BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Han, Bong-Gyoon	Scientist
eRA COMMONS USER NAME (credential, e.g., agency login) bghan2	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Seoul National University, Korea	B.S.	02/87	Microbiology
University of California, Berkeley, CA	Ph.D.	05/94	Biophysics

A. Personal Statement

I have a track record of solving several high-resolution structures by X-ray crystallography, including an influential bovine aquaporin structure and human red blood cell protein 4.1. Through my career, membrane proteins have been one of my major research interests, and I carried out structural studies of several membrane proteins by electron microscopy, including bacteriorhodopsin and gastric H, K ATPase. More recently, I have developed my skills in single-particle EM techniques by solving eight structures of large, soluble-protein complexes. As a result, I can now bring both areas of my expertise together in order to work on high-resolution cryo-EM structural studies of membrane proteins. In addition to my personal skills, I would like to point out that I am part of a very strong EM group at Berkeley, which includes Robert Glaeser, Eva Nogales, and Kenneth Downing. I strongly believe that I can perform exciting structural studies of membrane proteins, considering my current level of skill in cryo-EM, access to a newly developed phase-plate technology, and access to high-profile membrane proteins with medical relevance.

B. Positions and Honors

Professional Experience

1994-1997 Postdoctoral Fellow, University of Calif. Berkeley.
1997-2000 Postdoctoral Fellow, Life Sciences Division, Lawrence Berkeley National Laboratory
2000-present Scientist, Life Sciences Division, Lawrence Berkeley National Laboratory.

Honors

1987 *Magna cum laude*, Seoul National University in Korea.
1991 Odell Wilson Scholar, University of California, Berkeley
1993 Presidential award, Microscopy Society of America.

C. Selected Peer-reviewed Publications

(I have an average citing of 54 times per article according to the ISI Web of Knowledge)

Most relevant to the current application:

1. **Han BG***, Dong M*, Liu H, Camp L, Geller J, Singer M, et al. Survey of large protein complexes in D. vulgaris reveals great structural diversity. **Proc Natl Acad Sci U S A**. 2009;106(39):16580-5. PMCID: PMC2742403. *Equal contribution.
2. Arbelaez P, **Han BG**, Typke D, Lim J, Glaeser RM, Malik J. Experimental evaluation of support vector machine-based and correlation-based approaches to automatic particle selection. **J Struct Biol**. 2011;175(3):319-28.

Additional recent publications of importance to the field (in chronological order)

1. Forster F, **Han BG**, Beck M. Visual proteomics. **Methods Enzymol**. 2010; 483:215-43.
2. **Han BG**, Guliaev AB, Walian PJ, Jap BK. Water transport in AQP0 aquaporin: molecular dynamics studies. **J Mol Biol**. 2006;360(2):285-96.
3. Sui H*, **Han BG***, Lee JK, Walian P, Jap BK. Structural basis of water-specific transport through the AQP1 water channel. **Nature**. 2001; 414(6866):872-8. *Equal contribution.
4. **Han BG**, Han M, Sui H, Yaswen P, Walian PJ, Jap BK. Crystal structure of human calmodulin-like protein: insights into its functional role. **FEBS Lett**. 2002; 521(1-3):24-30.
5. An XL, Takakuwa Y, Manno S, **Han BG**, Gascard P, Mohandas N. Structural and functional characterization of protein 4.1R-phosphatidylserine interaction: potential role in 4.1R sorting within cells. **J Biol Chem**. 2001; 276(38):35778-85.
6. **Han BG**, Nunomura W, Wu H, Mohandas N, Jap BK. Crystallization and preliminary X-ray crystallographic analysis of the 30 kDa membrane-binding domain of protein 4.1 from human erythrocytes. **Acta Crystallogr D Biol Crystallogr**. 2000; 56(Pt 2):187-8.
7. **Han BG**, Nunomura W, Takakuwa Y, Mohandas N, Jap BK. Protein 4.1R core domain structure and insights into regulation of cytoskeletal organization. **Nat Struct Biol**. 2000; 7(10):871-5.
8. Vonck J, **Han BG**, Burkard F, Perkins GA, Glaeser RM. 2 Progressive Substates of the M-Intermediate Can Be Identified in Glucose-Embedded, Wild-Type Bacteriorhodopsin. **Biophysical Journal**. 1994; 67(3):1173-8.
9. **Han BG**, Wolf SG, Vonck J, Glaeser RM. Specimen Flatness of Glucose-Embedded Biological-Materials for Electron Crystallography Is Affected Significantly by the Choice of Carbon Evaporation Stock. **Ultramicroscopy**. 1994;55(1):1-5.
10. **Han BG**, Vonck J, Glaeser RM. The Bacteriorhodopsin Photocycle - Direct Structural Study of 2 Substates of the M-Intermediate. **Biophysical Journal**. 1994; 67(3):1179-86.

D. Research Support

Ongoing Research Support

DE-AC02-05CH11231 (Arkin) 10/01/2011 – 09/30/2012
DOE/ENIGMA
3-D Reconstruction of Multi-Protein Complexes by Electron Microscopy
The broad aim of this subproject is to develop high-throughput capabilities for determining the overall morphology and arrangement of subunits within large, biochemically purified multi-protein complexes of *Desulfovibrio vulgaris* Hildenborough. Work that is aimed towards increasing the throughput of single-particle EM currently includes the implementation of automated data collection and automated data analysis, and the engineering of new support-film technologies for EM sample preparation.
Role: Key Personnel

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Robert M. Glaeser	Biophysicist Staff Scientist
eRA COMMONS USER NAME RMGLAESER	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE	MM/YY	FIELD OF STUDY
University of Wisconsin, Madison, WI	B.S.	01/1959	Physics & Mathematics
University of California, Berkeley, CA	Ph.D.	01/1964	Biophysics
Oxford University, Oxford, UK	Postdoc	1963-64	Quantum Chemistry
University of Chicago, Chicago, IL	Postdoc	1964-65	Quantum Chemistry

A. Personal Statement

My research career has involved a mixture of (1) development of methodology for structural biology, with a major emphasis on electron microscopy, and (2) applications of this methodology to specific, biological projects. Areas of previous work that are relevant to the current proposal have included: establishing the extent to which radiation damage limits imaging at high resolution, and the need to use averaging of noisy images to overcome those limitations; the use of frozen-hydrated specimens to preserve native, hydrated structure and, to a small extent, to improve the degree to which biological macromolecules can tolerate radiation damage; characterization of the resolution-limiting phenomenon of beam-induced movement; development of software tools for automated particle boxing and other aspects of high-throughput single-particle EM; and development of a microfabricated electrostatic device for in-focus phase contrast in transmission electron microscopy. My role as PI on this proposal is a natural extension of my similar role in the previous 4 years of the project.

B. Positions and Honors

1965 - 1966 Lecturer, Division of Medical Physics, University of California, Berkeley
1965 - 2006 Faculty Scientist, Life Sciences Division, Lawrence Berkeley National Laboratory
1966 - 1971 Assistant Professor, Biophysics, University of California, Berkeley
1971 - 1976 Associate Professor, Biophysics, University of California, Berkeley
1976 - 1978 Director, Electron Microscopy Laboratory, University of California, Berkeley
1976 - 2006 Professor, University of California, Berkeley
1978 - 1983 Divisional Dean, Biological Sciences, University of California, Berkeley
1983 - 1984 Guggenheim Foundation Fellow (at MRC Lab Molec. Biol., Cambridge)
1983 - 1986 Member, National Advisory Committee on Electron Microscopy, NIH Division of Research Resources
1984 - 1987 Study Section, National Institutes of Health, Division of Research Resources, Small Grants Program
1986 President, Electron Microscopy Society of America
1988 - 1989 Alexander von Humboldt Award (at Max-Planck-Institute for Biochemistry, Martinsried)
1992 Elizabeth R. Cole Award, Biophysical Society
1992 - 1996 Department Head, Subcellular Structure Department, LSD, Lawrence Berkeley National Laboratory
1994 - 1997 Council Member, Biophysical Society
1995 - 1998 Chair, Graduate Group in Biophysics, University of California, Berkeley
1998 - 2003 US National Committee, International Union Pure and Applied Biophysics
1999 - 2001 US National Committee, International Union Crystallography
2001 Chair, Gordon Conference on 3-D Electron Microscopy
2004 Distinguished Scientist Award for the Biological Sciences, Microscopy Society of America
2006 - present Emeritus Professor, University of California, Berkeley, and Scientist, Lawrence Berkeley National Laboratory

C. Selected peer-reviewed publications.

Five most relevant to the current application

1. Cambie R, Downing KH, Typke D, **Glaeser RM**, and Jian Jin. (2007) Design of a microfabricated, two-electrode phase-contrast element suitable for electron microscopy. *Ultramicroscopy* 107: 329-339.
2. Danev R, **Glaeser RM**, and Nagayama K. (2009) Practical factors affecting the performance of a thin-film phase plate for transmission electron microscopy. *Ultramicroscopy*, 109*,* 312-325.
3. Hall RJ, Nogales E and **Glaeser RM** (2011) Accurate modeling of single-particle cryo-EM images quantitates the benefits expected from using Zernike phase contrast. *J Struct Bio*, 174, 468-475.
4. Downing KH and **Glaeser RM**. (2008) Restoration of weak phase-contrast images recorded with a high degree of defocus: The "twin image" problem associated with CTF correction. *Ultramicroscopy*. 108, 921-928. PMCID: PMC2694513
5. Mueller H, Jin J, Danev J, Spence H, Padmore H, and **Glaeser RM** (2010) Design of an electron microscope phase plate using a focused continuous-wave laser. *New Journal of Physics*, 12, 073011.

Additional recent publications of importance to the field (in chronological order)

6. Rockel B, Peters J, Muller SA, Seyit G, Ringler P, Hegerl R, **Glaeser RM**, and Baumeister W. (2005) Molecular architecture and assembly mechanism of Drosophila tripeptidyl peptidase II. *PNAS* 102,10135-40. PMCID: PMC1177415
7. Garczarek F, Dong M, Typke D, Witkowska E, Hazen TC, Nogales E, Biggin M and **Glaeser RM**. (2007) Octomeric Pyruvate-Ferredoxin Oxidoreductase from *Desulfovibrio Vulgaris*. *J Struct Bio* 159, 9-18.
8. Typke D, Gilpin CJ, Downing KH, and **Glaeser RM** (2007) Stroboscopic image capture: reducing the dose per frame by a factor of 30 does not prevent beam-induced specimen movement in paraffin. *Ultramicroscopy* 107, 106-115.
9. Taylor KA and **Glaeser RM**. (2008) Retrospective on the early development of cryoelectron microscopy of macromolecules and a prospective on opportunities for the future. *J Struct Bio*, 163, 214-223. NIHMSID: NIHMS74454
10. Han BG, Dong M, Liu H, Camp L, Geller J, Singer M, Hazen TC, Cho M, Witkowska HE, Ball DA, Typke D, Downing KH, Shatsky M, Brenner SE, Chandonia JM, Biggin M, and **Glaeser RM** (2009) Survey of large protein complexes in D. vulgaris reveals great structural diversity. *Proceedings of the National Academy of Sciences USA*, 106,16580-16585. PMCID: PMC2742403
11. **Glaeser RM**, McMullan, G, Faruqi, AR, and Henderson, R (2011) Images of paraffin monolayer crystals with perfect contrast: minimization of beam-induced specimen movement. *Ultramicroscopy*, 111, 90-100.
12. **Glaeser RM,** Typke D, Tiemeijer PC, Pulokas J and Cheng, A (2011) Precise beam-tilt alignment and collimation are required to minimize the phase error associated with coma in high-resolution cryo-EM. *J Struct Bio*, 174, 1-10.
13. **Glaeser RM** and Hall, RJ (2011) Reaching the information limit in cryo-EM of biological macromolecules. *Biophys J*, 100,2331-2337.
14. Hall R, Nogales, E, and **Glaeser RM** (2011) Accurate modeling of single-particle cryo-EM images quantitates the benefits expected from using Zernike phase contrast. *J Struct Bio* 174, 468-475.
15. Arbelaez P, Han BG, Typke, D, Lim J, **Glaeser RM**, and Malik J. (2011) Experimental evaluation of support vector machine-based and correlation-based approaches to automatic particle selection. *J Struct Bio*, 175, 319-328.

D. Research Support

Ongoing Research Support

R01 GM083039 (Glaeser) 09/30/11 - 08/31/15
NIH/NIGMS
In-Focus Phase Contrast for Cryo-EMs
The goal of this research project is to determine whether technology can be developed to use an electrostatic phase-contrast aperture ("quarter-wave plate") for in-focus phase contrast in electron microscopy of biological macromolecules.
Role: Principal Investigator

DE-AC02-05CH11231 (Adams) 10/01/11 - 09/31/12
Department of Energy
ENIGMA (Ecosystems & Networks Integrated with Genes and Molecular Assemblies: A Multiscale Systems Approach)
An overall goal of this multi-project research is to create a platform of integrated and generally applicable biochemical, biophysical, and computational technologies that will allow us to rapidly understand the essential components of microbial systems at all scales (molecules to cells to organisms and communities).
Role: Project Lead

DBI 1040543 (Mueller) 09/01/10 - 08/31/14
National Science Foundation
MRI: Development of Zernike Phase Contrast for Biological Electron Microscopy
The goal of this Major Research Instrumentation grant is to develop a novel phase-plate device for the transmission electron microscope that is based on the ponderomotive interaction between light and electrons. A Fabry-Perot cavity will be used as a simultaneous high numerical aperture focusing device and a power buildup device in order to simultaneously (1) confine the ponderomotive interaction to the region of the focused, unscattered electrons in an electron diffraction pattern and (2) achieve the light intensity that is needed to produce a 90 degree phase shift.
Role: Co-Investigator

Completed Research Support (during the past three years)

P01 GM064692 (Glaeser) 06/01/03 - 05/31/10
NIH/NIGMS
Computational Technology for High-Throughput Cryo-EM
The overall goal of this program project grant was to develop the software technology required to use electron microscopy to determine the atomic structures of isolated macromolecular assemblies in a routine and rapid fashion.
Role: Principal Investigator

DE-AC02-05CH11231 (Parvin) 10/01/08 - 09/30/09
Department of Energy
Nuclear Imaging of Gene Expression (Equipment sub-project)
The purpose of this sub-project was to provide partial support for the purchase of a transmission electron microscope. Support for this purchase was also provided by R01 GM083089
Role: Principal Investigator