

David Cowburn

Professional Biographical Information

Education:

- 1965 B. Sc. Hon. Dept. of Biochemistry, University of Manchester
Institute of Science and Technology
- 1970 Ph. D., Medical Research Council Biophysics Research Unit, King's College,
University of London

Employment:

- 2010- Professor, Biochemistry, Physiology & Biophysics, Albert Einstein College of
Medicine
- 2000-10 President and CEO; Director, Lab. Physical Biochemistry, New York
Structural Biology Center
- 1973-2000 Assistant, Associate Professor, Head of Lab, Rockefeller University
- 1970-3 Research Associate, Department of Neurology; College of Physicians and
Surgeons of Columbia University
- 1971-3 Research Fellow of the Interdisciplinary Research Training Program in the
Biological Sciences in relation to Mental Health, Columbia University
- 1970 Research Fellow of the European Molecular Biology
Organization, Laboratory of Molecular Biophysics, Portsmouth
Polytechnic, England
- 1968-9 Physics Teacher, London Education Authority Adult Classes (Part
time) 1966-8 Demonstrator in Biochemistry, King's College

Awards and distinctions:

State scholar, 1962-5; EMBO Fellow, 1970; Member, American Society of Biochemistry and
Molecular Biology, 1978; Doctor of Science, University of London, 1981 (by examination):
Adjunct Faculty, The Rockefeller University, 2000-11; Mount Sinai School of Medicine, 2008- :
Fellow, New York Academy of Sciences, 2003; Fellow, Royal Society of Chemistry, 2012.

Patents issued:

1. [United States Patent 5,888,763](#) Hanafusa, et al. March 30, 1999 Peptides specific for the first Crk-SH3 domain. Licensed to Amgen.
2. [United States Patent 6,171,804](#) Cowburn, et al. January 9, 2001 Method of determining interdomain orientation and changes of interdomain orientation on ligation.
3. [United States Patent 6,391,649](#) Cowburn, et al. May 21, 2002 Method for the comparative quantitative analysis of proteins and other biological material by isotopic labeling and mass spectroscopy. Licensed by Invitrogen and others
4. [United States Patent 6,642,059](#) Cowburn, et al. November 4, 2003 Method for the comparative quantitative analysis of proteins and other biological material by isotopic labeling and mass spectroscopy. Licensed by Invitrogen and others
5. [World Patent WO9816638-A1](#); AU9674324-A Cowburn et al. 1998, Consolidated ligand comprising two ligands - for different binding domains on protein, used as diagnostic agent, for drug screening and therapeutically, has greater affinity and specificity than single ligands.
6. [World Patent WO2006086800](#) Cowburn et al. 2006 Methods and devices for characterizing macromolecular complexes using isotope labeling techniques.

Research Interests:

Structure - function relationships in biological chemistry. Understanding molecular contributions to physiological mechanisms in health and diseases of control of genetic expression, and of intracellular signal transduction. Development of magnetic resonance, applied math, and molecular biophysics techniques in biomedical research for structural and chemical biology.

Publications: (Peer reviewed, and/or [PubMed listed](#) and/or [Google Scholar](#))

[168](#). NMR Assignment through Linear Programming. JFS Bravo-Ferreira, D Cowburn, Y Khoo, A Singer . 2021 arXiv preprint arXiv:2008.03641

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- [163.](#) Hayama, R., Sparks, S., Dutta, K., Hecht, L., Cabana, C., Karp, J., Rout, M.P., and Cowburn, D. (2018). Thermodynamic characterization of the multivalent interactions underlying selective translocation through the Nuclear Pore Complex. *The Journal of biological chemistry* 10.1074/jbc.AC117.001649 Editors' pick. F1000 citation, PMC5868264
- [162.](#) Sparks, S., Temel, D., Rout, M., and Cowburn, D. (2018). Deciphering the 'fuzzy' interaction of FG nucleoporins and transport factors using SANS. *Structure* **26**, 477-484 e474, PMC5929991
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- [160.](#) Stevens AJ, Sekar G, Shah NH, Mostafavi AZ, Cowburn D, Muir TW. A promiscuous split intein with expanded protein engineering applications. *Proceedings of the National Academy of Sciences of the United States of America*. 2017;**114** (32):8538-43. PMC5559002 ^P
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- [158.](#) Karp, J.M., Sparks, S., and Cowburn, D. (2017). Effects of FGFR2 kinase activation loop dynamics on catalytic activity. *PLoS Comput Biol* **13**, e1005360 PMC5313233
- [157.](#) Liu D, Cowburn D. Segmental isotopic labeling of proteins for nmr study using intein technology (2017) *Methods in molecular biology*. 2017;**1495**:131-45
- [156.](#) Khoo Y, Singer A, Cowburn D. Bias Correction in Saupe Tensor Estimation. *arXiv preprint arXiv:160606975*. 2016
- [155.](#) Khoo Y, Singer A, Cowburn D. Integrating nOe and RDC using sum-of-squares relaxation for protein structure determination. *J Biomol NMR*. 2017;**68** (3):163-85
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- [151.](#) Stevens, A.J., Brown, Z.Z., Shah, N.H., Sekar, G., Cowburn, D., and Muir, T.W. (2016). Design of a Split Intein with Exceptional Protein Splicing Activity. *Journal of the American Chemical Society* **138**, 2162-2165 ^P
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- R6. Cowburn, D.; Fischman, A. J.; Live, D. H.; Agosta, W. C.; Wyssbrod, H. R. "An approach to the unequivocal determination of peptide conformations." (1977) in Peptides: Proc. Fifth Amer. Peptide Symp. Goodman, M.; Meienhofer J. Eds. Halsted, New York. 323-4
- R5. Craig, L. C.; Cowburn, D.; Bleich, H. "Methods for the study of the conformation of small peptide hormones and antibiotics in solution." (1975) *Ann. Rev. Biochem.* **44** 477-90^p
- R4. Cowburn, D.; Fischman, A. "Applications and methods of biospecific affinity chromatography." (1975) Chemistry and Biology of Peptides. Ed. J. Meienhofer and R. Walter. (Ann Arbor Scientific)
- R3. Karlin, A; Cowburn, D. "Molecular properties of membrane-bound and of solubilised and purified acetylcholine receptor identified by affinity labeling." (1974) Neurochemistry of cholinergic receptors. Ed. E. De Robertis and R. Schacht. Raven Press, New York^p
- R2. Karlin, A.; Cowburn, D.; Reiter, M. J. "Molecular properties of the acetylcholine receptor." (1973) Drug receptors Ed. H. P. Rang, MacMillan, London, 193-209
- R1. Cowburn D. "Equilibrium and kinetic studies of the conformation of proteins." (1970) Ph.D. Thesis University of London.
- Numerous other anonymous publications as editorial correspondent of journals and as contributor to computer program libraries.
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Theses

- 1978 Alan J. Fischman. "The solution conformation of oxytocin." Ph. D.
- 1978 Dana Giulian, M.D. "Biochemical events within the visual system of the goldfish during neural regeneration." Ph. D.
- 1980 Alan K. Engel. "NMR studies of isotopic isomers of Dipalmitoyl Phosphatidyl Choline." Ph. D.
- 1993 Michael Overduin. "Solution structure of c-Abl SH2" Ph .D.
- 2016 Jerome M. Karp. "Using Enhanced Sampling molecular dynamics simulations to investigate the roles of disordered regions in proteins" Ph. D. (MSTP program)
- 2017 Samuel Sparks "INVESTIGATION INTO THE DYNAMIC MECHANISM OF NUCLEAR TRANSPORT THROUGH THE NUCLEAR PORE COMPLEX"
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Reviewing, Consulting, Adjunct Positions

I have been a reviewer for, consultant to, or have held adjunct, board, or editorial positions with the following entities or journals:

National Institutes of Health; National Science Foundation; U.S. Department of Defense; U.S. Dept. of Energy; U.S. Dept. of Commerce; European Commission; Canadian Foundation for Innovation; ESPRC, BBSRC-UK; U.S.-Israel Bi-national Science Foundation; NIST; Oak Ridge National Laboratory; New York State Health Department; State of Missouri; American Heart Association; American Cancer Society; Wellcome Foundation; Petroleum Research Fund; Memorial Sloan-Kettering Cancer Center; New York University; Columbia University; Australian National University; City University of New York; Mount Sinai School of Medicine; University of Southern California; University of California, Riverside; Weill-Cornell University Medical College; Eastern Analytical Symposium; NMR Concepts; Bair & Co.; Coferon Llc; Elsevier; General Electric; Gerson Lehrman Group; Kodak; Lederle Laboratories; Select Equity Llc; Standard Life; Technoven Corp.; Intermagnetics General Co.; Merck; Oxford University Press; UBS; Bioorganic Chemistry; Biochemistry; Biopolymers; Biophysical Journal; Canadian Journal of Chemistry; Cell; Chemical Science; Concepts in Magnetic Resonance; eLife; EMBO Journal; Faculty of 1000 Journal; Frontiers in Chemistry; Inorganic Chemistry; International Journal of Peptide and Protein Research; Journal of Biological Chemistry; Journal of Biomolecular Stereodynamics; Journal of Chemical Information; Journal of The American Chemical Society; Journal of Computational Chemistry; Journal of Experimental Medicine; Journal of Magnetic Resonance; Journal of Molecular Biology; Journal of Proteomics and Computational Biology; Magnetic Resonance in Medicine; The Medical Letter; Molecular and Biochemical Parasitology; Nature; New England Journal of Medicine; Open Cell Signaling Journal; PLOS Computational Biology; Proceedings of the National Academy of Science; Science ; Steroids ; Structure.

Funded Grants Since 2000:

- 1992-2010 National Institutes of Health, "Structural Biology of Tyrosyl Kinases"
- 2000- National Institutes of Health, "Segmental labeling for protein NMR" (PI Tom Muir)**
- 2000-03 DOD Breast Cancer, "Designed Mimics of BH3 motifs"
- 2000-04 National Institutes of Health, "Myosin Binding Proteins" (PI Don Fischman)
- 2001-09 New York State Office of Science, Technology and Academic Research, "Strategically Targeted Academic Research Center"
- 2002 National Institutes of Health, "Research Facilities Construction"
- 2002-8 National Institutes of Health, "900 MHz NMR Spectrometer for Structural Biology"
- 2002-8 Department of the Army, "900 MHz NMR Spectrometer for Structural Biology"
- 2005-9 National Institutes of Health "Novel Receptors for vitamin A in the cytoplasm" (PI Ulrich Hammerling)
- 2008-11 National Institutes of Health, "Dynamic character of kinase domains" (PI Ranajeet Ghose)
- 2009-11 National Institutes of Health, "Rational design of HIV capsid inhibitors" (PI Asim Debnath)
- 2014-5 National Institutes of Health, "Probe and console upgrade for 600 MHz NMR"
- 2015-9 National Institutes of Health, "Dynamics in enzymatic catalysis" (PI Vern Schramm)
- 2016- National Institutes of Health, "The dynamic mechanism of nuclear transport visualized at the atomic scale"**
- 2017-8 National Institutes of Health, "Integrase binding proteins as drug targets to inhibit HIV-1 assembly" (PI G. Kalpana)

Society Memberships

The American Society of Biochemistry and Molecular Biology; The American Chemical Society; American Association for the Advancement of Science; The Harvey Society; New York Academy of Science (Fellow); Royal Society of Chemistry (Fellow).

Professional Public Information

[Orcid](#) [Linkedin](#) [Einstein Faculty](#)

Selected Past and Future Lectures

- 2020** Texas A&M Biochemistry Seminar (remotely)
- 2019** Telluride Conference on methods for IDPs, July
 Am. Cryst. Assoc. Cincinnati, SANS contrast, July
 Nuclear Pore Complex Conference, Edinburgh, UK, Aug.
 New York Academy of Sciences, "Phase Separation in Biology and Disease",
 Plenary Lecture, Feb.
- 2018** Oak Ridge National Lab, Isotope labeling and polymer structure
 Telluride conference on nuclear pores, August
 ICMRBS, Dublin, Eire, August
- 2017** ASRC/City College, Mar.
 Nuclear Pore Complex Conference, Spain, Sep.
 Astbury Structural Molecular Biology Center, Leeds University, Oct.
- 2016** ICMRBS, Kyoto, Japan, August
 Telluride Conference on Nuclear Pores, July
 Sailing the protein seas, Brown U, Apr.
- 2015** Oak Ridge National Laboratory, Chair, Biological Applications of the STS-2, Oct.
 New York Structural Biology Discussion Group, "Mechanism of nuclear transport", Aug.
 Cold Spring Harbor Lab, "Protein engineering using inteins", Apr.
- 2014** Brown University, Chemistry Dept., Apr.
 Oak Ridge National Laboratory, Neutron Sciences, Oct.
- 2013** Princeton University, NMR in Chemistry Symposium (Sept.)
 Gordon Conference, Computational Methods in NMR/Structural Biology (June)
- 2012** Chianti Conference, June
- 2011** Einstein / Montefiore Center for AIDS Research, 2 Dec
 Dept. of Biology, Brookhaven National Laboratory, Nov.
 Steenbock Symposium, U. Wisconsin, Madison, June 27-28
 Albany Conversation / Stereodynamics June 14-18
 Ohio State U., Mathematics and Biology Institute, "How NMR could benefit from
 new applied math" February
- 2010** D.E. Shaw Research -Dynamic structures in protein – protein interactions. Dec
 University of Frankfurt - Macromolecular Complexes November
 U. Kansas – Symposium on protein interaction modeling
 ICMRBS- Cairns – Protein-Protein interactions, structure and Dynamics
 ISMAR-Euromar - NMR approaches to protein-protein interactions
- 2009** University of South Florida – Structural Biology using NMR
 Albert Einstein College of Medicine – Dynamic structures ...
- 2008** Duke University – Biochemistry Seminar

- New York University (Chemistry)
Academy of American Medical Colleges —The New York Structural Biology Center
U Colorado Cancer Center — Structural Biology in Cancer Drug Design
Mid-Atlantic American Chemical Society
- 2007** U. Maryland — Symposium in Modern Applications of NMR
U. Kansas – Symposium on protein interaction modeling
- 2006** XXII ICMRBS – Gottingen – Protein Interfaces
Cleveland Center for Structural Biology – Frontiers of NMR Spectroscopy
NHLBI, NIH – Forty years of NMR in Biological Systems
- 2005** Rockefeller U - NMR determination of protein structure, Biochem. Course
IBM Almaden - The future of Structural Biology
XXI ICMRBS, Hyderabad, India - Reduced proton density interface mapping
- 2004** Bionet Conference on Enabling Technologies, Durham, UK - Using NMR to study protein domain interactions
Tokyo Metropolitan University - New methods of isotope labeling
Yokohama U. - NMR studies of Csk
ANZMAG 04 - What NMR can do in studying domain motions?