaotic Systems”, International Workshop on “Chaos in Quantum Mechanics – Experiment and Theory”, at the Institute for Theoretical Atomic and Molecular Physics, Harvard Smithsonian Center for Astrophysics (ITAMP), Sept. 30 – Oct. 2, 1993.
- 20) “Introduction to Chaos in Particle Traps”, Nobel Pre-Symposium 91, August 19 – August 20, 1994, Lysekil, Sweden.
- 21) “Nonlinear Dynamics of Trapped Ions”, Nobel Symposium 91 on “Trapped Charged Particles and Fundamental Physics”, Lysekil, Sweden, August 21 – August 26, 1994.
- 22) “Ray Splitting and Quantum Chaos”, Winter School on Quantum Chaos and Applications, Weizmann Institute, Feb. 18 – 23 (1996).
- 23) “Quantum Implications of Ray Splitting”, Quantum Optics IV, Jaszowiec, Poland, June 17 – 24, 1997.
- 24) “Hydrogen Rydberg Atoms in Strong Microwave Fields”, Winter-School and Workshop on Photo-Induced Nonlinear Dynamics in Strong Laser Fields, Technion and MINERVA Center for Nonlinear Physics, Israel, February 22 – 27, 1998.
- 25) “Nonlinear Dynamics in Ion Traps”, International Conference on “Trapped Charged Particles and Fundamental Physics”, Monterey, California, USA, August 29 – September 4, 1998.
- 26) “Ionization of hydrogen Rydberg atoms: classics, semiclassicals, quantum mechanics”, Symposium on *Classical, semiclassical and quantum mechanics in atomic physics*, Bonn, Germany, March 2000.

- 27) “Chaos and ray splitting in microwave cavities”, EuroEM2000, Edinburgh, Scotland, May 28 – June 2, 2000.
- 28) “Ray-Splitting Correction to the Weyl Formula: Experiment versus Theory”, March Meeting of the American Physical Society, Montreal, Canada March 22 – 26, 2004.

## **VI. Colloquium Presentations**

- 1) Physik Kolloquium in Bayreuth, Germany, on “The Manifestations of Quantum Chaos in the Excitation and Ionization of Highly Excited Rydberg Atoms”, December 1987.
- 2) Physics Colloquium in Stony Brook, SUNY, on “Chaos in Atomic Physics: Ions, Atoms, Molecules”, October 1988.
- 3) Departmental Colloquium in Albuquerque, UNM, on “Chaos in Atomic Physics: Ions, Atoms, Molecules”, Nov. 4, 1988.
- 4) Tandem Kolloquium in Erlangen, Univ. Erlangen-Nürnberg, Germany, on “Irregular Scattering”, Dec. 15, 1988.
- 5) Physics Colloquium of the Weizmann Institute, Rehovot, Israel, on “Phase Transitions of Laser Cooled Ions in a Paul Trap: An Interesting Nonlinear System with only a Few Degrees of Freedom”, April 1989.
- 6) Physics Colloquium at Drexel University, Philadelphia, on “Chaos in Atomic Physics: Ions, Atoms, Molecules”, Sept. 14, 1989.
- 7) Physical Chemistry Graduate Research Colloquium at The University of Pennsylvania, on “Phase Transitions of Laser Cooled Ions in a Paul Trap”, Dec. 1, 1989.
- 8) Swarthmore College Physics and Astronomy Colloquia, on “Ion Trapping”, Dec. 7, 1989.
- 9) Physics Colloquium at the University of Delaware, on “Quantum Chaos”, February 26, 1992.
- 10) Festkolloquium aus Anlaß des 60. Geburtstages von Professor K. Dietrich, Sektion Physik, Ludwig-Maximilians-Universität, München, May 6, 1994.
- 11) Departmental Colloquium, Laval University, Ste. Foy, Canada, on “Ray Splitting”, December 2, 1997.
- 12) Theory Colloquium, Technical University Munich, on “Ray Splitting”, February 18, 1998.
- 13) Physics Colloquium at Drexel University, on “The Crystron”, February 2000.
- 14) Physics Colloquium at North-Eastern University, Boston, on “Quantum Chaos”, November 2, 2000.
- 15) SPS Colloquium at the Physics Department of The University of Connecticut, April 30, 2004.

## **VII. Visiting Scientist Appointments**

- 1) March 1983 – June 1983: Department of Nuclear Physics, The Weizmann Institute of Sciences, Israel.
- 2) January 1984 – November 1984: Department of Nuclear Physics, The Weizmann Institute of Sciences, Israel.
- 3) December 1984: Balliol College, Oxford University, England.
- 4) October 21 – 31, 1985: Department of Nuclear Physics, The Weizmann Institute of Sciences, Israel.
- 5) January 7 – February 25, 1988: Department of Nuclear Physics, The Weizmann Institute of Sciences, Israel.
- 6) October 31 – November 18, 1988: Department of Theoretical Physics, University of New Mexico, Albuquerque, USA.
- 7) March 21 – April 19, 1989: Department of Nuclear Physics, The Weizmann Institute of Sciences, Israel.
- 8) May 14 – 25, 1990: Department of Nuclear Physics, The Weizmann Institute of Sciences, Israel.
- 9) October 1 – December 15, 1992: Department of Physics, State University of New York at Stony Brook, USA.
- 10) March 9 – 23, 1994: Department of Complex Systems, Weizmann Institute of Sciences, Israel.
- 11) August 17, 1994 – August 17, 1995: Department of Physics, State University of New York at Stony Brook, USA.
- 12) January 14 – 21, 1996: Department of Complex Systems, Weizmann Institute of Sciences, Israel.
- 13) November 27 – December 4, 1997: Department of Physics, Laval University, Canada.
- 14) August 13 – August 20, 1999: Department of Physics, Freiburg University, Germany.

## **VIII. Teaching Experience**

### *a) Lecture Courses, Seminars, Tutorials*

Summer 1992:

*Classical Mechanics*, including tutorials.

Summer 1993:

*Chaos*

Winter 1995/1996:

*Physics News*

*Chaos in Atomic Physics*

Summer 1996:

*Physics News*

*Ion Traps*

Winter 1996/1997:

*Physics News*  
*Quantum Optics*

Summer 1997:

*Superconductivity*  
*Semiclassical Methods*

Winter 1997/1998:

*Riemann's Zeta Function and its Applications*  
*Quantum Many-Body Methods*

Summer 1998:

*Nonlinear Dynamics*  
*Quantum Optics*

Spring 1999:

Lecture Course: *PHYS 214: Foundations of Quantum Mechanics*

Summer 1999:

REU: *Quantum Mechanics of Many-Body Systems*  
REU: *Ion Trapping*  
REU: *Building a Beowulf Personal Computer Cluster*

Fall 1999:

Lecture Course: *PHYS 313: Classical Dynamics*  
Individual Undergraduate Tutorial: *PHYS 401: Chaos*  
Individual Graduate Tutorial: *PHYS 501: Quantum Electrodynamics*

Spring 2000:

Lecture Course: *PHYS 214: Foundations of Quantum Mechanics*  
Organization of Seminar Series: *PHYS 588: Seminar in Chemical Physics*  
Individual Graduate Tutorial: *PHYS 502: Building a Production Beowulf*  
Graduate Group Tutorial: *PHYS 512: The Helium Atom*  
Undergraduate Research Tutorial: *PHYS 422: Chaos in Few-Body Systems*  
Undergraduate Research Tutorial: *PHYS 422: Physics with the Beowulf*  
Advanced Graduate Research: *PHYS 592: Hydrogen in a strong MW field*

Summer 2000:

REU (Lenny Eusebi): *Bose-Einstein Condensation*  
REU (Graham Rockwell): *Microwave ionization of hydrogen Rydberg atoms*

Fall 2000:

Lecture Course: *PHYS 215: Special Relativity*  
Lecture Course: *PHYS 217: Chaos*  
Lecture Course: *PHYS 354/554: Relativity and Cosmology*  
Organization of Seminar Series: *PHYS 507: Atomic and Molecular Physics*  
Undergraduate Group Tutorial (20 students): *Tools for Comp. Physics*  
Graduate Tutorial (J. D. Wright): *The Helium Atom*  
Undergraduate Research Tutorial (L. Eusebi): *Bose-Einstein Condensation*

Undergraduate Thesis Tutorial (I. Garrick): *Quantum Traps*  
Undergraduate Thesis Tutorial (G. Popkin): *Positron Crystal*  
Research Mentor of a University Scholar (S. Brown): *Complexity*  
Advanced Graduate Research (Th. Clausen): *Hydrogen in a strong MW field*

Spring 2001:

PHYS 402: 1-credit undergraduate individual tutorial on “Ion Trapping”.  
Student: Gabriel Popkin.  
PHYS 412: 1-credit group tutorial on “Computational Physics”.  
This course was mainly taught by Thomas Clausen,  
my Ph.D. student.  
Four undergraduate students took this course.  
PHYS 422: 1-credit research tutorial on ion trapping.  
Student: Lenny Eusebi.  
PHYS 422: 1-credit research tutorial on the dynamic Kingdon trap.  
This research resulted in a paper submitted to  
The Physical Review A. Student: Ian Garrick-Bethell.  
PHYS 502: 1-credit graduate individual tutorial on  
“Relativistic Quantum Mechanics”. Student: Marcus Kubitzki.  
PHYS 522: Organized the Colloquium Series of the Physics Department.  
8 students took this course.  
PHYS 588: Organized the weekly seminar in *Chemical Physics*.  
12 students took this course.  
PHYS 592: Advanced graduate research – Ph.D. thesis research.  
Student: Thomas Clausen.

Summer 2001:

REU (S. Brown): *Zipf’s Law in Complexity*  
REU (I. Garrick-Bethell): *Ion Trapping*

Fall 2001:

Research Mentor of a University Scholar (S. Brown): *Complexity*  
PHYS 319: Walls of Pure Energy  
PHYS 409: Senior Thesis Tutorial  
Student: Ian Garrick-Bethell  
PHYS 411: 1-credit group tutorial on “UNIX: Tools and Concepts”.  
This course was mainly taught by Vasilios Hoffmann,  
an exceptionally gifted Wesleyan undergraduate student.  
About 20 undergraduate students took this course.  
PHYS 521: Organized the Colloquium Series of the Physics Department.  
PHYS 591: Masters/Ph.D. thesis research.  
Students: Lenny Eusebi and Thomas Clausen.

Spring 2002: Sabbatical

PHYS 410: Senior Thesis Tutorial  
Student: Ian Garrick-Bethell  
PHYS 592: Masters/Ph.D. thesis research.

Students: Lenny Eusebi and Thomas Clausen.

Fall 2002:

PHYS 319: Walls of Pure Energy  
PHYS 421: Undergraduate Research  
Student: Sam Leitner  
PHYS 501: Graduate Individual Tutorial  
Student: Steve Coppage  
PHYS 501: Graduate Individual Tutorial  
Student: Andreas Pfund  
PHYS 509: Theoretical Physics Seminar  
PHYS 591: Graduate Advanced Research  
Student: Andreas Pfund

Spring 2003:

PHYS 238: Computational Physics II  
PHYS 510: Theoretical Physics Seminar II  
PHYS 574: Quantum Electrodynamics

Fall 2003:

PHYS 325: Radiation and Optics  
PHYS 509: Theoretical Physics Seminar I  
PHYS 591: Graduate Advanced Research  
Student: Ulrich E. Niedermeier

Spring 2004:

PHYS 356: Atoms and Molecules  
PHYS 422: Undergraduate Research  
Student: King Yeung Chan  
PHYS 522: Physics Colloquium II  
PHYS 572: Advanced Topics in Atomic and Molecular Physics

Fall 2004:

PHYS 215: Special Relativity  
PHYS 509: Theoretical Physics Seminar I  
PHYS 575: Advanced Topics in Theory  
PHYS 421: Undergraduate Research in the Sciences  
Student: June Hyun Kang, Topic: Quantum Graphs

Spring 2005:

PHYS 324: Electricity and Magnetism  
PHYS 588: Seminar in Chemical Physics

Fall 2005:

Sabbatical

Spring 2006:

PHYS 324: Electricity and Magnetism  
PHYS 510: Seminar in Theoretical Physics

## PHYS 522: Physics Colloquium II

### *b) Supervision of Thesis Research*

Gabriele Jaeckel, Max-Planck-Institute for Quantum Optics,  
Diploma completed: September 1988.

Cornelia Kappler, Max-Planck-Institute for Quantum Optics,  
Diploma completed: October 1989.

Claus Hillermeier, Max-Planck-Institute for Quantum Optics,  
Ph. D. completed: July 1991.

Michael Moore, University of Delaware,  
B. A. completed: April 1992.

Muhammed Thaha, University of Delaware,  
Ph. D. completed: May 1994.

Wei Fan, University of Delaware,  
M. A. completed: May 1994.

Achim Kohler, Freiburg University,  
Ph. D. completed, summa cum laude, December 1998.

Gerhard Killesreiter, Freiburg University,  
Diploma completed: October 1998.

Boris Reusch, Freiburg University,  
Diploma completed: December 1998.

Till Vorrath, Freiburg University,  
Diploma completed: January 1999.

Tobias Schneider, Freiburg University,  
Diploma completed: November 1998.

Thomas Clausen, Wesleyan University,  
Ph.D. completed: September 2002.

Lenny Eusebi, Wesleyan University,  
Masters Thesis completed: April 2002.

Ian Garrick-Bethell, Wesleyan University,  
Senior Thesis completed (High Honors): April 2002.

### *c) Postdocs advised*

Dr. Harel Primack, October 1997 – September 1999.

Dr. Yuri Dabaghian, January 2000 – July 2003

Dr. Vladimir Savichev, April 2001 – September 2002

Dr. Thomas Clausen, October 2002 – June 2004

Dr. Amarjeet Singh Bhullar, September 2004 – September 2005