PETER JOHN COLLINGS

PRESENT ADDRESS:

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BIRTH: January 29, 1947
Jamaica, New York

CITIZENSHIP: United States

EDUCATION:

College or University	From	To	Major	Degree
Yale University New Haven, CT 06520	Sept 1972	June 1976	Physics	M.Ph., Ph.D.
Yale University New Haven, CT 06520	Sept 1968	Feb 1969	Physics	
Amherst College Amherst, MA 01002	Sept 1964	June 1968	Physics	B.A.

TEACHING EXPERIENCE:

Morris L. Clothier Professor of Physics, Swarthmore College (1993-)
Chair, Department of Physics & Astronomy, Swarthmore College (1993-2001, 2003-04)
Professor of Physics, Swarthmore College (1990-93)
Professor of Physics, Kenyon College (1989-1990)
Associate Professor of Physics, Kenyon College (1983-1989)
Chair, Department of Physics, Kenyon College (1979-82, 1985)
Assistant Professor of Physics, Kenyon College (1976-83)
Acting Instructor of Physics, Yale University (1975-76)

RESEARCH EXPERIENCE:

Principal Investigator on 15 grants for liquid crystal and molecular aggregation research while at Kenyon College and Swarthmore College (1977-)

Visiting Scholar, Department of Physics & Astronomy, University of Pennsylvania, Philadelphia, PA (2004-05)

Senior Scientist, Center for Biomolecular Science & Engineering, Naval Research Laboratory, Washington, D.C. (2000-01)

Researcher, Iwan-N.-Stransky Institute, Technical University, Berlin, F. R. Germany (Fall, 1996)

Researcher, Liquid Crystal Institute, Kent State University (Summer, 1984)

Researcher, Department of Physical Chemistry, University of Paderborn, F. R. Germany (1983-84)

Researcher, Liquid Crystal Institute, Kent State University (Summer, 1977)

Graduate work in liquid crystal physics at Yale University (1972-76)

Undergraduate work in low temperature physics at Amherst College (1967-68)

GRANTS AND AWARDS:

American Chemical Society, Petroleum Research Fund, Type B Research Grant (2006-09)

American Chemical Society, Petroleum Research Fund, Undergraduate Faculty Sabbatical Grant (2004-05)

U. S. Civilian Research and Development Foundation, Georgian – U. S. Bilateral Grant (2003-04)

Alan Berman Research Publication Award, Naval Research Laboratory, Department of the Navy, Washington, D.C. (2002)

Fellow, American Physical Society (1999)

National Science Foundation, Research in Undergraduate Institutions Grant (1999-2003)

Fellow, American Association for the Advancement of Science (1998)

National Science Foundation, Collaborative Research in Undergraduate Institutions Grant (1995-99)

American Physical Society Prize for Research in an Undergraduate Institution (1994)

National Science Foundation, Research in Undergraduate Institutions Grant (1993-97)

National Science Foundation, Instrumentation and Laboratory Improvement Grant (1992-95)

National Academy of Sciences, Exchange Scientist to the Soviet Union (1991)

National Science Foundation, Research in Undergraduate Institutions Grant (1990-93)

William and Flora Hewlett Foundation Grant of Research Corporation (1988-91)

Nominated for Professor of the Year Award by the Council for the Advancement and Support Of Education (1987)

National Science Foundation, Research in Undergraduate Institutions Grant (1985-89)

Research Corporation, Cottrell College Science Grant (1985-88)

Alexander von Humboldt Fellow, University of Paderborn, F. R. Germany (1983-84)

Research Corporation, Cottrell College Science Grant (1978-82)

Senior Cup Award (1982) - given by the senior class to the Kenyon College faculty member "who has contributed the most to their undergraduate education."

Kenyon College Faculty Development Grants (1978, 1980, 1982, 1987, 1988, 1989)

National Science Foundation, Undergraduate Research Participation Grant (1977-78)

Sigma Xi, Grant-in-Aid-Research (1977)

Graduate Fellowship Award, Yale University (1968, 1972-73)

Honors Graduate in Physics, Amherst College (1968)

Who's Who Among America's Teachers, Who's Who in America, Who's Who in Technology Today, Who's Who in the Midwest, Who's Who in Frontiers of Science and Technology, Who's Who is Science and Engineering, Who's Who in the World, Who's Who in the East, American Men and Women in Science

PROFESSIONAL ORGANIZATIONS:

American Physical Society
American Association of Physics Teachers
American Association for the Advancement of Science
Council on Undergraduate Research
Sigma Xi, The Scientific Research Society

PROFESSIONAL ACTIVITIES:

Member, Committee on Education, American Physical Society (2008 -)

Vice-Chair, Gordon Research Conference on Liquid Crystals (2007)

Vice-Chair, Forum on Education, American Physical Society (2007-)

Panel Member, National Science Foundation Director's Award for Distinguished Teaching Scholars Program (2001)

Member, Board of Directors, International Liquid Crystal Society (2000-)

Member, Editorial Board, Liquid Crystals Today (2000-)

Chair, AAPT Search Committee for the Editor of the American Journal of Physics (2000)

Co-Chair, APS/AAPT Conference for Physics Department Chairs, College Park, MD (2000)

Visitation Team, Middle States Association of Colleges and Schools, Commission on Higher Education (1998, 2001, 2005, 2006)

Panel Member, National Science Foundation Graduate Research Fellowship Program (1998, 2000)

Member, M. J. Murdock Charitable Trust Advisory Committee (1996-)

Member, Scientific Committee, 16th International Liquid Crystal Conference, Kent, Ohio (1996)

Instructor, NSF Chautauqua Short Course "The Science and Technology of Liquid Crystals" (1994)

Associate Editor, American Journal of Physics (1993-95)

Member, GRE Physics Test Committee, Educational Testing Service (1992)

Member, XXIV International Physics Olympiad Examination Committee (1992-93)

Member, Research Corporation Advisory Committee (1992-98)

Site Visit Team, Advanced Liquid Crystalline Optical Materials (Science and Technology Center), National Science Foundation (1992,1993,1995)

Member, Committee on Science & the Arts, The Franklin Institute (1991-), Chair (2005-07)

Chair, Physics/Astronomy Disciplinary Council, Council on Undergraduate Research (1990-93)

Member, Board of Trustees, Planning and Steering Committee for the International Liquid Crystal Conference (1989-).

Consultant, Independent College Challenge Program, Ohio Board of Regents (1988).

Consultant, National Science Foundation, Undergraduate Education in Physics Workshop, April 14-15, 1988.

Treasurer for the 11th International Liquid Crystal Conference, Berkeley, California (1986)

Councilor, Council on Undergraduate Research (1986-95)

External Reviewer: Washington & Jefferson College, Lewis & Clark College, Oberlin College, Connecticut College, Hamilton College, Harvey Mudd College, Pomona College, College of Holy Cross, University of Richmond, Union College, St. Olaf College, College of Wooster, Whitman College, Macalaster College, Western Washington University, Gustavus Adolphus College, Washington & Lee University, Hartwick College, St. Mary's College, University of Wisconsin - Oshkosh, Colgate University, Franklin & Marshall College, Davidson College, Hendrix College, Albion College, Denison University, Hobart & William Smith Colleges, State University of New York at Fredonia, University of Michigan-Dearborn

Reviewer: National Science Foundation, Research Corporation, Petroleum Research Fund, M. J. Murdock Charitable Trust, Fund for the Improvement of Post-Secondary Education (FIPSE), International Science Foundation, W. M. Keck Foundation

Referee: Physical Review Letters, Physical Review, Molecular Crystals and Liquid Crystals, American Journal of Physics, Optics Letters, Liquid Crystals, Journal of Physical Chemistry, Applied Optics, Biophysical Journal, Optics Communications, Journal de Physique, Journal of the Optical Society of America, Applied Physics Letters

MISCELLANEOUS:

United States Soccer Federation Referee (1990-98)
Member, Board of Trustees, United Way of Knox County (1988-90)
Secretary/Treasurer, Mt. Vernon Soccer Association (1988-90)
Chairman, United Way Campaign, Kenyon College (1986), Gambier (1987)
President, Gambier Little League (1985-87)
Member, College Township Fire Department and Ambulance Squad (1980-83)
Restricted Line Officer, U. S. Navy (1969-72)
Married, two children

BOOKS:

P. J. Collings, *Liquid Crystals: Nature's Delicate Phase of Matter*, Princeton University Press, First Edition, 1990, Second Edition, 2002 (Selected by *Choice Magazine* as an Outstanding Academic Book).

P. J. Collings and J. S. Patel, eds., *Handbook of Liquid Crystal Research*, Oxford University Press, 1997.

P. J. Collings and M.Hird, *Introduction to Liquid Crystals: Chemistry and Physics*, Taylor and Francis, 1997.

BOOK CHAPTERS:

P. J. Collings, "Liquid Crystalline Materials," *Encyclopedia of Chemical Technology*, 4th Edition, Volume 15, Page 372, John Wiley & Sons, Inc., 1995.

P. J. Collings, "Phase Structures and Transitions in Thermotropic Liquid Crystals," in P. J. Collings and J. S. Patel, eds., *Handbook of Liquid Crystal Research*, Oxford University Press, 1997.

P. J. Collings, "Liquid Crystalline Materials," *Concise Encyclopedia of Chemical Technology*, 4th Edition, Page 1203, John Wiley & Sons, Inc., 1999.

JOURNAL ARTICLES:

P. J. Collings and J. E. Gordon, "An Undergraduate Experiment Demonstrating Flux Quantization and Superconductivity," American Journal of Physics, **37**, 293 (1969).

P. J. Collings, S. I Goss, and J. R. McColl, "Methods to Measure the Orientational Order in Cholesteric Liquid Crystals," Physical Review A, **11**, 684 (1975).

P. J. Collings, Book Review of *The Fast Fourier Transform* by E. Oran Brigham, American Journal of Physics, **43**, 200 (1975).

P. J. Collings, T. J. McKee, and J. R. McColl, "Nuclear Magnetic Resonance Spectroscopy in Cholesteric Liquid Crystals I: Orientational Order Parameter Measurements," Journal of Chemical Physics, **65**, 3520 (1976).

T. J. McKee, P. J. Collings, and J. R. McColl, "A Simple Technique for Encapsulating NMR Coils in Teflon PTFE," Journal of Physics E: Scientific Instruments, **9**, 811 (1976).

P. J. Collings, Reviews of American Scientist articles for The Physics Teacher, **15**, 366, 510; **16**, 50, 238, 398, 399, 414, 508; **17**, 62, 134, 322, 390, 468, 540; **18**, 156, 469, 538; **19**, 262.

P. J. Collings, T. B. Greenslade, F. Miller, and A. J. Owens, Film Review of *Skylab Films* by Thomas Campbell and Robert Fuller, The Physics Teacher, **16**, 497 (1978).

P. J. Collings and J. R. McColl, "Nuclear Magnetic Resonance Spectroscopy in Cholesteric Liquid Crystals II: The Blue Phase," Journal of Chemical Physics, **69**, 3371 (1978).

P. J. Collings and J. R. McColl, "A Comparison of Orientational Order in Nematic and Cholesteric Liquid Crystals," Solid State Communications, **28**, 997 (1978).

P. J. Collings, D. J. Photinos, P. J. Bos, P. Ukleja, and J. W. Doane, "NMR in Spinning Samples of Biaxial Liquid Crystals," Physical Review Letters, **42**, 996 (1979).

P. J. Collings, Book Reviews of Vibrations and Waves in Physics by I. G. Main and Waves by C. S. Coulson and A. Jeffrey, American Journal of Physics, **47**, 663 (1979).

P. J. Collings, "A Simple Measurement of the Band Gap in Silicon and Germanium," American Journal of Physics, **48**, 197 (1980).

T. K. Brog and P. J. Collings, "Optical Activity in the Cholesteric Blue Phase of a Liquid Crystal," Molecular Crystals and Liquid Crystals, **60**, 65 (1980).

R. V. Tranfield and P. J. Collings, "High Pressure Measurements in a Homologous Series of Liquid Crystals," Physical Review A, **25**, 2744 (1982).

N. D. Russell and P. J. Collings, "High Pressure Measurements in Phospholipid Bilayers Using Adiabatic Compression," Journal of Chemical Physics, **77**, 5766 (1982).

P. J. Collings, "Comment on 'NMR Spectroscopy in Cholesteric Liquid Crystals: I. Orientational Order Parameter Measurements'," Journal of Chemical Physics, **79**, 3605 (1983).

C. S. Johnson and P. J. Collings, "Nonreentrant and Reentrant Nematic Liquid Crystals under High Pressure: A Volumetric Study," Journal of Chemical Physics, **79**, 4056 (1983).

N. D. Russell and P. J. Collings, "Adiabatic Compression: A New Method to Measure Latent Heats in Phospholipid Bilayers," in *Liquid Crystals and Ordered Fluids 4*, A. C. Griffin and J. F. Johnson, eds. (Plenum Publishing Corp., New York, 1984), p. 479.

P. J. Collings, "Optical Rotatory Dispersion of Single Crystals in the Cholesteric Blue Phase, "Molecular Crystals and Liquid Crystals, **113**, 277 (1984).

P. J. Collings, "Optical Rotatory Dispersion Measurements in the Third Cholesteric Blue Phase (BP III)," Physical Review A, **30**, 1990 (1984).

Th. Blumel, P. J. Collings, H. Onusseit, and H. Stegemeyer, "Phase Diagrams of the Blue Phases," Chemical Physics Letters, **116**, 529 (1985).

P. J. Collings, "Comment on Chiral-Racemic Phase Diagram of a Blue-Phase Liquid Crystal, "Physical Review A, **33**, 2153 (1986).

M. B. Atkinson and P. J. Collings, "Optical Rotatory Power in the Isotropic Phase of Four Cholesteryl Esters," Molecular Crystals and Liquid Crystals, **136**, 141 (1986).

R. E. Tosh and P. J. Collings, "High Pressure Volumetric Measurements in Dipalmitoylphosphatidylcholine Bilayers," Biochimia et Biophysica Acta, **859**, 10 (1986).

M. W. Lampe and P. J. Collings, "High Pressure Volumetric Measurements Near a Smectic-Nematic-Isotropic Triple Point," Physical Review A, **34**, 524 (1986).

J. D. Miller, P. R. Battle, P. J. Collings, D. K. Yang, and P. P. Crooker, "Temperature-Concentration Phase Diagram for the Blue Phases of a Highly Chiral Liquid Crystal", Physical Review A **35**, 3959 (1987).

P. R. Battle, J. D. Miller, and P. J. Collings, "Pretransitional Optical Activity Measurements in a Highly Chiral Liquid Crystal System", Physical Review A **36**, 369 (1987).

J. Ennis, J. E. Wyse, P. J. Collings, "Optical Activity Measurements at Long Wavelengths in the Blue Phases of Highly Chiral Liquid Crystals", Liquid Crystals, **5**, 861 (1989).

P. J. Collings and T. B. Greenslade, Jr., "Using the Computer As a Laboratory Instrument", The Physics Teacher, **27**, 76 (1989).

J. E. Wyse, J. Ennis, P. J. Collings, "Coupling Between Structural Modes in the Isotropic Phase of Highly Chiral Liquid Crystals", Physical Review Letters, **62**, 1045 (1989).

K. C. Frame, J. L. Walker, and P. J. Collings, “Pretransitional Optical Activity in Chiral Smectic Liquid Crystals,” Molecular Crystals and Liquid Crystals, **198**, 91 (1991).

J. L. Walker and P. J. Collings, "A Comparison of Pressure-induced and Concentration-Induced Smectic A-Nematic-Isotropic Triple Points," Liquid Crystals, **9**, 751 (1991).

J. E. Wyse, and P. J. Collings, "Light Scattering in the Isotropic Phase of Highly Chiral Liquid Crystals," Physical Review A **45**, 2449 (1992).

P. J. Collings, "Optical Activity and Light Scattering in Highly Chiral Liquid Crystals," Modern Physics Letters B **6**, 425 (1992).

J. D. Rosenzweig and P. J. Collings, "Optical Activity in the Smectic A Phase of a Highly Chiral Liquid Crystal," Physical Review E, **47**, 1876 (1993).

R. F. Pasternack, C. Bustamante, P. J. Collings, A. Giannetto and E. J. Gibbs, "Porphyrin Assemblies on DNA As Studied By a Resonance Light Scattering Technique," Journal of the American Chemical Society, **115**, 5393 (1993).

B. D. Yanoff, A. A. Ruether, P. J. Collings, A. J. Slaney, and J. W. Goodby, "Optical Activity and Light Scattering in the Isotropic and Smectic A* Phases of a Highly Chiral Smectic Liquid Crystal," Liquid Crystals, **14**, 1793 (1993).

J. Hollmann, P. Pollmann, and P. J. Collings, "High Pressure Measurements of BP III and the Pretransitional Optical Activity in a Highly Chiral Liquid Crystal," Liquid Crystals, **15**, 651 (1993).

M. B. Bowling, P. J. Collings, C. J. Booth, and J. W. Goodby, "Phase Diagrams for the Blue Phases of Highly Chiral Liquid Crystals," Physical Review E, **48**, 4113 (1993).

Z. Kutnjak, C. W. Garland, J. L. Passmore, and P. J. Collings, "Evidence for a Supercritical 'Transition' to the Isotropic Phase in a Highly Chiral Liquid Crystal," Physical Review Letters, **74**, 4859 (1995).

J. L. Passmore, B. C. Collings, and P. J. Collings, "Autocorrelation of Electrical Noise: An Undergraduate Experiment," American Journal of Physics, **63**, 592 (1995).

J. B. Becker and P. J. Collings, "Optical Measurements on the BP III to Isotropic Phase Transition in Highly Chiral Liquid Crystals," Molecular Crystals and Liquid Crystals, **265**, 163 (1995).

R. F. Pasternack and P. J. Collings, "Resonance Light Scattering: A New Technique for Studying Chromophore Aggregation," Science, **269**, 935 (1995).

P. J. Collings, "Liquid Crystal Displays," American Journal of Physics, **63**, 1044 (1995).

J. W. Goodby, D. A. Dunmur, and P. J. Collings, "Lattice Melting at the Clearing Point in Frustrated Systems," Liquid Crystals, **19**, 703 (1995).

Z. Kutnjak, C. W. Garland, C. G. Schatz, P. J. Collings, C. J. Booth, and J. W. Goodby, "Critical Point for the Blue Phase III - Isotropic Phase Transition in Chiral Liquid Crystals," Physical Review E, **53**, 4955 (1996).

M. H. Kao, K. A. Jester, A. G. Yodh, and P. J. Collings, "Observation of Light Diffusion and Correlation Transport in Nematic Liquid Crystals," Physical Review Letters, **77**, 2233 (1996).

P. J. Collings, "Point and Line Disclinations in Models of the Blue Phases," Molecular Crystals and Liquid Crystals, **292**, 155 (1997).

H. Stark, M. H. Kao, K. A. Jester, T. C. Lubensky, A. G. Yodh, and P. J. Collings, "Light Diffusion and Diffusing-Wave Spectroscopy in Nematic Liquid Crystals," Journal of the Optical Society of America A **14**, 156 (1997).

U. Singh, P. J. Collings, C. J. Booth, J. W. Goodby, "Static and Dynamic Light Scattering Near the Liquid Crystalline Blue Phase III - Isotropic Liquid Critical Point," Journal de Physique II, **7**, 1683 (1997).

M. A. Anisimov, V. A. Agayan, and P. J. Collings, "The Nature of the BP III - Isotropic Critical Point: An Analogy With the Liquid - Gas Transition," Physical Review E, **57**, 582 (1998).

J. Parkash, J. H. Robblee, J. Agnew, E. Gibbs, P. Collings, R. F. Pasternack, and J. C. de Paula, "Depolarized Resonance Light Scattering by Porphyrin and Chlorophyll a Aggregates," Biophysical Journal, **74**, 2089 (1998).

R. F. Pasternack, E. J. Gibbs, P. J. Collings, J. C. DePaula, L. C. Turzo, and A. Terracina, "A. Non-conventional Approach to Supermolecular Formation Dynamics: The Kinetics of Assembly of DNA-bound Porphyrins," Journal of the American Chemical Society, **120**, 5873 (1998).

C. Nuckolls, T. J. Katz, G. Katz, P. J. Collings, and L. Castellanos, "Synthesis and Aggregation of a Conjugated Helical Molecule," Journal of the American Chemical Society, **121**, 79 (1999).

P. J. Collings, E. J. Gibbs, T. E. Starr, O. Vafek, C. Yee, L. A. Pomerance, and R. F. Pasternack, "Resonance Light Scattering and its Application in Determining the Size, Shape, And Aggregation Number for Supermolecular Assemblies of Chromophores," Journal of Physical Chemistry B, **103**, 8474 (1999).

B. J. Huff, J. J. Krich, and P. J. Collings, "Helix Inversion in the Chiral Nematic and Isotropic Phases of a Liquid Crystal," Physical Review E, **61**, 5372 (2000).

R. F. Pasternack, C. Fleming, S. Herring, P. J. Collings, J. dePaula, G. DeCastro, and E. J. Gibbs, "Aggregation Kinetics of Extended Porphyrin and Cyanine Dye Assemblies," Biophysical Journal, **79**, 550 (2000).

G. M. Barretto, P. J. Collings, D. Bennemann, D. Loetzsch, and G. Heppke, "Short Range Order in the Isotropic Phase of Antiferroelectric Liquid Crystals," Liquid Crystals, **28**, 629 (2001).

R. F. Pasternack, S. Ewen, A. Rao, A. S. Meyer, M. A. Freedman, P. J. Collings, S. L. Frey, M. C. Ranen, and J. C. dePaula, "Interactions of Copper (II) Porphyrins with DNA," Inorg. Chim. Acta, **317**, 59-71 (2001).

E. Grelet, P. J. Collings, M. H. Li, and H. T. Nguyen, "Optical Activity Measurements in the Smectic Blue Phases," European Physical Journal E, **6**, 157 (2001).

J. V. Selinger, P. J. Collings, and R. Shashidhar, "Field Dependent Tilt and Birefringence of Electroclinic Liquid Crystals: Theory and Experiment," Physical Review E, **64**, 061705 (2001).

D. Lacoste, P. J. Collings, and T. C. Lubensky, "Effective Index of Refraction, Optical Rotation, and Circular Dichroism in Isotropic Chiral Liquid Crystals," Physical Review E, **65**, 031717 (2002).

P. J. Collings, B. R. Ratna, and R. Shashidhar, "Order Parameter Measurements of Dichroic Dyes Dissolved in Smectic Liquid Crystals that Tilt Without Layer Contraction," Physical Review E, **67**, 021705 (2003).

A. Chanishvili, G. Chilaya, G. Petriashvili, P. J. Collings, "*Trans*-*Cis* Isomerization and the Blue Phases," Physical Review E, **71**, 051705 (2005).

J. J. Krich, M. B. Romanowsky, and P. J. Collings, "Correlation Length and Chirality of the Fluctuations in the Isotropic Phase of Nematic and Cholesteric Liquid Crystals," Physical Review E, **71**, 051712 (2005).

A. M. Alsayed, M. F. Islam, J. Zhang, P. J. Collings, and A. G. Yodh, "Premelting at Defects Within Bulk Colloidal Crystals," Science, **309**, 1207 (2005).

P. J. Collings, "Ferroelectric Liquid Crystals: The 2004 Benjamin Franklin Medal in Physics Presented to Robert B. Meyer of Brandeis University," Journal of the Franklin Institute, **342**, 599 (2005).

V. R. Horowitz, L. A. Janowitz, A. L. Modic, P. A. Heiney, and P. J. Collings, "Aggregation Behavior and Liquid Crystal Properties of an Anionic Monoazo Dye," Physical Review E, **72**, 041710 (2005).

G. Chilaya, A. Chanishvili, G. Petriashvili, R. Barberi, R. Bartolino, M. P. De Santo, M. A. Matranga, and P. Collings, "Light Control of Cholesteric Liquid Crystals Using Azoxy-Based Host Materials," Molecular Crystals and Liquid Crystals, **453**, 123 (2006).

P. J. Collings, "Reflections of the Chair of the Committee on Science and the Arts," Journal of the Franklin Institute, **343**, 211 (2006).

D. Aronzon, E. P. Levy, P. J. Collings, A. Chanishvili, G. Chilaya, and G. Petriashvili, "*Trans-cis* Isomerization of an Azoxybenzene Liquid Crystal," Liquid Crystals, **34**, 707 (2007).

P. J. Collings, "Reflections of the Chair of the Committee on Science and the Arts," Journal of the Franklin Institute (in press).

M. R. Tomasik and P. J. Collings, "Aggregation Behavior and Chromonic Liquid Crystal Phase of a Dye Derived from Naphthalenecarboxylic Acid," Journal of Physical Chemistry B (in press).

A. J. Dickinson, N. D. LaRacuente, C. B. McKitterick, and P. J. Collings, "Aggregate Structure and Free Energy Changes in Chromonic Liquid Crystals," Molecular Crystals and Liquid Crystals (submitted).

COURSES TAUGHT:

Relativity, Quantum Mechanics, and Chaos (2005)
The Character of Physical Law (1990,91,93,97,98,2002,03)
Geology (1980,81,82,83,85,86,87,89,90,94,95,99,2002,04,07)
The Earth and Its Climate (2006)
Classical & Modern Physics (1977,78,79,80,81,87)
General Physics (1986,87,88,95,2008)
Electricity, Magnetism, and Waves (1991,92,2007)
Modern Physics (1976,80,85,86,2003)
Introductory/Intermediate Mechanics (1982,2000)
Oscillations and Waves (1988,89)
Mathematical Methods of Physics (2002)
Electronics (1976,77,78,79)
Electromagnetic Theory (1977,78,85,94)
Thermodynamics and Statistical Mechanics (1987,91,92,94,98)
Theoretical Mechanics (1977,79,81,83,85)
Quantum Theory (1982,84,96)
Quantum Applications (1997)
Modern Optics (2000,01)
Experimental Physics (1981,84,88,89)
Advanced Laboratory (1976,77,78,79,94,98,99,2000,01,02,03,04,05,06,07,08)
Topics in Advanced Physics (1977,78,79,80,81,82,85)
Independent Study (1986,87,88,89,90,95)
Honors Thesis (1978,79,80,81,82,83,84,85,87,88,89,94,97,99,2000,03,04,05,06,07)
Integrated Program in Humane Studies (1989,90)