Curriculum Vitae **ROBERT CALLENDER** Date: October 1, 2010
Department of Biochemistry
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DEGREES

University of Minnesota	1960-1964	B.A. Mathematics, M.S. Physics
Harvard University	1964-1969	Ph.D. Applied Physics

APPOINTMENTS

University of Paris	10/69-9/70	Postdoctoral Research Associate
The Hebrew University	1/77-7/77	Visiting Associate Professor
Columbia University	9/85-6/86	Visiting Professor
The City College of The City University	9/70-9/1996	Ph.D. program faculty in Physics (1970) & Biochemistry (1980)
The City University	7/89-9/1996	Distinguished Professor of Biophysics
Albert Einstein College of Medicine	9/96-present	Professor of Biochemistry

VISITING APPOINTMENTS/CONSULTING

The GoodYear Rubber & Tire Co.	1986-1987	Consultant
The Eli Lilly and Company	1992-1993	Consultant
Los Alamos National Labs	1992-2005	Visiting Scientist/Consultant
Emisphere Corporation	1998-2000	Consultant

PROFESSIONAL ACTIVITIES

Publishing:

Editorial Board Member, *Basic and Applied Biological Physics* series (AIP Press), 1994-1996; Editorial Board, *Israel Journal of Chemistry*, 1995;
Editorial Advisory Board, *Biospectroscopy*, 1994-1998;
Editorial Board, Biological Physics Series, AIP press, 1997-present;
Editorial Board Member and Associate Editor of *Biophysical Journal*, 1985-1991, 1998-2002.
Editor-in-Chief, *Biophysical J*., 2002-2007

Advisory Boards:

Biological Physics Study Group, Div. Physics, NSF;
Los Alamos Physics Division Advisory Committee (1997-2002)
Member, FASEB Publications Committee.

American Physical Society:

Fellow; Division of Biological Physics
Executive Committee Member, 1988-1991
Division of Biological Physics, vice-Chair elect, vice Chair, Chair, 1991-1993
Member of Society Nominating Committee, 1993-1995
Centennial Speaker, Am. Physical Soc, 1998-1999
Member of Council, Am. Phys. Soc., 1997-2000.

Peer Review Boards:

NSF Biophysics review panel, 1987-1990, 2001
NIH reviewers reserve, 1995-1999; numerous times member various study sections

PROFESSIONAL SOCIETY MEMBERSHIP

American Physical Society (fellow) Biophysical Society
American Chemical Society

COURSES TAUGHT

Physics (and Some Math)

Remedial Math
Freshman Physics
Computer Interfacing (grad & undergraduate)
Optics (undergraduate)
Biophysics (grad & undergraduate)
Advanced Physics Laboratory (grad and undergraduate)
Classical Mechanics (graduate level)
Quantum Mechanics (undergraduate)
Thermodynamics (undergraduate)

Biology

Physical Biochemistry (graduate level)
Molecular Biophysics (graduate)
Protein Folding: Disease and Design (graduate)
Physics & Biology of Vision (graduate level)
Biochemistry (graduate level)

CITY UNIVERSITY AND CITY COLLEGE RELATED ACTIVITIES

Physics Teaching Laboratory Committee; Shop Chairman;
Physics Department Executive Committee (1980-1989);
Faculty Coordinator for Science Division Computer Facility;
Graduate Committee on Admission and Awards;
Development of Computer Interfacing Course;
Instrumentation development for computer on line experiments;
Wrote NSF grant resulting in funding of Science Division computer;
Member, City University Committee on Research (1985-1987);
Science Division Computer Committee Chairman;
Member, City University's Chancellor's Advisory Committee on Academic Program Planning, 1992;
Chair, committee to develop applied physics degree in materials science, optics/photonics and biomedical physics (1993-1996).

ALBERT EINSTEIN

Awards Committee
Faculty Senate
Promotions Committee

MENTORING

I have had the wonderful privilege of mentoring a group of just very talented of scientists.

Primary mentor for 20 Ph. D. graduates.
Primary mentor for 30 Postdoctoral research fellows.

PUBLICATIONS

(www.bioc.aecom.yu.edu/labs/calllab/PPpapers/callender/bobPubs.pdf)

142 scientific articles in Peer Reviewed Journals
18 Invited Reviews
13 Book Chapters

RESEARCH INTERESTS

Our work is centered on studying the structural and dynamical properties of proteins in order to understand the molecular mechanisms of protein function. We have developed new spectroscopic methods to obtain the vibrational spectra of specific protein groups and/or bound ligands, even within large proteins. With these techniques, it is possible to determine bond

lengths with an accuracy of better than 0.01 Å. We also have developed techniques to monitor atomic motion in proteins on multiple time scales, as fast as picoseconds and out to minutes.

The primary problem of the lab is to understand the dynamics of enzymatic catalysis at a molecular level. This involves measurement of (1) static structures of enzymes complexes with their ligands and (2) how atomic motion evolves during the catalytic event. Structure is probed with vibrational spectroscopic tools that are capable of determining the Raman and IR spectra of bound substrates and specific protein molecular moieties. Vibrational spectroscopy yields a very high resolution of structure (better than 0.01 Å), and changes on this order are key to understanding enzymatic catalysis.

Modern paradigms for enzymatic catalysis all include atomic motion of the catalyst and reactants, either implicitly or explicitly. Binding of a substrate to form the Michaelis complex involves motions: formation of encounter complex(es), movement of the substrate towards the enzyme active site, desolvation of substrate, and often loop or flap closure or domain motion. Once the Michaelis complex is formed, movement of atoms and groups at the binding site occur to bring about the proper catalyzed chemistry and achieve these catalytic states with the incredible rate enhancements approaching 10^{18} relative to uncatalyzed reactions. We have recently developed kinetic approaches that can measure molecular motions in proteins on fast time scales (down to 10 ps), here-to-fore inaccessible to measurement, based on initiating chemical and structural changes via a laser induced temperature jump. Measurements of evolving structure is probed using optical and vibrational spectroscopies.

We also wish to understand how proteins arrive at their three dimensional structure (the protein folding problem). A number of studies are underway to understand the thermodynamics of folding. In addition, the crucial kinetic events of protein folding occur faster than the conventional millisecond time scale of stopped-flow mixing techniques. These early kinetic events in the folding process are being studied using our fast advanced initiation techniques.

See: www.callenderlab.org and/or www.proteindynamics.org.

GRANTS (current)

"Imaging Enzyme Structure and Dynamics: Specific Function and Functional Diversity", NIH, R01EB001958, 8/1/03-7/31/09, $1,980,004 (total direct costs); 6/1/09-5/31/10, $971,923 (total direct costs). This work develops and applies new advanced methods of imaging, or 'seeing', the structures of proteins and how they work, very much in the spirit of the development of, for example, magnetic resonance imaging methods developed in the last century. The fruits of this work can lead to more thoroughly understanding disease and then to the discovery of new drugs as well as laboratory diagnostic methods.

“Protein Dynamics in Enzymatic Catalysis”, NIH, P01GM068036, 5/1/2004-4/30/2009, $5,922,836 (total direct costs); 5/1/2009-4/30/2014, $6,971,653 (total direct costs). The goal of this Program Project is to study atomic motion in enzymes. We are trying to understand how the dynamical nature of proteins affect enzymic function and the energy landscape of enzymes from enzyme-substrate to on-enzyme transition state formation.