

**Curriculum Vitae**  
**Robert J. Buenker**  
(updated July 5, 2011)

**Family Status**

May 6, 1942                      Born to Mr. and Mrs. Joseph F. Buenker in  
Dubuque, Iowa  
Married to Marilyn Lambrecht Buenker  
Three children: Michael, Timothy and Anne  
Marie

**Education**

June 1963                      Received B.S. Degree (Maxima Cum Laude)  
in Mathematics and Chemistry from Loras  
College, Dubuque, Iowa

June 1966                      Received Ph.D. Degree in Chemistry from  
Princeton University, Princeton, New Jersey.

**Positions Held**

June 1963 - August 1963      Research Associate, General Electric Research  
Laboratories, Schenectady, New York

Sept. 1963 - May 1964        Graduate Teaching Assistant, Department of  
Chemistry, Princeton University, Princeton,  
New Jersey

June 1964 - May 1966        National Science Foundation  
Pre-doctoral Fellow, Princeton University,  
Princeton, New Jersey

June 1966 - May 1967        Post-doctoral Research Associate, Department  
of Chemistry, Michigan State University, East  
Lansing, Michigan

June 1967 - August 1967      Post-doctoral Research Associate, Institut  
für Theoretische Physik, Justus Liebig Uni-  
versität Gießen, Germany

Sept. 1967 - August 1970      Assistant Professor of Chemistry, University  
of Nebraska, Lincoln, Nebraska

June 1968 - August 1968  
& June 1969 - August 1969    Visiting Professor, Institut für Theoretische  
Physik, Justus Liebig Universität, Gießen,  
Germany

June 1970 - January 1971      Visiting Professor, Institut für Physikali-  
sche Chemie, Johannes Gutenberg Universität,  
Mainz, Germany

Sept. 1970 - August 1973	Associate Professor of Chemistry, University of Nebraska, Lincoln, Nebraska
June 1971 - August 1971 & June 1972 - August 1972	Visiting Professor of Chemistry, Institut für Physikalische Chemie, Johannes Gutenberg Universität, Mainz, Germany
April 1973 - August 1975	Visiting Professor of Chemistry, Lehrstuhl für Theoretische Chemie, Universität Bonn, Germany
Sept. 1973 - Dec. 1975	Professor of Chemistry, University of Nebraska, Lincoln, Nebraska
January 1976 - April 1977	Wissenschaftlicher Rat und Professor, Universität Bonn, Germany
April 1977 - July 2007	Professor of Theoretical Chemistry, Bergische Universität-Gesamthochschule, Wuppertal, Germany
July 1980 - October 1981	Vice-speaker of the Sonderforschungsbereich 42, Wuppertal, Germany
Oct. 1981 - Oct. 1984	Speaker of the Sonderforschungsbereich 42, Wuppertal, Germany
June 1983 - June 1985	Dean of the Chemistry and Biology Faculty (FB 9) of the Bergische Universität-GH Wuppertal, Germany
Oct. 1984 - Oct. 1988	Vice-Speaker of the Sonderforschungsbereich 42, Wuppertal, Germany
June 1985 - Sept. 1987	Vice-dean of the Chemistry and Biology Faculty (FB 9) of the Bergische Universität-GH Wuppertal, Germany
Feb. 1990 - January 1996	Member of the Forschergruppe of the Deutsche Forschungsgemeinschaft at the University of Wuppertal, Germany
July 1990 - April 1991	Guest Professor at Argonne National Laboratory, Argonne, IL, U.S.A.
October 1991	Guest Professor, Universidad Autonoma de Madrid, Madrid, Spain
July 1992	Guest Professor, Universidad Autonoma de Madrid, Madrid, Spain
May 1993	Guest Professor, Physical Institute of the Leningrad State University, St.Petersburg, Russia
July - August 1997	Guest Professor, Department of Chemistry, North Carolina State Univ., Raleigh, NC., U.S.A.

March - April 1998 U.S.A.	Guest Professor, Department of Chemistry, North Carolina State Univ., Raleigh, NC, U.S.A.
August 1998 - April 1999	Guest Professor, Institute for Atomic and Molecular Physics of the Harvard-Smithsonian Institute for Astrophysics
February - March 2000	Guest Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
July - August 2000	Guest Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
September - October 2000	Guest Professorship and Lecture Series at the Institute for Intelligence Modeling at the University of Tokyo, Japan
March 27 - April 27, 2001	Guest Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
July 23 - August 23, 2001	Guest Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
February 1 - March 31, 2003	Guest Professorship and Lecture Series at the Department of Physics, Yamaguchi University, Yamaguchi, Japan and at the Department of Engineering at the University of Tokyo, Japan
July 15 - Sept. 30, 2003	Visiting Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
October 2003 - Sept. 2004	Marie Curie Individual Fellow of the European Community, National Hellenic Research Foundation, Athens, Greece
Sept. 15-October 15, 2005	Visiting Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
Feb. 15-April 15, 2006	Visiting Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
Feb. 15-April 15, 2007	Visiting Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
June 1, 2007-	Adjunct Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
July 2007 -	Emeritus Professor of Theoretical Chemistry, Bergische-Universität, Wuppertal, Germany
Sept. 10-October 2, 2007	Visiting Professor, Institute of Applied Phys. and Computational Mathematics, Beijing, China

Oct. 22-December 6, 2007	Visiting Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
Jan. 20-May 13, 2008	Visiting Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
June 23 - 30, 2008	Visiting Professor, National Hellenic Research Foundation, Athens, Greece
July 3-Aug. 15, 2008	Visiting Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
Oct. 28-Feb. 11, 2009	Visiting Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
May 10-Sept. 7, 2009	Visiting Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
Sept. 26-Oct. 23, 2009	Visiting Professor, National Institute of Fusion Science, Tajimi, Japan
Dec. 7, 2009 - March 29, 2010	Visiting Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
July 21 -Oct. 26, 2010	Visiting Professor, Department of Chemistry, North Carolina State University, Raleigh, NC, USA
Jan. 1, 2011 -	Adjunct Professor, Department of Physics and Astronomy, University, of Georgia, Athens, GA, USA

### **Honors and Awards**

1961	NSF Summer Fellowship for Undergraduate Research, Loras College
1961 - 1962	Scholar Athlete of the Year at Loras College
1961 - 1962	NSF Summer Fellowship for Undergraduate Research, Loras College

1962	Delta Epsilon Sigma Honor Society
1963	Who's Who in American Colleges and Universities
1963	NCAA Midwest Regional Tennis Champion (College Division): Singles and Doubles
1964 - 1966	NSF Pre-doctoral Fellowship, Princeton University, Princeton, New Jersey
1966	Sigma Xi Honor Society
1969	Summer Faculty Fellowship (University of Nebraska, Research Council)
1971	Outstanding Young Men of America
1973 - 1975	Senior U.S. Scientist Award of the Humboldt Foundation for research and teaching at the University of Bonn, Germany
2001	Induction in the Loras College Athletic Hall of Fame for Tennis Career (1959-1963)
2003- 2004	Marie Curie Individual Fellow of the European Community at the National Hellenic Research Foundation, Athens, Greece

### **Invited Talks and Contributions to Symposia**

May 1963	One paper in each of the Chemistry and Mathematics Sections of the Iowa Academy of Science, Ames, Iowa
May 1963	Paper at the Meeting of the American Chemical Society in St. Paul, Minnesota
May 1963	Paper at the Meeting of the American Chemical Society in Chicago, Illinois
April 1966	Colloquium Speaker, Department of Chemistry, Princeton University, Princeton, New Jersey
March 1967	Seminar, Department of Chemistry, University of Nebraska, Lincoln, Nebraska
July 1967	Seminar, Institut für Theoretische Physik, Justus Liebig Universität, Gießen, Germany
October 1968	Seminar, Department of Chemistry, Iowa State University, Ames, Iowa
April 1969	Rocky Mountain Quantum Chemistry Meeting, Boulder, Colorado
December 1969	Seminar, Department of Chemistry, Rice University Houston, Texas

May 1970 Seminar, Battelle Institute, Columbus, Ohio,

May 1970 Invited Paper, Joint Meeting of the American Chemical Society and the Canadian Institute of Chemistry, Toronto, Canada

November 1970 Lecture Series on Woodward-Hoffmann Rules, Johannes Gutenberg Universität, Mainz, Germany

December 1970 Seminar, Institut für Physikalische Chemie, Universität Frankfurt, Frankfurt am Main, Germany

December 1970 Seminar, Institut für Theoretische Chemie, Universität Göttingen, Götting, Germany

January 1971 Seminar, Institut für Physikalische Chemie Universität Frankfurt, Frankfurt am Main, Germany

April 1971 Seminar, Laboratory of Molecular Structure and Spectra, University of Chicago, Chicago Illinois

April 1971 Rocky Mountain Quantum Chemistry Meeting, Boulder, Colorado

October 1971 Meeting, Department of Chemistry, Iowa State University Ames, Iowa

February 1972 Recruiting Visit, Area Colleges in Dubuque, Iowa (Loras College, University of Dubuque and Clarke College)

November 1972 Paper given at the Midwest Regional Meeting of the American Chemical Society at Columbia, Missouri

April 1973 Paper at the Sixth Jerusalem Symposium on Chemical and Biochemical Reactivity

July 1973 Attended First International Congress in Quantum Chemistry Menton, France

November 1973 Seminar, Institut für Physikalische Chemie, Karlsruhe, Germany

January 1974 Seminar, Institut für Physikalische Chemie, Regensburg, Germany

June 1974 Seminar, Institut für Physikalische Chemie, Ulm, Germany

July 1974 Gave Invited Lecture at the Discussion Meeting in Excited States of Molecules, Schloß Reisenburg, Germany

October 1974 Seminar, Institut für Physikalische Chemie, Frankfurt am Main, Germany

January 1975 Seminar, Institut für Theoretische Chemie, Frankfurt am Main, Germany

May 1975 Seminar, Institut für Physikalische Chemie, Kaiserslautern, Germany

July 1975	Seminar, Institut für Physikalische Chemie, Essen, Germany
August 1975	Seminar, National Science Foundation, Chemistry Section, Washington, D.C.
August 1976	Lecturer, NATO ASI on Environmental Effects in Arraba, Italy
March 1977	Lecturer, NATO ASI on Excited State Calculations in Kos, Greece
September 1978	Invited Talk, Latin Speaking Quantum Chemistry Conference in Stresa, Italy
June 1979	Workshop on Sudden Polarization in Paris, France
September 1979	Invited Paper, IBM Meeting on use of Computers in Chemistry, Bad Neuenahr, Germany
February 1980	Invited Paper, Workshop on Quantum Chemistry and Molecular Physics in Wollongong, Australia
March 1980	Invited Talk, Sanibel Symposium in Palm Coast, Florida
July 1980	Lecturer, NATO ASI on Theoretical Organic Chemistry in Menton, France
September 1980	Discussion Leader, Theoretical Chemistry Meeting of Germany, Austria and Switzerland in Wildhaus, Switzerland
February 1981	Invited Paper, Workshop on Molecular Spectroscopy in Mülheim/Ruhr, Germany
June 1981	Invited Lecturer at the Workshop on Quantum Chemistry, Pisa, Italy
August 1981	Invited Lecturer at IUPAC Meeting in Vancouver, Canada
September 1981	Invited Lecturer at the Latin Speaking Quantum Chemistry Conference in Barcelona, Spain
May 1982	Invited Paper at the International Congress of Quantum Chemistry held in Uppsala, Sweden
June 1982	Organized First SFB 42 Colloquium in Wuppertal on Excited States of Small Molecules
February 1983	Organized Discussion Meeting on Non-adiabatic and Relativistic Effects in Bad MÜnstereifel, Germany
March 1983	Lecturer at the German Physical Society Meeting in Regensburg, Germany
February 1984	Lecture Tour of Universities in Great Britain including a Visit to the Daresbury Laboratory

June 1984	Organized Second SFB 42 Colloquium on the Excited States of Small Molecules
July 1984 - October 1984	Leave of absence at IBM Research Laboratories in Kingston, New York
February 1985	Series of Invited Lectures in Excited States at the Annual Theoretical Chemistry Meeting in Mariapfarr, Austria
August 1985	Invited Lecturer at the Fifth International Congress of Quantum Chemistry in Montreal, Canada
March 1986	Plenary Lecturer at the Sanibel Symposium in Florida
June 1986	Invited Lecturer at the 69th Canadian Conference in Saskatoon
September 1986	Invited Lecturer at German-speaking Theoretical Chemistry Meeting held in Gmunden, Austria
August 1987	Invited Lecturer WATOC Meeting at Budapest, Hungary
September 1987	Invited Lecturer Joint Meeting of Quantum Chemists in Great Britain held in Edinburgh
October 1987	Invited Lecturer at Workshop for Applications of Microcomputers in Chemistry held at the Banaras Hindu University in Varanasi, India
June 1988	Invited Lecturer at Workshop of Quantum Chemistry held in Girona, Spain
August 1988	Invited Lecturer at International Symposium on the Electronic Structure and Properties of Molecules on Crystals held in Dubrovnik, Yugoslavia
September 1988	Invited Lecturer 32nd Okazaki Conference on Excited Molecules, Okazaki, Japan
September 1989	Invited Lecturer at XI Meeting of Spectroscopy, held in Gießen, Germany
August 1990 - April 1991	Leave of Absence at Physics Division, Argonne National Laboratory, Argonne, IL U.S.A.
July 1990	Invited Lecturer at the 2nd WATOC Meeting, held in Toronto, Canada
November 1990	Seminar, Department of Chemistry Rice University, Houston, Texas, U.S.A.
November 1990	Seminar, Department of Chemistry, University of Texas Austin, Texas, U.S.A.
February 1991	Seminar at the Institute for Theoretical Atomic and Molecular Physics, Harvard-Smithsonian Institution, Cambridge, MS, U.S.A.



January 1992 Seminar, National Hellenic Research Foundation, Athens, Greece

August 1992 Seminar at Argonne National Laboratory, Argonne, IL, U.S.A.

May 1993 Presentation at the Molecular Opacities in the Stellar Environment Meeting held in Copenhagen, Denmark

June 1993 Invited Presentation at the European Research Conference on Relativistic Effects held in De Haan, Belgium

September 1993 Presentation and Session Chairmanship at the 29th Theoretical Chemistry Meeting held in Oberwiesenthal, Germany

March 1994 Lecture and Research Discussion Visits to the Argonne National Laboratory (Physics Division) and University of Nebraska-Lincoln (Department of Chemistry and Physics)

May 1994 Presentation at the Deutsche Forschungsgemeinschaft Schwerpunktprogramm Meeting on Relativistic Effects held in Bonn, Germany

May 1994 Invited Lecturer at the Workshop on Relativistic Effects for Molecules held in Toulouse, France

June 1994 Invited Lecturer and Session Chairmanship at the Workshop on Calculations for Large Molecules held in Wroclaw, Poland

July 1994 Invited Lecturer and Round Table Discussions at the Workshop on Non-Adiabatic Effects held at Argonne National Laboratory Argonne, IL, U.S.A.

May 1995 Invited Lecturer at Second Meeting of the Forschungsschwerpunktprogramm "Relativistic Effects" held in Bonn, Germany

September 1995 Invitation to the University of Aleppo in Syria

October 1995 Series of Invited Lectures to Various Institutes in the People's Republic of China: Chinese Academy of Sciences (Beijing), Key Laboratory of Theoretical Chemistry (Changchun) Northwest China University (Xian), Suzhou University (Suzhou), Chinese Academy of Sciences (Shanghai) and Guangzhou University (Guangzhou)

November 1995 Series of Invited Lectures to Various Institutes in India: Banaras Hindu University (Varanasi), Northeastern Hill University (Shillong), Indian Association for the Cultivation of Science (Calcutta), Indian Institute of Technology (Kharagpur), Hyderabad University and Indian Institute of Chemical Technology (Hyderabad) and Indian Institute of Technology (Bombay)

May 1996 Poster at Third Meeting of the DFG-Schwerpunktprogramm "Relativistic Effects" held in Elmshagen, Germany

September 1996 Poster at the "14th International Conference on High Resolution Molecular Spectroscopy" in Prag

October 1996 Invitation to participate in the Royal Society Meeting on "Rydberg States in Chemistry" in London

October 1996 Invitation to participate the Discussion Meeting of the CIBA Foundation in London

January 1997 Invited Lecture at the 60<sup>th</sup> Birthday Symposium from Prof. S.D. Peyerimhoff held in Bonn, Germany

March 1997 Seminar, Kansas State University, Manhattan, Kansas, U.S.A.

May 1997 Invited Lecture with A. Alekseyev at the Fourth meeting of the DFG-Schwerpunktprogramm "Relativistic Effects" held in Bonn, Germany

July - August 1997 Research Visit, Department of Chemistry, North Carolina State University, Raleigh, NC., U.S.A.

September - October 1997 Series of Invited Lectures held under the Auspices of the Japanese Society for the Promotion of Science and the Deutscher Akademischer Austauschdienst to various Institutes in Japan: Tokyo Institute of Technology (Tokyo), Tokyo University (Tokyo), Institute for Molecular Science (Okazaki), Yamaguchi University (Ube)

March - April 1998 Research Visit to Department of Chemistry, North Carolina State University, Raleigh, NC, U.S.A.

May 1998 Participation in the Fifth Meeting of the DFG-Schwerpunktprogramm "Relativistic Effects" held in Elmshagen, Germany

August 1998 - April 1999 Leave of Absence at the Institute for Atomic and Molecular Physics of the Harvard-Smithsonian Institute for Astrophysics

September 1998 Invited Lecture at the MOLEC XII European Conference on Dynamics of Molecular Collisions, Bristol, UK

November 1998 Seminars at Carlton University and the Steacie Institute of Molecular Sciences of the National Research Council in Ottawa, Canada

December 1998 Research Visit to Department of Chemistry, North Carolina State University, Raleigh, NC, U.S.A.

February 1999 Research Visit to Department of Chemistry, North Carolina State University, Raleigh, NC, U.S.A.

March 1999 Invited Lecture at the 100th Anniversary Meeting of the American Physical Society, Quantum Chemistry Symposium held in Atlanta, GA, USA

May 1999	Participation in the Sixth Meeting of the DFG-Schwerpunktprogramm "Relativistic Effects" held in Elmshagen, Germany
June 1999	Invited Lecture at the Max Planck Institute for Quantenoptik at Garching bei München, Germany
August 1999	Invited Lecture at the American Chemical Society Meeting held in New Orleans, LA, USA
October 1999	Seminar at the Department of Engineering, University of Tokyo, Japan
February - March 2000	Research Visit to the Department of Chemistry, North Carolina State University, Raleigh, NC, USA
April 2000	Participation in the Final Meeting of the DFG-Schwerpunktprogramm "Relativistic Effects" held in Kloster Banz, Germany
June 2000	Invited Participation in the Japanese Society for the Promotion of Science Symposium held in Berlin, Germany
July - August 2000	Research Visit to the Department of Chemistry, North Carolina State University, Raleigh, NC, USA
September - October 2000	Guest Professorship and Lecture Series at the Institute for Intelligence Modeling at the University of Tokyo, Japan
March 12 - 16, 2001	Invited Lecture at the International Seminar on Physics of Electronic and Atomic Collision held in Klyazma, Russian Federation
March 27 - April 27, 2001	Research Visit to the Department of Chemistry, North Carolina State University, Raleigh, NC, USA
July 23 - August 23, 2001	Research Visit to the Department of Chemistry, North Carolina State University, Raleigh, NC, USA
August 4 - August 9, 2001	Invited Lecture at the 14 <sup>th</sup> Canadian Symposium on Theoretical Chemistry held at Carleton University in Ottawa, Canada
Sept. 23 - Sept. 27, 2001	Series of Posters with Dr. A. Alekseyev, Dr. D. Kokh and Dipl.Chem. V. Rai at the German Theoretical Chemistry Meeting held in Bad Herrenalb, Germany
March 18-21, 2002	Invited Lecture at the International Seminar on Atomic Interactions and Differential Scattering held in St. Andreasberg, Germany
April 26-27, 2002	Invited Participation in the Meeting of the Japanese Society for the Promotion of Science Symposium "New Visions of the Universe" held in Dresden, Germany
July 1-7, 2002	Guest Professorship and Research Visit to the National Hellenic Research Foundation, Athens, Greece

February 1 - March 31 2003	Guest Professorship and Lecture Series at the Institute for Intelligence Modeling at the University of Tokyo and Department of Physics, Yamaguchi University, Japan
April 25-26 2003	Invited Participation in the Meeting of the Japanese Society for the Promotion of Science Symposium held in Würzburg, Germany
July - Sept. 2003	Invited Lectures at North Carolina State University, Raleigh, North Carolina
October 2003	Introductory Lecture as Marie Curie Individual Fellow of the European Community, National Hellenic Research Foundation, Athens, Greece
June 2005	Invited Lecture at the Annual Meeting of the European Community Network on Positron and Electron Scattering(Prof. F. A. Gianturco Coordinator) held in Viterbo, Italy.
July 2005	Invited Lecture at the International Workshop on Low Energy Positron and Positronium Physics held in Campinas, Brazil
Sept. 2005	Invited Lecture at the Chemistry Department of the University of Nevada-Las Vegas
Feb. - March 2006	Invited Lectures at North Carolina State University, Raleigh, North Carolina
Aug. 28-30, 2007	Invited Lecture at the International Workshop on Low Energy Positron and Positronium Physics held in Reading, UK
Sept. 11 - Oct. 2, 2007	Invited Lectures at the Institute of Applied Phys. and Computational Mathematics, Beijing, China
Sept. 26 - Oct. 23, 2009	Invited Lectures at the National Institute of Fusion Science (Tajimi), International Christian University (Tokyo) and Kyoto University, Japan
June 21 - 26, 2010	Invited Lecture at the AIS2010 Conference in Kaliningrad, Russia, Institute of Applied Phys.
Nov. 9 - 12, 2010	Invited Lecture at the MC2010 Workshop in Stockholm, Sweden, The Royal Swedish Academy of Sciences
June 5 - 15, 2011	Invited Lectures at the Institute of Applied Phys. and Computational Mathematics, Beijing, China

### **Teaching Experience**

Sept. 1967 - December 1975	Freshman Chemistry, Physical Chemistry (Lecture and Lab) and Quantum Chemistry for Honors Students
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Department of Chemistry, University of Nebraska-  
Lincoln, Lincoln, NE

April 1976 - Physical Chemistry Lecture  
February 1977 Department of Chemistry, University of Bonn, Bonn, West  
Germany

April 1977 - Theoretical Chemistry (Introductory and Advanced)  
July 2007 Department of Chemistry, University of Wuppertal,  
Wuppertal, Germany

July-Aug. 2008 Physical Chemistry Lecture  
Department of Chemistry, North Carolina State  
University, Raleigh, NC

July-Aug. 2009 Physical Chemistry Lecture  
Department of Chemistry, North Carolina State  
University, Raleigh, NC

### **Research Interests and Points of Emphasis of Robert J. Buenker**

1. *Ab Initio* Calculations of Electronic Spectra of Small Molecules and Atoms: Transition Energies and Probabilities between Rovibrational Levels.
2. Development of the Multireference Single- and Double-Excitation CI Method for the Calculation of Electronic Wavefunctions and Properties: Author of MRD-CI Computer Program System widely employed in Germany, Canada, Greece, United Kingdom, Italy, Japan and the United States.
3. Study of Nonadiabatic Effects in the Electronic Spectra of Polyatomic Molecules Using *Ab Initio* MRD-CI Wavefunctions: Bound-Bound and Bound-Continuum Interactions and the Renner-Teller and Pseudo-Jahn-Teller Effects.
4. Treatment of Relativistic Effects Employing Two-Component Methods of Both Perturbational (Breit-Pauli) and Variational Type: Spin-orbit and Spin-spin Coupling Plus Use of Einstein Kinetic Energy Operator and the Darwin and Orbit-Orbit Interactions. Use of Averaged and Spin-orbit Relativistic Effective Core Potentials at the MRD-CI Level of Treatment.
5. Calculation of Atom-Atom and Atom-Molecule Scattering Cross Sections Based on *Ab Initio* CI Potential Energy Surfaces, Non-adiabatic and Spin-orbit Matrix Elements.
6. Application of Complex Scaling Techniques for the Description of Radiationless Processes such as Predissociation and Autoionization.
7. Theory and Calculations for the Radiative Decay of Positronium and Its Production of High-Energy Photons.

8. Use of Relativistic Effective Core Potentials in *Ab Initio* CI Treatments of Chemisorption and Cluster Reactions.
9. Theory of Photon Interactions with Transparent Media and Their Effect on the Speed of Light (Comparison with Gravitational Bending)
10. Study of the Effect of Inhomogeneous Magnetic Fields (Electroweak Stern-Gerlach Effect) in Neutron Decay and its Relation to Parity Non-conservation Theory
11. *Ab Initio* SCF and CI Calculations for the Interactions of Positrons with Small Molecules
12. Development of Relativity Theory Based on the Theoretical Methods Employed for the Global Positioning System
13. Use of Schiff's Method for the Gravitational Scaling of Physical Units to Compute the Trajectories of Planets and Light in the Vicinity of Large Masses