

## **PRABHAT ARYA**

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Adjunct Professor: Biochemistry, McGill University  
<http://www.mcgill.ca/biochemistry/>

### **Education**

B.Sc. (Hons), Delhi University, India (1974-77)  
M.Sc., Delhi University, India (1978-80)  
M.Phil., Delhi University, India (1980-81)  
Ph.D. (Synthetic Organic Chemistry), Delhi University, India (1981-85)

### **Awards and Honors**

1985 Research Associate, National Chemical Laboratory, Pune, India  
1985-86 Maître de Conférence, Institut de Chimie Moléculaire, Montpellier, France  
1986-87 Post-doctoral Fellow, Cambridge University  
1987-89 Post-doctoral Fellow, McGill University  
1989-92 Research Associate, National Research Council of Canada  
1994 NRC Vice President Collaborative Funds Award- with Drs. G. W. Burton, M. B. Perry and J. C. Richards  
1997 SIMS Outstanding Achievement Award  
2002 Dept of Atomic Energy Science Chair, School of Chem, Univ Hyderabad, India  
2003 SIMS Award- Bringing SIMS into a Significant Partnership

### **Academic and Research Employment**

1985 Research Associate, National Chemical Laboratory, Pune, India  
Supervisor: Dr. A. V. Rama Rao  
1985-86 Maître de Conférence, Institut de Chimie Moléculaire, Montpellier, France  
Supervisor: Professor Robert J. P. Corriu  
1986-87 Post-doctoral Fellow, Department of Chemistry, Cambridge University, UK  
Supervisor: Dr. Ian Paterson  
1987-89 Post-doctoral Fellow, Department of Chemistry, McGill University  
Supervisor: Professor Tak-Hang (Bill) Chan  
1989-92 Research Associate, Chemistry Division, NRC  
1992-93 Assistant Research Officer (term), SIMS, NRC  
1993-95 Associate Research Officer (term), SIMS, NRC  
1994-95 Sessional Academic Staff, Department of Chemistry, University of Ottawa  
1996-98 Associate Research Officer, Chemical Biology Program, SIMS, NRC  
1997 Sessional Academic Staff, Department of Chemistry, University of Ottawa  
1996-05 Project Leader, Organic & Bioorganic Synthesis, Chemical Biology, SIMS, NRC  
1999-05 Senior Research Officer, Chemical Biology Program, SIMS, NRC  
1999-05 Adjunct Professor, Department of Chemistry, University of Ottawa  
1999-05 Adjunct Professor, Ottawa-Carleton Chemistry Institute, Ottawa  
2001- Adjunct Professor, Department of Biochemistry, McGill University, Montreal  
2005- Senior Research Officer, Molecular and Nanomaterial Architectures, SIMS, NRC

### **Invited Talks (2001-)**

1. Dept of Chem, Delhi University, India (2001)
2. Dr. Reddy's Research Foundation, Hyderabad, India (2001)
3. Indian Institute of Chemical Technology, Hyderabad, India (2001)
4. School of Chem, University of Hyderabad, India (2001)
5. Dept of Org Chem, Indian Institute of Science, Bangalore, India (2001)
6. National Chemical Laboratory, Pune, India (2001)

7. Gordon Conference- Carbohydrates, NH, USA (2001)
8. NRC-IRAP Forum, Montreal (2001)
9. Institute for Biodiagnostics-West, NRC, Calgary (2001)
10. Dept of Biochem, McGill Univ (2002)
11. National Cancer Institute, NIH, MD (2002)
12. 5<sup>th</sup> Int Symp Lab Automation in Chem Process R&D, Boston (2002)
13. Interomex Pharmaceuticals, Vancouver (2002)
14. Dept of Chem, Univ Alberta (2002)
15. CHI 3<sup>rd</sup> Annual Meeting on Chemical Genomics, Boston, Nov 18-19 (declined) (2002)
16. Dept Chemistry, Univ Saskatchewan (Cancelled) (2003)
17. Institute for Chemistry and Cell Biology (ICCB), Harvard (2003)
18. Chemistry Dept, Boston University (2003)
19. CHI Meeting "Glycomics-Carbohydrates in Drug Development", Boston (2003)
20. Frontiers in Chemical and Structural Biology, McGill University (2003)
21. CHI Meeting "Advancing Library Design and Organic Synthesis", San Diego (2003)
22. Dr. Reddy's Research Foundation, Hyderabad, India (2003)
23. Indian Institute of Chemical Technology, Hyderabad, India (2003)
24. School of Chem, University of Hyderabad, India (2003)
25. Gordon Conference-Combinatorial Chemistry, Oxford, UK (2004)
26. Work Shop on, "Organic Synthesis Directed Towards Chemical Biology and Chemical Genetics" at the National Chemical Laboratory, Pune, India (4 Lectures) (2004)  
Lecture 1: Organic Synthesis in Post Genomics Age- Challenges and Opportunities (2004)
27. Lecture 2: Combinatorial Approaches to Carbohydrates- Small Molecule Probes for Glycobiology (2004)
28. Lecture 3: Combinatorial Chemistry in Chemical Genomics Age (2004)
29. Lecture 4: Stereocontrolled Diversity Oriented Synthesis- Natural Product-like Complex Polycyclics as Chemical Probes (2004)
30. IUPAC Meeting-Biodiversity and Natural Products, New Delhi, India (2004)
31. Ranbaxy Pharmaceuticals, New Delhi, India (2004)
32. Chemical Biology Workshop, Dept of Biochemistry, McGill University (2004)
33. IBC's Inaugural Annual International Conference on High Throughput Chemistry in Drug Discovery, San Diego (March, 2005) (presented by Dr. Reni Joseph, a former group member)
34. Second International Symposium on Organic Synthesis and Process Chemistry (OSPC), ICT, Hyderabad, India (April, 2005) (declined)
35. CSC Meeting, Saskatoon- Symposium on Drug Design Targeting Protein-Protein Interactions, May 28-June 1 (2005)
36. Diversity Oriented Synthesis Meeting, Boston, Sept 22-23 (2005)
37. Chemical Biology and Cancer Research Meeting in Lyon, France, December 4-5 (2005)

### Ongoing Research Support

**NCIC Operating Grant**; Title of Grant: Diversity Oriented Synthesis- Chemical Dissectors of Macromolecular Interactions (Grant #: 016408, Grant Type: 001 CCS Research Grant); Name of PI: Prabhat Arya; Team Member: Jerry Pelletier, Biochemistry, McGill University; Period: 2005-2008; Amount: 116,000.00 per year

**CIHR**; Title of Grant: Canadian Chemical Biology Network: Chemical libraries and informatics support; Name of PI: David Thomas (Biochemistry, McGill); Team Members: Michel Roberge, Raymond Anderson, Dennis Hall, Mike Tyers, Eric Brown, Prabhat Arya, William Lubell, Gerry Johnston, Donald Weaver; Period: 2005-2006; Amount: 700,000.00

**CIHR (Operating Grant)**; Title of Grant: Selective Targeting of the FAK Protein Module Driving Tumor Cell "Invadopodia"; Name of PI: Moulay Alaoui-Jamali, LDI, McGill University; Team Member: Prabhat Arya; Period: 2004-2008; Amount: 150,282.00 per year

**NRC**; Title of Grant: Structure/Function Characterization of Kinase Signaling Networks; Name of PI: Mirek Cygler, BRI, NRC; Team Members: P. Arya, L. Johnston, A. Nantel, R. Menard, Maureen O'Conner, E. Purisima, T. Sulea, M. Whiteway; Period: 2005-2008; Amount: 500,000.00 (55,000.00/year Arya Funds)

### Contributions to the Training of Highly Qualified Personnel- Current Group Members

	Name	Degrees/Training	Period	Funding
1.	Michael L. Barnes, TO	MS Ottawa	1996-	NRC SIMS
2.	Maya Sharma, TO	MS India	2004-	CIHR

3.	Shahriar Khadem, PhD	MS Iran	Sept 2001-	NCIC
4.	Jean-Louis Brochu, MS	BS Ottawa	Sept 2004-	NCIC
5.	P. Thirupathi Reddy, PDF	PhD India	Sept 2003-	NCIC
6.	Utpal Sharma, PDF	PhD India, PDF, USA	Oct 2003-	NCIC
7.	Ayub Reayi, PDF	PhD MD, USA	Feb 2004-	NCIC
8.	Michael Prakesch, PDF	PhD France, PDF Canada	Aug 2004-	NRC SIMS
9.	Jyoti Prokash Nandy, PDF	PhD India, PDF Scripps	Oct 2004-	NRC Genomics
10.	Stuti Srivastava, PDF	PhD India	Dec 2004-	NRC SIMS
11.	Deogratis Ntirampebura	PhD Belgium, PDF Canada	Mar 2005-	McGill Chemical Biology
12.	Ravi Naga Prasad, PDF	PhD India	April 2005-	CIHR

### **Past Group Members- Post-doctoral Fellows and Technical Officers**

- Ms. U. Wronska, 1993-94, Canadian Patent Office, Ottawa
- Dr. Sho-Nong Wang, 1995, Sussex Research Labs, Ottawa
- Mr. Guy Boisvert, 1993-95, Technical Officer, Waters
- Mr. Sylvain Dion, 1996-97, Technical Officer, CHUL, Quebec City
- Dr. Suoding Cao, 1996, GlycoDesign, Toronto
- Dr. George Shimizu, 1996, Professor, Dept of Chem, Univ of Calgary
- Dr. Francois Maltais, 1996-97, Vertex Pharmaceuticals, USA
- Dr. Johanne Roby, 1997-98, CEGEP Teacher, Sherbrooke
- Dr. Robert Ben, 1996-98, Professor, Dept of Chem, Ottawa
- Dr. Huiping Qin, 1997-99, Software Eng, Sprint USA
- Dr. Kristina Kutterer, 1997-99, Wyeth Ayerst, NY, USA
- Dr. N. Venugopal Rao, 1998-00, Johnson Matthey Pharmaceuticals, USA
- Dr. Angela Barkley, 1998-01, Johnson Matthey Pharmaceuticals, USA
- Dr. Wei He, 1999-00, Naeja Pharmaceuticals, Alberta
- Dr. Yifa Zhou, 2000-01, Chiron Cooperation, Singapore
- Dr. Gautam Panda, 2000-01, Research Scientist, CDRI, Lucknow, India
- Dr. Karla Randell, 2000-01, Canadian Patent Office, Ottawa
- Dr. Myung-Gi Baek, 1999-01, BioMira, Edmonton, Alberta
- Dr. Doug Chou, 2000-02, Cardiome Pharma, Vancouver
- Dr. Bugga Sarma, 2000-02, SaiDruSyn Laboratories Ltd, India
- Dr. Suzanne Hof, 2000-02, Patent Law Company, Ottawa
- Dr. Zai-Xin Chen, 2001-02, Jiangsu Yabang Pharma, China
- Dr. Reni Joseph, 2001-03, MDS Pharma, Montreal
- Dr. Patricia Durieux, 2002-03, PDF, Switzerland
- Dr. Samuel Couve-Bonnaire, 2002-03, Professor, Rouen, France
- Dr. Chang-Qing Wei, 2001-03, PainCeptor Pharma, Ottawa
- Dr. Majid Rastegar, 2002-04, PDF, Carleton University
- Dr. Rohtash Kumar, 2003-04, Pharmaceutical Company, Edmonton
- Dr. Nallareddy Babu, 2002-04, GVK Biosciences, India
- Ms. Sophie Quevillon, 2003-04
- Dr. Zhonghong Gan, 2002-04, PainCeptor Pharma, Ottawa

### **Past Group Members- Graduate Students**

- Sophie Quevillon, Dept of Chem, Univ of Ottawa (Aug 2003), MS Thesis- Toward the Diversity-Oriented Synthesis of Indoline-based Polycyclic Derivatives.
- Kamani Ilangasinghe, Dept of Chem, Univ of Ottawa (Jan 2005), PhD Thesis- Stereocontrolled Diversity-Oriented Synthesis of 2H-Benzopyran-based Natural Product-like Polycyclic Derivatives.

### **Appointments, Committees and Memberships (2001-)**

- Secretary, Organic Division, Canadian Society of Chemistry (CSC), 2002-03
- Member, NIH Grant Panel, "Centers of Excellence in Chemical Methodologies and Library Development Combinatorial Chemistry, Molecular Diversity, Biological Screening, New Synthetic Methodologies, 2002
- Referee, Human Frontier Science Program Grant Application, 2002
- Program Chair, Organic Division, 39<sup>th</sup> IUPAC Congress and 86<sup>th</sup> Conference of the Canadian Society of Chemistry, August 10-15, Ottawa, 2003
- Scientific Advisor, CHI Meeting- Advancing Library Design and Organic Synthesis, Feb 24-28, 2003
- Member, International Advisory Board for journal, *QSAR & Combinatorial Science* (Wiley-VCH), 2003-

- Scientific Advisor, CHI Meeting: Glycomics-Carbohydrates in Drug Development", May 5-6, 2003
- Scientific Advisor, CHI Meeting-Genomics on Target: Diversity-Oriented Synthesis", Oct 8-10, 2003
- Committee Member, CIHR-Pipeline to Prosperity, Oct 16, 2003
- Vice Chair, Organic Division, Canadian Society of Chemistry, 2003-04
- Organized a workshop on "Organic Synthesis Directed towards Chemical Biology and Chemical Genetics" at the National Chemical Laboratory, Pune, India, Feb 2 and 3, 2004.
- Editor (with Jared Shaw, ICCB, Harvard) for a New Book Proposal from Wiley-VCH, "Combinatorial Synthesis of Natural Products"
- Guest Editor (Co-editor with Hans Joerg Roth, Novartis, Basel) for the Combinatorial Chemistry Section, Current Opinion in Chemical Biology (June 2005 issue)
- Member, Steering Committee, CIHR Network for Chemical Biology, 2004-
- Chair, Organic Division, Canadian Society of Chemistry, 2004-05
- Member, Scientific Advisory Board, University of Kansas, NIH Funded Combinatorial Methodologies and Library Development (CMLD) Center, 2004-
- Ad hoc member, NIH panel- Synthetic and Biological Chemistry B Study Section (SBC-B), Feb 2005

### **Refereed Publications (2001-)**

1. Prabhat Arya, Doug T. H. Chou and Myung-Gi Baek. Diversity-based Organic Synthesis in the era of Genomics and Proteomics. *Angew. Chem. Int. Ed.* **40**, 339-346 (2001).
2. Angela Barkley and Prabhat Arya. Combinatorial Chemistry toward Understanding the Function(s) of Carbohydrates and Carbohydrate Conjugates. *Chem. Eur. J.* **7**, 555-563 (2001).
3. Prabhat Arya, Gautam Panda, N. Venugopal Rao, Howard Alper, S. Christine Bourque and Leo E. Manzer. Solid Phase Catalysis: A Biomimetic Approach toward Ligands on Dendritic Arms to Explore Recyclable Hydroformylation Reactions. *J. Am. Chem. Soc.* **123**, 2889-2890 (2001).
4. Prabhat Arya and Myung-Gi Baek. Natural Product-like, Chiral Derivatives by Solid Phase Synthesis. *Curr. Opin. Chem. Biol.* **5**, 292-301 (2001).
5. Prabhat Arya, Reni Joseph and Doug T. H. Chou. Toward High-throughput Synthesis of Complex Natural Product-like Compounds in the Genomics and Proteomics Age. *Chemistry & Biology*, **9**, 145-156 (2002).
6. Prabhat Arya, Angela Barkley and Karla D. Randell. Automated, High-throughput Synthesis of Artificial Glycopeptides: Small-Molecule Probes for Chemical Glycobiology. *J. Comb. Chem.*, **4**, 193-198 (2002).
7. Karla Randell, Angela Barkley and Prabhat Arya. High-throughput Chemistry toward Complex Carbohydrates and Carbohydrate-like Compounds. *Comb. Chem. & HTS*, **5**, 179-193 (2002).
8. Shlomo Antebi, Prabhat Arya, Leo E. Manzer and Howard Alper. Carbonylation Reactions of Iodoarenes with PAMAM Dendrimer-Palladium Catalysts Immobilized on Silica. *J. Org. Chem.*, **67**, 6623 (2002).
9. Prabhat Arya, Patricia Durieux, Zai-Xin Chen, Reni Joseph and Donald M. Leek. Stereoselective Diversity-Oriented Solution and Solid Phase Synthesis of Tetrahydroquinoline-based Polycyclic Derivatives. *J. Comb. Chem.* **6**, 54-64 (2004).
10. Prabhat Arya, Chang-Qing Wei, Michael L. Barnes and Malgosia Daroszewska. A Solid Phase Library Synthesis of Hydroxyindoline-derived Tricyclic Derivatives by Mitsunobu Approach. *J. Comb. Chem.* **6**, 65-72 (2004).
11. Samuel Couve-Bonnaire, Doug T. H. Chou, Zhonghong Gan and Prabhat Arya. A Solid Phase Library Synthesis of Natural Product-like Derivatives from an Enantiomerically Pure Tetrahydroquinoline Scaffold. *J. Comb. Chem.* **6**, 73-77 (2004).
12. Shahriar Khadem, Reni Joseph, Majid Rastegar, Donald M. Leek, Konstantin A. Udachin and Prabhat Arya. A Solution and Solid Phase Approach to Tetrahydroquinoline Derived Polycyclics Having a Ten Membered Ring. *J. Comb. Chem.* **6**, 724-734 (2004).
13. Prabhat Arya, Samuel Couve-Bonnaire, Patricia Durieux, Daisy Laforce, Rohtash Kumar and Donald M. Leek. Solution and Solid Phase Synthesis of Natural Product-like Tetrahydroquinoline-based Polycyclics Having a Medium Size Ring. *J. Comb. Chem.* **6**, 735-745 (2004).

14. P. Arya, S. Quevillon, R. Joseph, C.-Q. Wei, Z. Gan, M. Parisien, E. Sesnilo, P. T. Reddy, Z.-X. Chen, P. Durieux, D. Laforce, L.-C. Campeau, S. Khadem, S. Couve-Bonnaire, R. Kumar, U. Sharma, D. M. Leek, M. Daroszewska and M. L. Barnes. Towards the Library Generation of Natural Product-like Polycyclic Derivatives by Stereocontrolled Diversity-Oriented Synthesis. *Pure & Appl. Chem.* **77**, 163-178 (2005).
15. Zhonghong Gan, P. Thirupathi Reddy, Sophie Quevillon, Samuel Couve-Bonnaire and Prabhat Arya. Stereocontrolled, Solid Phase Synthesis of a 90 Membered Library of Indoline Alkaloid-like Polycycles from an Enantioenriched Aminoindoline Scaffold. *Angew. Chem. Int. Ed.* **44**, 1366-1368 (2005).
16. Prabhat Arya, Reni Joseph, Zhonghong Gan and Bojana Rakic. Exploring New Chemical Space by Stereocontrolled Diversity Oriented Synthesis. *Chemistry & Biology*, **12**, 163-180 (2005).
17. Ayub Reayi and Prabhat Arya. Natural Product-like Chemical Space: Search for Chemical Dissectors of Macromolecular Interactions. *Curr. Opin. Chem. Biol.* **9**, 240-247 (2005) (Combinatorial Chemistry Theme Issue- Editors: Prabhat Arya and Hans Joerg Roth).
18. Prabhat Arya and Hans Joerg Roth. Combinatorial Chemistry- Editorial Overview. *Curr. Opin. Chem. Biol.*, **9**, 229-231 (2005)
19. Michaël Prakesch, Utpal Sharma, Maya Sharma, Shahriar Khadem, Donald M. Leek and Prabhat Arya. A Modular, Solid Phase Approach to Obtain Tetrahydroquinoline-derived, Different Polycyclic Skeletons for Combinatorial Chemistry. Manuscript in preparation, May 2005.
20. Utpal Sharma, Michaël Prakesch, Maya Sharma, Donald M. Leek and Prabhat Arya. A Modular Approach to Obtain Tetrahydroquinoline-derived, Different Natural Product-like Architectures for Combinatorial Chemistry. Manuscript in preparation, May 2005.
21. P. Thirupathi Reddy, S. Quevillon, Zhonghong Gan, Nauzer Forbes, Donald M. Leek and Prabhat Arya. A Diverse Set of Natural Product-like, Polycyclic Derivatives for Combinatorial Chemistry from an Aminoindoline Scaffold. Manuscript in preparation, May 2005.
22. Prabhat Arya, Bojana Rakic, Bugga V. N. B. Sarma, Nallareddy Babu, Jyoti Prokash Nandy, Marc Lefrance and Donald M. Leek. An *Enantioenriched*, Benzofuran-derived  $\alpha$ -Amino Acid: A Versatile Scaffold for Building Structurally Diverse Architectures by Solution and Solid Phase Synthesis. Manuscript in preparation, May 2005.
23. Prabhat Arya, Shahriar Khadem, Utpal Sharma, P. Thirupathi Reddy. Stereoselective Solution and Solid Phase Synthesis towards the Generation of Natural Product-like Libraries. *Chem. Rev.* Manuscript in preparation. 2005 (initial proposal accepted).
24. Prabhat Arya and Michaël Prakesch. Natural Products-like New Chemical Space by Stereocontrolled Diversity Oriented Synthesis. *Acc. Chem. Res.* Manuscript in preparation. 2005 (initial proposal accepted).
25. Prabhat Arya and Michaël Prakesch. Exploring Natural Product-like Chemical Space. *Chem. Eur. J.* Manuscript in preparation. 2005 (invited article).

## **Books**

Editor (with Jared Shaw, ICCB, Harvard) for a New Book Proposal from Wiley-VCH, "Combinatorial Synthesis of Natural Products"- In progress, 2004-

## **Book Chapters**

1. Prabhat Arya, Robert N. Ben and Kristina M. K. Kutterer. Combinatorial Chemistry for the Synthesis of Carbohydrates/Carbohydrate Mimics Libraries. *Organic Synthesis Highlights IV*, Wiley-VCH. 337-342 (2000).
2. Reni Joseph and Prabhat Arya. Invited Book Chapter, *Combinatorial Chemistry in the Age of Chemical Genomics!* Wiley-VCH Book – Chemogenomics in Drug Discovery. Chapter 15, p no 405-432, 2004
3. Prabhat Arya and Bugga VNBS Sarma. *Combinatorial Carbohydrate Chemistry. The Organic Chemistry of Sugars*, Marcel Dekker, Inc. Invited Book Chapter (in press, 2005).

## **Patents**

1. Pyrroline N-Oxide Derivatives, P. Arya and D. Griller. US patent serial no. 08-046 727, April 1994.
2. Bile Acids for Biological and Chemical Applications and Processes for the Production Thereof, P. Arya and G. W. Burton. US patent serial no. 5, 541,348, June 1996.
3. Extensively Oxidized Carotenoids and Retinoids and Related Conjugated Polyenes and Derived Fractions and Pure Compounds Useful as Non-Toxic Cell Differentiation Inducers, Cytostatic Agents and Anti-Tumor Agents, G. W. Burton, J. Daroszewski, J. Phipps and P. Arya, Int. patent serial no. WO 96/05160, Feb, 1996.
4. Analogs of Vitamin E. M. A. Alaoui-Jamali, P. Arya, G. W. Burton, G. Batist, PCT, International Publication Number WO 99/24417, 1999.
5. Supported Dendrimer Catalyst. L. E. Manzer, P. Arya, H. Alper, S. C. Bourque, G. Jefferson (US 6,288,253 B1, Sept 11, 2001).
6. Neoglycopeptides, Their Combinatorial Synthesis and Use. P. Arya and K. M. K. Kutterer and A. Barkley (US and PCT, filed 2000).
7. Oxidized Carotenoid Fractions and Ketoaldehyde Useful as Cell-Differentiation Inducers, Cytostatic Agents, and Anti-tumor Agents. G. W. Burton, J. Daroszewski, J. Phipps and P. Arya, 2003. (US 2002-196695 20020715).