

## **William A. Boulanger, Ph.D.**

404 North Shore Drive  
Mahomet, Illinois 61853  
217-586-1574

**Executive Chemist, CEO, and Founder, Obiter Research, LLC**, Urbana, Illinois (Nov. 2001 to present)

- Custom development and kiloscale synthesis of chemicals
- Internal chemical research
- Manufacture of high-tech specialty chemicals and pharmaceutical intermediates.

**Adjunct Professor in Chemistry at University of Illinois**, Champaign/Urbana (2009 to present)

- Teach practical chemistry at the graduate level.
- Operated the Chemistry Department's High Pressure Lab until 2020 (retired)

**Senior Research Scientist at Albany Molecular Research**, Albany, New York (Jan. 1994 to June 2001)

- Directed a research and synthesis group in:
  - Process development and GMP synthesis of clinical supplies of pharmaceuticals
  - Writing master batch records
  - Writing research proposals and initiating original research
  - Fabrication of specialty equipment
- Launched a new Separations division, specializing in both large- and small scale chiral resolutions using a variety of techniques, especially chromatography
- Launched both the cGMP and Process areas at Albany Molecular Research
- Specialized in unusual process problems, scale-up, and controlled substances such as opiates and amphetamines

**Senior Research Scientist at MediChem Research, Inc.**, Lemont, Illinois (1990-1993)

- Initiated original research in pharmaceuticals and wrote proposals for government funding
- Oversaw synthesis projects, including construction and engineering of specialty equipment and reactors

**Guest appointment to Argonne National Labs**, Argonne, Illinois (1993)

- Collaborated in methods to implement design of mechanism-based, non-active site inhibitors

**Supervisory Research Chemist at FMC**, Princeton, New Jersey (1985-1990)

- Primary responsibilities included initiation and implementation of research projects, chemical design, synthesis, and supervision of synthetic chemists
- Provided emergency glassblowing and equipment repair

**Synthetic Chemist at Abbott Laboratories**, North Chicago, Illinois (1980-1981)

- Focused on anti-inflammatory discovery

### **Significant Company Start-ups:**

Co-founded Viking Mushrooms 1987

Co-owner of AMRI prior to company going public, 1997-1999

Founded Obiter Research, LLC 2001

Founded Terran Enterprises 2008

Co-founded Peopull 2010

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Co-founded Savant 2012

I am experienced in a diverse range of organic synthesis, including hydrocarbons, amino acids, and dipeptides, strained olefins, propellanes, polyamines, organometallics, vitamin D family of compounds, steroids, heterocyclic compounds such as imidazoles, pyrones, pyridines, thiazoles, diindoles, and many more. I am also experienced in deuterium labeling, flash-vacuum pyrolysis, high vacuum and high pressure techniques. I have fabricated a 316 SS 15-liter hydrogenator, one 50-liter, three 100-liter, four 150-liter and six 200-liter teflon and glass reactors, as well as many other pieces of equipment, including a stainless steel 8" wiped-film still and several flow reactors, including a photoflow reactor. I have performed optical resolutions on the multi-kilo scale using both enzymes and fractional recrystallization. Scale of synthesis ranged from 1 mg to 20 kg. I have made over a thousand compounds.

I am accomplished with QSAR techniques and computer modeling to design bioactive compounds. I use many of the discovery-allied softwares such as MACCS, REACCS, Scifinder. Areas of discovery work include antiinflammatories, plant growth regulators, insecticides, the glutamate receptor, sodium channel blockers, suicide inhibitors for serine proteases and anti-HIV Calanolides. I was a co-founder of a successful entrepreneurial action team at FMC, which reduced a concept for a new mode of action in plant growth regulators to success in the field in less than nine months.

I have been an operator of a wide range of instruments; many different types of NMR, both continuous wave and FT; gas chromatographs, HPLC's, IR's, polarimeters, etc. I am familiar with microbiological culture techniques and enzyme assays. Additional training in "Molecular Modeling for Biological Systems" (ACS), QSAR, Molecular Biology, and Immunology. I read and Speak German.

As I have a broad spectrum of experience, including not just practical and theoretical chemistry, but also engineering and fabrication, I currently focus my energies on challenging process chemistry, and the development of new products within my company, Obiter Research, LLC. This often requires creation of equipment designed specifically for that purpose, as usually only part of the solution is chemistry, while the other part is engineering. As a result, my company supplies the monomer trimethylene carbonate, and the cannabinoid components PMD and Olivetol in extreme purity. We have numerous other products in the pipeline. I also hold the process patents for 18MC, a new drug shown to alleviate addiction. The company doubles as a training forum for organic chemists early in their career.

### Publications and Grants

"Stereochemical Control of Transpositional Allylic Oxidation" Philip Warner, William Boulanger, Thomas Schleis, Shih Lai Lu, Ziem Lee, and Suae-Chen Chang *J. Org. Chem.* **1978**, 43, 4388-91.

"Double Bridgehead Olefins via Pyrolysis" William Boulanger and Philip Warner *Tetrahedron Lett.* **1980**, 21(2), 123-6.

"Bridged Dienes: Synthesis of Bicyclo[4.3.1.] deca-1-5-diene" William Boulanger and Philip Warner *Tetrahedron Lett.* **1983**, 24(39), 4165-8.

"5-(Halomethyl)-2-pyranones as Irreversible Inhibitors of  $\alpha$  Chymotrypsin" William Boulanger and John Katzenellenbogen *J. Med. Chem.* **1986**, 29, 1483.

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"Structure-Activity Study of 6-Substituted-2-pyranones as Inactivators of  $\alpha$  Chymotrypsin" William Boulanger and John Katzenellenbogen *J. Med. Chem.* **1986**, 29, 1159.

"An Improvement in the Synthesis of 1,2,4,9 Tetrahydrocarbazol-3-one" William Boulanger and Victoria Dolsen. *Org. Prep. Proced. Int.* **1993**, 25(6), 707-8.

"Improved Resolution of (+/-)-cis-2'-hydroxy-5,9-dimethyl-6,7-benzomorphan and preparation of racemic, (+)- and (-)-cis-2-methylcyclopropyl-2'-hydroxy-5,9-dimethyl-6,7benzomorphan (cyclazocine) Boulanger, William A. *Synthetic Communications* (1999) 29(12), 2201-2210

"Synthesis, Chromatographic Resolution, and Anti-Human Immunodeficiency Virus Activity of (+/-) Calanolide A and its Enantiomers" Michael T. Flavin; John D. Rizzo; Albert Khilevich; Alla Kucherenko; Abram K. Sheinkman; Vilayphone Vilaychack; Lin Lin; Wei Chen; Eugenia Mata Greenwood; Thitima Pengsuparp; John M. Pezzuto; Stephen H. Hughes; Tom M. Flavin; Michael Cibulski; William A. Boulanger; Robert L. Shone; and Ze-Qi Xu *J. Med Chem.* **1996**, 39, 1303-1313.

"Synthesis of the Novel AntiAIDS Agent Calanolide A", grant 1R43AI34805-01 awarded by the National Institutes of Health via the SBIR 7/93. William A. Boulanger submitter and principle investigator.

"Total Synthesis of (S)-Equol" Heemstra, J.; Kerrigan, S.; Helfrich, W. T.; Boulanger, W. A. *Org. Lett.*, 2006, 8 (24), 5441-5443.

"Assessing Chiral Self-recognition Using Chiral stationary Phases" Lee, Wonjae; Snyder Seth E.; Volkers, Phillip I.; Pirkle, William H.; Engebretson, David A. ; Boulanger, William A.; Lin, Huei-Shian; Huang, Bin-Syuan; Carey, James R. *Tetrahedron* (2011), 67(37), 7143-7147.

"Novel Approach for the synthesis of (+/-)-Calanolide-A and its anti-HIV Activity" Kucherenko, Alla; Flavin, Michael T.; Boulanger, William A.; Khilevich, Albert; Shone, RobertL.; Rizzo, John D.; Sheikman, AbramK.; Xu, Ze-Qi *Tetrahedron Letters* (1995) 36(31), 5475-5478

"Obiter Research: A Company with a Radically Different Mission; Not only to Train but also to Benefit Investors" Presented at the 224<sup>th</sup> ACS National Meeting in Boston, MA August 18-22, 2002.

"Obiter Research, LLC: Six Years Down the Road" Presented at 233<sup>rd</sup> ACS National Meeting, Chicago, IL March 25-29 2007

### **Patents**

U.S. 4,370,339 to Abbott Labs (January 25, 1983) "Method for Treating Inflammatory Conditions" Fortuna Haviv, Robert Denet, and William Boulanger

U.S. 6,043,271 (March 28, 2000) "Method for the Preparation of (+/-) Calanolide A and Intermediates Thereof" Michael T. Flavin, Ze-Qi Xu, John D. Rizzo, Alla Kucherenko, Albert Khilevich, Abram Kivovich Sheinkman, Vilayphone Vilaychack, Lin Lin, Wei Chen, William Boulanger

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U.S. 9,266,734B2 to Neuraltus “Chlorite Formulations and Methods of Preparation and Use Thereof”  
William Boulanger and Arasteh Ari Azir 2016-02-23

U.S. Pat. Application (2007) US 20070145328 A1 20070628 Pharmaceutical Compositions Containing  
Chlorite with High Purity and Less Toxicity” William Boulanger and Arasteh Ari Azir

U.S. 20120238772 “Process and Intermediates in the Preparation of Canfosfamide and Its Salts”. A  
process for and intermediates in the preparation of canfosfamide and its salts. Some of the intermediates  
have anticancer activity. William Boulanger

U.S. 20130178618 “Novel Pharmaceutical Intermediates and Methods for Preparing the Same” William  
Boulanger

U.S. 20140213782 “Novel Pharmaceutical Intermediates and Methods for Preparing the Same” William  
Boulanger

U.S. 20140213783 “Novel Pharmaceutical Intermediates and Methods for Preparing the Same” William  
Boulanger

U.S. 20140213797 “Novel Pharmaceutical Intermediates and Methods for Preparing the Same” William  
Boulanger

U.S. Patent Application (2018) US 20180071336 A120180315 “Copper Complexes with glycine,  
pyruvate, and succinate for treatment of mitochondrial and neuromuscular diseases” Charles Louis  
Albartus Barker and William Boulanger

U.S. Patent Application (2016) US20160024118 A1 20160128 “Copper(I) Complexes with glycine,  
pyruvate, and succinate” Charles Louis Albartus Barker and William Boulanger

PCT Int Appl. (2014) WO2014138589 A2 20140912 “Copper(I) Complexes with Glycine, Pyruvate, and  
Succinate” Charles Louis Albartus Barker and William Boulanger

### **Education**

B.A. Chemistry 1975 St. Mary's College (Winona, MN) GPA: 3.2/4.00

M.S. Organic Chemistry 1980 Iowa State University (Ames, IA) GPA: 3.44/4.00

PhD Organic Chemistry 1984 University of Illinois (Urbana, IL) GPA 4.3/5.0

### **Organizations, Activities, Etc.**

- Member of the American Chemical Society (50-year member)
- Member of the New Jersey Mycological Association (1985-91)
- Photography, glass-blowing, woodworking, printmaking, telescope making, metal-working (especially metal lathe), the growing and collecting of morel mushrooms and other edible fungi, radio-controlled airplanes, beer-brewing, welding. I have constructed six violins and one cello. I am currently learning Mandarin Chinese.

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**References Upon Request**