

## LANCE MICHAEL WESTERHOFF

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**Entrepreneur and Computational Biochemist** whose experience includes project management and leadership; software engineering and development; strategic planning; and fund raising efforts including angel, venture capital, and public/grant funding sources. Scientifically accomplished through projects involving the synergistic application of quantum mechanics and molecular mechanics in the life and pharmaceutical sciences. Well accustomed to the small company environment and able to “wear many hats” in order to perform the duties required for successful research, development, and deployment of advanced technology. Able to interact with and manage scientists, engineers, and business people in various capacities including management, investors, customers, staff scientists, and academicians.

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### PROFESSIONAL EXPERIENCE

#### QuantumBio, Inc., State College, PA

2001-present

Co-founded the Company along with Dr. Kenneth M. Merz, Jr. (CEO), and Mr. Walter Greenblatt (CFO).

#### Chief Software Engineer/Product Manager (2001-2005)

Managed a team of Software Engineers and Computational Scientists to engineer, develop, optimize, and validate a suite of quantum mechanics-based computational chemistry solutions derived from intellectual property under exclusive license from the Pennsylvania State University (PSU). Reported directly to the Chief Executive Officer. Key duties and skills include:

- Manage software engineering efforts including requirement gathering through customer surveys and presentations, UML diagramming, and ongoing customer interaction.
- Participate in or manage all marketing efforts including presentations, pre- and post-sales support, and joint customer/partner research projects to validate QuantumBio technology.
- Worked with management team to raise ~\$1.2 million in investor funding from the Life Sciences Greenhouse of Central PA, Ben Franklin Technology Partners, and angel investors.
- Principle Investigator: Department of Defense Phase I SBIR valued at ~\$65,000 to demonstrate proprietary QMScore technology in industrial environment (complete).
- Development of C++ graphical user interface (GUI) and application programming interface (API) for command line interface (CLI) legacy Fortran/Perl/Python-based software licensed from PSU.
- Optimization and modernization of legacy software through in-house optimization efforts and integration with performance libraries including LAPACK, ScaLAPACK, MPI, and ESSL.
- Built product using portable C++/Fortran, Qt (from Trolltech.com), and OpenGL/Openinventor for GUI/CLI support for Linux, Mac OS X, IRIX, and Windows XP (CLI support for IBM BlueGene).

#### General Manager & Chief Software Engineer/Product Manager (2005-present)

In addition to Chief Software Engineer/Product Manager duties detailed above, general management duties including general oversight of day-to-day corporate operations, strategic planning, and fund raising efforts. Report directly to the Chief Executive Officer and the Board of Directors. Key duties and skills include:

- Co-Principle Investigator: National Institutes of Health FastTrack STTR valued at ~\$100,000 in Phase I and ~\$750,000 in Phase II to explore QuantumBio’s NMR technology (current).
- (Co-)Principle investigator for additional proposals under submission using Grants.gov to support further QuantumBio intellectual property development and to create additional corporate value.
- Overall strategic planning and project management using Excel, Word, and Project.
- Monthly briefings of the Board of Directors regarding progress with strategic initiatives.

## FORMAL EDUCATION

**Doctorate in Chemistry** **2006**

**Master of Science in Chemistry** **2005**

The Pennsylvania State University Department of Chemistry – University Park, PA 16802

Thesis Advisor: Dr. Kenneth M. Merz, Jr.

Ph.D. Thesis: *Quantum Biochemical Database: Interfacing Quantum Chemistry with Biochemistry*

M.S. Thesis: *Quantum Mechanical Description of the Interactions between DNA and Water*

In pursuit of advanced degrees in Computational Biochemistry, two major projects were undertaken resulting in both a M.S. and a Ph.D. in Chemistry. Both projects utilized linear-scaling quantum mechanics, molecular mechanics, method development, and high performance computing to study macromolecular (protein/DNA) structure and function at a quantum mechanical level. Key skills include:

- Exposure to numerous opensource and proprietary applications including among others the AMBER suite for biomolecular structure preparation, optimization, and molecular dynamics; and the DivCon application for linear-scaling, semi-empirical quantum mechanical characterization.
- Helped raise a \$40,000 grant from the Huck Institute (PSU) and ~500,000 CPU-hours in grants from NCSA/NSF for development and population of Quantum Biochemical Database (QBioDB).
- Managed a team of chemistry undergraduate students to aide in population of QBioDB.
- Designed and implemented relational schema – along with SQL, Perl, PHP, and C++ interfaces – for the MySQL-based QBioDB to store AM1/PM3-derived frontier molecular orbital data, charges, energies etcetera, along with the structural data of ~4000 proteins, DNA, and RNA.

**Bachelor of Science** – majors in both Biochemistry and Applied Computer Science **1998**

Lebanon Valley College – Annville, PA 17003

Advisors: Drs. Stephen E. Williams (Biochemistry) and Michael Fry (Computer Science)

- Worked to solve the phylogenetic relationship of over 450 sequences of RuBisCO ranging from *R. rubrum* to *Spinacia* through sequence alignment using ClustalW, parsimony analysis using PAUP, enzyme structure modeling using Sybyl, and C++ software development.
- Additional research projects performed at Cornell University under Drs. Roger M. Spanswick (Summer 1995), Thomas G. Owens (Summer 1996), and Steven E. Ealick (Summer 1997).

## OTHER PROFESSIONAL DEVELOPMENT AND EXPERIENCE

**I-99 Keystone Innovation Zone Executive Board** **2005-present**

- Chairman (present), Vice Chairman (1 year)

**General UNIX/Linux/Mac Consultant and Systems Administrator** **1994-present**

**Hawke's Company & LaForge** – PA Renaissance Faire, Mt. Hope, PA **1992-1998**

- Sword commission sales, blacksmithing, and fighting/fencing; and historical reenactment.

**Sears** – Lancaster, PA **1990-1998**

- Commission Retail Sales: Housewares, Paint, and Hardware, Brand Central – Computers

## AWARDS AND MEMBERSHIP

Member: American Chemical Society 1998-present

Fellow: Integrative Graduate Education and Research Traineeship 2001-2005

Braucher Award – Penn State Department of Chemistry 2002

Fellow: National Science Foundation Graduate Research Training Grant 1998-2000

Member: Beta Beta Beta 1996-1998

Lebanon Valley College Leadership Scholarship 1993-1998

Eagle Scout – Boy Scouts of America 1992

*REFERENCES AVAILABLE UPON REQUEST*

**PUBLICATIONS, LECTURES, AND SOFTWARE\***

\*Does not include customer/partner lectures or any activities protected by non-disclosure agreement.

1. Westerhoff, L.M. and K.M. Merz, Jr., *Quantum Biochemical Database: Architecture and Data Analysis Strategies*. Manuscript in Preparation, 2006.
2. Westerhoff, L.M. and D. Diller, *Validation quantum mechanical scoring function (QMScore) through a comparative study of two MAP Kinase*. Manuscript in Preparation, 2006.
3. Westerhoff, L.M., *Quantum Biochemical Database: Interfacing Quantum Chemistry with Biochemistry*, in *Department of Chemistry*. 2006, The Pennsylvania State University: University Park, PA 16802. p. 167.
4. Yechangunja, R., J. Varghese, H. Kim, and L.M. Westerhoff, *CHEMIX: A Chemical Platform for Quantum Mechanics-based Molecular Modeling*. 2005, Distributed by QuantumBio, Inc.: State College, PA 16803.
5. Westerhoff, L.M. and K.M. Merz, Jr., *Quantum Mechanical Description of the Interactions Between DNA and Water*. *J. Mol. Graph. and Mod.*, 2005. **24**(6): p. 440-455.
6. Westerhoff, L.M., *Quantum Mechanical Description of the Interactions Between DNA and Water*, in *Department of Chemistry*. 2005, The Pennsylvania State University: University Park, PA. p. 50.
7. Wang, B., K. Raha, N. Liao, M.B. Peters, H. Kim, L.M. Westerhoff, A.M. Wollacott, A.v.d. Vaart, V. Gogonea, D. Suárez, S.L. Dixon, J.J. Vincent, E.N. Brothers, and K.M. Merz, Jr., *DivCon 4.x*. 2005, Distributed by QuantumBio, Inc.: State College, PA 16803.
8. Raha, K., A. van der Vaart, K.E. Riley, M.B. Peters, L.M. Westerhoff, H. Kim, and K.M. Merz Jr., *Pairwise Decomposition of Residue Interaction Energies Using Semiempirical Quantum Mechanical Methods in Studies of Protein-Ligand Interaction*. *J. Am. Chem. Soc.*, 2005. **127**: p. 6583-6594.
9. Chair: Westerhoff, L.M., *New Developments in Biophysical Applications of Quantum Mechanics*, in *eCheminfo InterAction Meeting Session*. 2005: Philadelphia, PA.
10. Westerhoff, L.M., *Lecture: Quantum Mechanics for Drug Discovery*, in *eCheminfo: Applications of Cheminformatics and Chemical Modelling to Drug Discovery*. 2004, Chair: Mulholland, A.: <http://www.echeminfo.com/>.
11. Westerhoff, L.M. and K.M. Merz, Jr., *Poster: Quantum Biochemical Database*, in *43rd Sanibel Symposium*. 2003: St. Augustine, FL.
12. B. Wang, M.B.P., A. van der Vaart, V. Gogonea, D. Suarez, L. M. Westerhoff, K. Raha, S. L. Dixon, J. J. Vincent, E. N. Brothers and K. M. Merz Jr., *DivCon 3.x*. 2003, Distributed by QuantumBio, Inc.: State College, PA 16803.
13. Westerhoff, L.M. and K.M.J. Merz. *Poster and Lecture: The Quantum Bioinformatics Database*. in *IBM BlueGene 2002*. 2002. Edinburgh, Scotland.
14. Westerhoff, L.M. and E.N. Brothers, *Mathematica: The Mathematical Revolution*, in *Scientia et Macintosh*. 2002, <http://www.appleust.com/scitech/archives/mathematica/mathematica.shtml>.

15. Westerhoff, L.M., *Evolution: From the Server to the Desktop*, in *Terminal Mac*. 2002, <http://www.applelust.com/alust/terminal/archives/terminal020301.shtml>.
16. Westerhoff, L.M., *Darwin/Mac OS X: The Fifth BSD*, in *Terminal Mac*. 2002, <http://www.applelust.com/alust/terminal/archives/terminal041202.shtml>.
17. Gogonea, V., L.M. Westerhoff, and K.M. Merz, Jr., *Quantum Mechanical/Quantum Mechanical Methods. I. A Divide and Conquer Strategy for Solving the Schrodinger Equation for Large Molecular Systems Using A Composite Density Functional-Semiempirical Hamiltonian*. *Journal of Chemical Physics*, 2000. **113**(14): p. 5604-5613.
18. Dixon, S.L., A. van der Vaart, V. Gogonea, J.J. Vincent, E.N. Brothers, L.M. Westerhoff, and K.M.J. Merz, *DivCon99*. 1999, The Pennsylvania State University: University Park, PA 16802.
19. Westerhoff, L.M., T.L. Fickert, and S.E. Williams, *Poster: Modeled Effect of the Spinach CYS172-CYS192 Disulfide Bond on the RUBISCO Active Site*, in *61st Annual Meeting Northeast Section of American Society of Plant Physiologists*. 1997: Cornell University, Ithaca, NY.
20. Gowan, G., L.M. Westerhoff, and T.G. Owens, *Poster by Owens: Computer Simulation of Excited State Dynamics and Nonphotochemical Quenching in Photosystem II*, in *14th Eastern Regional Photosynthesis Conference*. 1997: Woods Hole, MA.
21. Westerhoff, L.M. and S.E. Williams, *Matrixor: A New Program for Alignment of Nucleotide Sequences that Code for Protein*, in *72nd Annual Meeting of the PA Academy of Science*. 1996: The Pennsylvania State University, University Park, PA.
22. Westerhoff, L.M., J.C. Raber, and S.E. Williams, *A Phylogeny of Photosynthetic Bacteria and Chloroplast Based on Parsimony Analysis of Type I Ribulose-1, 5-Bisphosphate Carboxylase/Oxygenase (RuBisCo)*, in *72nd Annual Meeting of the PA Academy of Science*. 1996: The Pennsylvania State University, University Park, PA.
23. Raber, J.C., L.M. Westerhoff, and O.A. Moe, *A Model of the Evolution of Type I Ribulose-1,5-Biphosphate Carboxylase/ Oxygenase from the Common Ancestor of the Spinach Chloroplast and Synechococcus*, in *72nd Annual Meeting of the PA Academy of Science*. 1996: The Pennsylvania State University, University Park, PA.