

## William M. Zuk

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### Education

**Ph.D., Biophysics**, Syracuse University, Syracuse, New York, Thesis Title: "VCD of Amino Acids and Simple Peptides as a Function of pH", Advisor: Dr. Laurence Nafie.

**B.S., Chemistry**, Utica College, Utica, New York,

### Teaching Experience

Laboratory Coordinator, Hobart and William Smith Colleges, Geneva, NY, 2009-present.

- Taught and Developed Curricula for Introductory Chemistry I and II Laboratories.
- Taught Inorganic Chemistry Laboratory.
- Taught Organic Chemistry I Laboratory.
- Taught Biochemistry II Laboratory.

Assistant Professor, Hobart and William Smith Colleges, Geneva, NY, 2005-2009.

- Taught Physical Chemistry I and II Lectures and Laboratories.
- Taught Introductory Chemistry I and II Lectures and Laboratories.
- Taught Advanced Inorganic Chemistry Lecture and Laboratory.
- Taught Quantitative Analysis Lecture and Laboratory.

Lecturer, Howard University, Washington, DC, 2003-2005.

- Taught General Chemistry I and II Lectures and Recitations.
- Taught General Chemistry I Laboratory.
- Taught Chemistry for Health Science Majors I and II Laboratories.

### Research Experience

Senior Scientist I and Group Supervisor, Geo-Centers, Inc., Naval Research Laboratory, Washington, DC, 1995-2003

Scientist III, Geo-Centers, Inc., Naval Research Laboratory, Washington, DC, 1989-1995

- Applied spectroscopic techniques, including Fourier Transform Infrared (FTIR) spectroscopy, and Vibrational Circular Dichroism (VCD), to determine conformational changes in the secondary structures of proteins in solution. Conducted experiments using a Bomem Prota FTIR instrument and a BioTools ChiralIR VCD instrument.

- Investigated mechanisms of protein crystal growth using dynamic light scattering (DLS) methods, FTIR and VCD. Assembled microscopic DLS apparatus.
- Examined usefulness of microgravity as a protein crystallization parameter. Developed breadboard model of flight hardware which would perform protein crystal growth experiments aboard the International Space Station.
- Developed protocols to control crystallization experiments remotely using WWW-activated interfaces.

Office of Naval Technology Postdoctoral Fellow, Naval Research Laboratory, Washington, DC, 1986-1989

- Automated protein crystallization experiments using laboratory robotics.
- Developed automated video inspection system for protein crystal growth experiments.
- Designed image analysis methods for automated detection of crystals.

Research Assistant, Syracuse University, Syracuse, NY, 1983-1986

- Used molecular spectroscopic techniques to study conformation of amino acids and oligopeptides in solution. Methods used included dispersive infrared (IR), Fourier-Transform Infrared (FTIR) and Vibrational Circular Dichroism (VCD) spectroscopies.
- Developed software to control dispersive VCD instrument.

### **Research Interests**

- Application of Vibrational Circular Dichroism (VCD) and Fourier Transform Infrared (FTIR) Spectroscopies to biochemical systems including the study of protein secondary structure using FTIR and VCD and the determination of the absolute configuration and conformation of chiral natural product molecules.
- Development of VCD and FTIR as diagnostic and detection methods.
- Study of molecules of pharmaceutical interest using VCD and FTIR.
- Investigation of protein crystal growth mechanisms through the use of dynamic light scattering and vibrational spectroscopy techniques.

### **External Funding**

NASA Office of Microgravity Sciences (1989) – Two year grant to study automation methods of protein crystal growth. Approximately \$120,000.

NASA Office of Microgravity Sciences (1992) – Three year grant to study the temperature dependence of protein crystal growth. Approximately \$300,000.

NASA Office of Microgravity Sciences (1995) – Four year grant to begin preliminary development of microgravity-based crystal growth hardware. Approximately \$600,000.

NASA Office of Microgravity Sciences (1999) – Four year grant to develop an experimental apparatus to study crystal growth processes aboard the International Space Station. Approximately \$850,000.

## Appointments

Co-chairman of the SPIE Symposium on Space Optical Materials and Space Qualification of Optics, held in Orlando, FL, March 1989.

## Awards and Honors

Office of Naval Technology Postdoctoral Fellowship, 1986-1989.

Coblentz Society Award for Outstanding Student in Vibrational Spectroscopy, 1986.

## Publications and Proceedings

Gorti, S., W. M. Zuk, H. Yang, T. Tanaka, and K. B. Ward, "Lysozyme Diffusion in the Vicinity of Crystal Surfaces", *J. Crystal Growth*, **232**, 256-261 (2001).

Zuk, W. M., S. Gorti, and K. B. Ward, "Investigation of Protein Crystal Growth Mechanisms in Microgravity", *Proceedings, Spacebound 97* (1998).

Ward, K. B.; Perozzo, M. A.; Zuk, W. M.. "Automating crystallization experiments", *Cryst. Nucleic Acids Proteins* (1992), 291-310.

Ward, K. B. , W. M. Zuk, M. A. Perozzo, M. A. Walker, G. I. Birnbaum, W. Kung, A. Cavaliere, D. R. Uffen, and H. Scholaert. "Dynamic telerobotic control of crystallization experiments", *J. Crystal Growth*, **122**, 235-242 (1992).

Ward, K. B., M. A. Perozzo, and W. M. Zuk "Automating Crystallization Experiments", In **Crystallization of Proteins and Nucleic Acids: A Practical Approach**, Chapter 13, pp. 291-310, Eds, A. Drucux and R. Giege, IRL Press (1991).

Zuk, W.M. and K. B. Ward, "Methods of Analysis of Protein Crystal Images," in *J. Crystal Growth*, **110**, 148-156 (1991).

Zuk, W. M., K. B. Ward, and M. A. Perozzo, "Video Monitoring and Analysis Subsystem: A CCD-Based Monitoring system for the Protein Crystal Growth Apparatus", *SPIE Vol. 1118 Proceedings, Space Optical Materials and Space Qualifications of Optics* (1989) 154.

Zuk, W. M., T. B. Freedman, and L. A. Nafie, "Vibrational Circular Dichroism in the CH-Stretching Region of L- $\alpha$ -Amino Acids as a Function of pH," *J. Phys. Chem.* **93**, 1771(1989).

Zuk, W. M., T. B. Freedman, and L. A. Nafie, "Vibrational CD Studies of the Solution Conformation of Simple Alanine-Peptides as a Function of pH," *Biopolymers* **11**, 2025 (1989).

Ward, K. B., W. M. Zuk, and M. A. Perozzo, "Preparation of Protein Crystals Using Robotics and Automated Visual Inspection," *Laboratory Robotics and Automation*, **1**, 157-176 (1989).

Ward, K. B., M. A. Perozzo, and W. M. Zuk, "Automatic Preparation of Protein Crystals Using Laboratory Robotics and Automated Visual Inspection," *J. Crystal Growth* **90**, 325 (1988).

Zuk, W. M., K. B. Ward, M. A. Perozzo, "Automated Preparation of Protein Crystals: Integration of an Automated Visual Inspection Station," in: **Advances in Laboratory Automation Robotics**, vol. 4, J. R. Strimaitis and G. L. Hawk, eds., Zymark Corp., Hopkinton, MA, 1988, pp. 217-234.

Freedman, T. B., A. C. Chernovitz, W. M. Zuk, M. G. Paterlini, and L. A. Nafie, "Vibrational Circular Dichroism in the Methine Bending Modes of Amino Acids and Dipeptides," *J. Am. Chem. Soc.* **110**, 6970 (1988).

Polavarapu, P. L.; Hess, B. A., Jr.; Schaad, L. J.; Henderson, D. O.; Fontana, L. P.; Smith, H. E.; Nafie, L. A.; Freedman, T. B.; Zuk, W. M.. "Vibrational spectra of methylthiirane." *Journal of Chemical Physics* (1987), 86(3), 1140-6.

Freedman, T. B., J. Kalmerten, C. G. Zimba, W. M. Zuk, and L. A. Nafie, "Raman Optical Activity in the Skeletal Motions of (+)-(3R)-Methylcyclohexanone. Chiral Mixing in Inherently Achiral Vibrations," *J. Am. Chem. Soc.* **106**, 1244 (1984).

## **Presentations**

Gorti, S., W. M. Zuk and K. B. Ward, "Lysozyme Diffusion in the Vicinity of Crystal Surfaces", presented at the Sixth International Conference on Crystallization of Biological Macromolecules, Destin, FL, 2001.

Zuk, W. M., S. Gorti, and K. B. Ward, "Investigation of Protein Crystal Growth Mechanisms in Microgravity", presented at Spacebound 97, Montreal, Canada, 1997. (Invited).

Zuk, W. M., S. Gorti, and K. B. Ward, "Dynamic Control of Protein Crystallization Experiments: New Directions", presented at the annual Protein Crystal Growth Meeting, Panama City, FL 1996. (Invited).

Zuk, W. M. and K. B. Ward, "Automation of Protein Crystallization Experiments: Crystallization by Dynamic Control of Temperature", presented at the annual Protein Crystal Growth Meeting, Panama City, FL 1995. (Invited).

Zuk, W. M., and M. A. Perozzo, "Automating Protein Crystallization Experiments Using Laboratory Robotics" presented at the Pharmaceutical Manufacturers Association Annual Meeting, Washington, DC, 1989.

Zuk, W.M. and K. B. Ward, "Methods of Analysis of Protein Crystal Images," presented at the Third International Conference on Crystallization of Biological Macromolecules, Washington, DC, 1989. (Invited).

Zuk, W. M., K. B. Ward, and M. A. Perozzo, "Video Monitoring and Analysis Subsystem: A CCD-Based Monitoring system for the Protein Crystal Growth Apparatus", presented at *SPIE Symposium on Space Optical Materials and Space Qualifications of Optics*, Orlando, FL, 1988. (Invited).

## References

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