

**APURBA BHATTACHARYA**

**2. Dr Reddy's Laboratories. Hyderabad, India.**

**F. Editorial Board: Open Journal of Medicinal Chemistry**  
[<http://www.scirp.org/journal/ojmc/>]

**G. Editorial Board: Modern Research in Catalyst (MRC)**  
[[www.scirp.org/journal/MRC](http://www.scirp.org/journal/MRC)]

**H. Editorial Board: Open Journal of Synthesis Theory and Applications**  
[<http://www.scirp.org/journal/ojsta/>]

**I. Editorial Board: Infinity Press: Communications in Applied Sciences**  
[<http://infinitypress.info/index.php/cas/pages/view/Editorial>]

**J. Member: *Panel of Drug Evaluators for Current Drugs (CD)*.** Responsible for the evaluation of drugs, which are being launched worldwide under FDA guidelines.

**K. Honorary Visiting Professor at Institute of Life Sciences (ILS) Hyderabad, India.**

**L. Bill & Melinda Gates Foundation**

**M. Scientific Process Advisor:**

**3. PHARM-ECO A Johnson Matthey Company**

**4. Texas Bio Technology.**

**5. Bristol Myers Squibb Pharmaceutical Co.**

**6. Boehringer-Ingelheim Pharmaceutical.**

**7. Johnson & Johnson Pharmaceutical Research & Development.**

**8. Ambion.**

**9. National Advisory Committee, Osmania University, India.**

**10. Bill & Melinda Gates Foundation.**

**11. "Pharmaceutical Expert witness" in the areas of "Drug Development"**

**N. Consultant:**

**1. Senator Kay Bailey Hutchison's List of Designated Expert in Environmental Chemistry .**

**2. Corpus Christi Regional Economic Development Corporation**

**O. Advisory Board Member: Chembiotek, India.**

**P. Advisor: NIH: SSS-L study section, SBIR/STTR applications in Drug Discovery, Development and Delivery.**

**Q. Advisor: NIH Panel "Preclinical Drug Development for the Division of Preclinical Innovation (DPI), National Center for Advancing Translational Sciences (NCATS)"**

**R. Director, NIH Texas Bridges to Doctorate Program.**

## ACADEMIC EXPERIENCE

Graduate Research Assistant, (1977-1982), Professor James K. Whitesell. Department of Chemistry, University of Texas at Austin. Asymmetric induction in carbon-carbon bond forming reaction was studied. Very high asymmetric induction (92-99%) were achieved in the nucleophilic addition of chiral glyoxylate and pyruvate esters as well as concerted "-ene" and cycloaddition reactions. Kinetic resolutions of simple olefins were accomplished via asymmetric "-ene" reactions. Intramolecular Diels-Alder reactions were exploited for asymmetric synthesis of a natural product, antibiotic "X-14547A"

Teaching Assistant Undergraduate organic chemistry laboratory.

## INDUSTRIAL EXPERIENCE

**Senior Vice President, Global Head of Research & Development; Active Pharmaceutical Ingredient (A.P.I.) Dr. Reddy's Laboratories:**

### **Responsibilities:**

The responsibilities as the Sr. Vice President in the world-wide Active Pharmaceutical Ingredient (API) Business in Dr Reddy's Laboratories R&D function across Asia, Europe and USA include the following:

- Provide leadership and strategic direction for the global R&D (consisting of more than 700 Ph.D. Chemists and Engineers) and serve on senior R&D staff that is responsible for ensuring effective and innovative product development.
- Direct the activities of multiple project team leaders, pilot pharmaceutical production and chemistry/pharmaceutical services throughout the API and Generics product organization.
- Demonstrate a wealth of scientific, business and cGMP experience in pharmaceutical process development.
- Work in a strongly collaborative and collegial fashion with peers in engineering, formulation and preclinical/pharmacology disciplines to develop novel products involving the release of therapeutic products such as biologics, drugs and other agents.
- Actively participate in the preparation and analysis of the company's strategic direction, the overall operating plans and new portfolio plan for product development.
- Play a key role in managing the intellectual property output of the R&D group and serve on the world-wide patent portfolio management committee.
- Drive projects to ensure the achievement of product development timelines, which are consistent with corporate objectives, ensuring the highest quality control and output standards.
- Establish and maintain an adequate organizational structure and resources to ensure devices are designed and produced in compliance with applicable federal and international regulations/standards.

- Act as a technical advisor/consultant to senior management as well as multi-disciplinary project teams and other functional areas interfacing with key marketing/sales personnel as well as interfacing with physician customers and business development.
- Team building including hiring of people, their development and motivation from business perspectives while meeting forecasted costs and deliverables maintaining competitive advantage worldwide with cutting edge technology.

#### **Merck.**

Discovered and developed novel silicon mediated quinone oxidation of aza-steroids successfully implemented for the production of Finasteride (**PROSCAR<sup>TM</sup>** / **PROPECIA<sup>TM</sup>**) and other benign prostatic hypertrophy (BPH)-candidates.

Process Research and Development designing novel, practical and cost-effective synthesis of drug candidates from bench scale to commercialization.  
Introduced efficient chiral phase-transfer technology to prepare either enantiomer of the drug candidate **L-644, 711**.

#### **Hoechst.**

Devised and developed a unique **amphoteric copolymer** derived from vinylpyridine and acetoxystyrene.

Discovered and developed a waste-free synthesis of chiral **ibuprofen** via unprecedented diastereoreversal.

Discovered and developed a synthesis of **D-p-hydroxyphenylglycine** via a novel

Developed a novel surfactant mediated waste-free “**Green Technology**”

Developed a “Green” economic one-step synthesis of **Acetaminophen<sup>TM</sup>** (Tylenol®).

**HONORS AND AWARDS:**

- Robert A. Welch Fellowship (1980-1983).
- Phi Kappa Phi Fellowship for academic excellence (1982-1983).

A&M Professor's Goal: more life-saving Drugs (*Austin American Statesman*, **November 26, 1999**)  
 Professor hopes to inspire Texas students (*Houston Chronicle* **November 14, 1999**)  
 Renowned chemist sharing his vision (*Corpus Christi Caller-Times* **November 1, 1999**)  
 Chemist who invented baldness drug joins A&M Kingsville (*Fort Worth Star Telegram* **November 26, 1999**)  
 Partnership with Drug Industry (*Corpus Christi Caller-Times* **August 1, 2001**)  
 Process chemistry collaboration (*Chemical & Engineering News* **July 23, 2001**)  
 Spark of learning: (*Corpus Christi Caller-Times Editorial* **August 6, 2001**).

## **PROFESSIONAL ACTIVITIES**

- American Chemical Society
- Merck and Hoechst ambassador in University of Texas at Austin , Houston and Texas A & M University.
- Who's Who in Sciences Higher Education (WWSHE).
- **PANEL DISCUSSIONS.**
- Moderator. Panel discussions in the pharmaceutical section of the “Green Chemistry Workshop” (July 20-25, 2002) at the University of Oregon.
- Moderator. Panel discussion in *Career Development programs at Texas A&M* October 1, 2001 on pharmaceutical process R&D.
- Research Incentive Committee, TAMUK.
- Arts and Sciences Tenure Committee, TAMUK.
- Advisor: NIH Panel “Preclinical Dr

4. "Promoting Chemical Safety and Security in Developing Countries" National Research Council of the National Academies. [www.nap.edu/catalog.php?record\_id=12857]. The National Academic Press. Washington, D.C. **2010**.
5. "Chemical Laboratory Safety and Security A Guide to Prudent Chemical Management" National Research Council of the National Academies. [http://dels.nas.edu/global/bcst/Chemical-Management]. The National Academic Press. Washington, D.C. **2010**.
6. "Green Chemistry in Drug Development" pp 25-40. *Scalable Green Chemistry. Case Studies from Pharmaceutical Industry* Edited by Stefan G. Koenig. Pan Stanford Publishing, **2013**.
7. "Improved Greener Process for Pioglitazone and its Pharmaceutically Acceptable Salts." pp 141-154. *Scalable Green Chemistry. Case Studies from Pharmaceutical Industry* Edited by Stefan G. Koenig. Pan Stanford Publishing, **2013**.

## II Peer Reviewed Published Manuscripts

8. "Asymmetric Induction, Nucleophilic Addition to a Chiral Glyoxylate Ester", Whitesell, J. K.; Bhattacharya, A. ; and Henke, K., *J. Chem. Soc. Chem. Commun.*, 988-89 (**1982**).
9. "Asymmetric Induction. Ene Reactions of a Chiral Glyoxylate Ester", Whitesell, J. K.; Bhattacharya, A.; Aguilar, D. A.; and Henke, K., *J. Chem. Soc. Chem. Commun.*, 17, 989-90 (**1982**)
10. "A Glimpse Towards Asymmetric Induction", Bhattacharya, A., *Diss. Abstr. Int. B*, 43 (12, pt. 1), 3980 (**1983**)
11. "Asymmetric Induction. Reduction, Nucleophilic Addition to and Ene Reaction of Chiral Alpha-Keto Esters", Whitesell, J. K.; Bhattacharya, A.; and Deyo, D., *J. Chem. Soc. Chem. Commun.*, 15, 802 (**1983**)
12. "Efficient Catalytic Asymmetric Alkylations. 2. Chiral Robinson Annulations via

17. "DDQ Oxidation of Silyl Enol Ethers to Enones Proceeds via DDQ-Substrate Adducts", Bhattacharya, A.; DiMichele, L. M.; Dolling, U.-H.; Grabowski, E. J. J.; Grenda, V. J., *J. Org. Chem.*, 54,6118-6120 (**1989**).
18. "Silicon Assisted Quinone Oxidations Proceeds via Quinone-Substrate Adducts". *Merck Speakers Program Brochure* **1989-1990**.
19. "Proscar<sup>®</sup>" *Merck Index*, eleventh edition, 7888, **1989**.
20. "Oxidation of 4-Aza-3-Ketosteroids". Bhattacharya, A., *Centennial Year Edition, MSDRL Selected Publications*.
21. "Acylimidazolides as Versatile Synthetic Intermediates for the Preparation of Sterically Congested Amides and Ketones: A Practical Synthesis of Proscar" Bhattacharya, A.; Williams, J. M.; Amato, J. S.; Dolling, U.-H.; and Grabowski, E. J. J., *Synthetic Communications* 30(17), 2683-2690, **1990**.
22. "Crystallization Induced Asymmetric Transformation: Synthesis of D-p-Hydroxyphenylglycine" Bhattacharya, A.; Aruallo-Mcadams, C.; and Meier, M. B., *Synthetic Communications*, 24(17), 2449-2459, **1994**.
23. "Methyl Glyoxylate" Book Chapter, *Encyclopedia of Reagents for Organic Synthesis (EROS)*, Bhattacharya, A. **1994**.
24. "Phenmenthyl Glyoxylate" Book Chapter, *Encyclopedia of Reagents for Organic Synthesis (EROS)*, Bhattacharya, A. **1994**.
25. "Preparation of Acrylophenones and 2-Alkyl Indanones Utilizing Hexamethylenetetramine as an Inexpensive Mannich Reagent" *Synthetic Communications*, 26(9), 1775-1784 (**1996**).
26. "Environmentally Friendly Solvent-Free Processes: Application of a Novel Surfactant Induced Dual Catalysis in Henry Reaction" *Organic Process Research*

38. "An Improved Process for Repaglinide *via* an Efficient and One Pot Process of (1S)-3-methyl-1-(2-piperidin-1-ylphenyl)butan-1-amine - A Useful Intermediate". CHIMIA International Journal for Chemistry, Volume 60, Number 9, pp. 593-597(5), September **2006**.
39. "Substrate Modification Approach to Achieve Efficient Resolution: Didesmethylcitalopram-A Key Intermediate for Escitalopram" Organic Process Research Development 11(2), 289-292, **2007**.
40. "An Efficient and Impurity-Free Process for Telmisartan: An Antihypertensive Drug". Organic Process Research & Development, 11(1), 81-85, **2007**.
41. "Efficient synthesis of (1R)-[3,5-bis (trifluoromethyl) phenyl] ethanol; a key intermediate for aprepitant, an NK-1 receptor antagonist". Synthetic Communications. 37: 3439-3446, **2007**.
42. "(S)-3-(Aminomethyl)-5-methylhexanoic acid (Pregabalin)". Acta Cryst. Section C, C63, o306±o308, **2007**.
43. "An Alternative Approach to Achieve Enantiopure (3S)-4-Benzyl-3- (4-fluorophenyl)morpholin-2-one: A Key Intermediate of Aprepitant, an NK1 Receptor Antagonist" Organic Process Research & Development. 11(3), 455-457, **2007**.
44. "Effect of Solvent on Stereoselectivity in Pd-C (Type-39K) Catalyzed
45. Hydrogenation of Methyl 3-oxo-4-aza-5- $\beta$ -androstene-17-carboxylate- A
46. Key Intermediate for Finasteride and Dutasteride". Organic Process Research & Development, 11(5); 889-891, **2007**.
47. "An Alternate Route to 2-Amino-3-Nitro-5-Bromo Picoline: Regioselective Pyridine Synthesis via 2-Nitramino Picoline Intermediate". Organic Process Research & Development, 11(5); 885-888. **2007**. [Top ten most downloaded paper in 2007]
48. "An Improved Synthesis of Rimonabant: Anti-obesity Drug" Organic Process Research & Development, 11(5), 910-912, **2007**. [Top ten most downloaded paper in

60. "An Alternative Synthesis of Tadalafil: PDE5 Inhibitor" *Synthetic Communications*, 38(23), 4265-4271, **2008**.
61. "Reaction of Finasteride Intermediate with Benzeneseleninic Anhydride: An In-depth Study" *Industrial & Engineering Chemistry Research* 47(23), 9201-9205, **2008**.
62. "An improved process for eszopiclone: anti-insomnia agent" *Organic Communications*. 1(2), 33-38, **2008**.
63. "Borid acid catalyzed environmentally benign amidation and esterification processes in the synthesis of active pharmaceutical ingredients". Abstracts of Papers, 236th ACS National Meeting, Philadelphia, PA, United States, August 17-21, **2008**.
64. "Synthesis of quinoline analogs. Search for antimalarial agents". *Monatshefte fuer Chemie*. 139(2), 179-181, **2008**.
65. "Efficient Synthesis of Olmesartan Medoxomil, an Antihypertensive Drug" *Synthetic Communications*, 39 (2): 291–298, **2009**.
66. "Novel synthesis of fosphenytoin. anti-convulsant prodrug". *Synthetic Communications*. 39(4), 748. **2009**.
67. Ab initio structure determination of anhydrous sodium alendronate from laboratory powder X-ray diffraction data . *Journal of Pharmaceutical Sciences* 98(6), 2113-2121, **2009**.
68. Preparative Chromatography Technique in the Removal of Isostructural Genotoxic Impurity in Rizatriptan: Use of Physicochemical Descriptors of Solute and Adsorbent. *Organic Process Research & Development*, 13 (4), 683. **2009**.
69. "Scalable Process for the Premix of Esomeprazole†" *Organic Process Research & Development*, 13 (6), 1122. **2009**.
70. "An Improved Process for Pioglitazone and Its Pharmaceutically Acceptable Salt†", *Organic Process Research & Development*, 13(6), 1190, **2009**.
71. "Recycling of undesired isomers of key intermediate for Aprepitant Green Chemistry". *Letters and Reviews*, 2: 4, 243, **2009**.
72. "Green Technologies in the Generic Pharmaceutical Industry" An invited Book Chapter. From *Green Chemistry in the Pharmaceutical Industry* 289-309., Edited by Dunn, Peter J.; Wells, Andrew S.; Williams, Michael T. John Wiley & Sons, **2010**.
73. "Synthesis and Process Optimization of Amtolmetin: An Antiinflammatory Agent" *Organic Process Research & Development* 14(2), 362, **2010**.
74. "Emerging trends in the synthesis of central core of HIV protease inhibitors" [Accepted]. *Research Trends*, **2010**.
75. "Synthesis of All Enantiomerically Pure Diastereomers of Aprepitant" *Synthetic Communications*1, 40: 2254, **2010**.
76. "Novel Approach to the Synthesis of Omeprazole: An Anti-peptic Ulcer Agent" *Synthetic Communications*1, 40: 2983, **2010**.
77. "An alternate synthesis of levetiracetam" *Green Chemistry Letters and Reviews* (**2010**), 3(3), 225-230.
78. "Asymmetric synthesis of (S,S,S)-2-aza-bicyclo[3.3.0]octane-3-carboxylic acid benzyl ester. Formal synthesis of ramipril" *Synthetic Communications* (**2011**), 41(8), 1186-1191.
79. "Emerging trends in the synthesis of central core of HIV protease inhibitors" *Trends in Organic Chemistry*. 14, 83-92, **2010**.
80. "

81. "An efficient synthesis of dextansoprazole employing asymmetric oxidation strategy" Tetrahedron Letters, 52(42), 5464-5466, **2011**.
82. "Diastereoselective synthesis of a core fragment of ritonavir and lopinavir" Tetrahedron Letters, 52(51), 6968-6970, **2011**.
- 83.

97. "Amphoteric copolymer derived from vinylpyridine and acetoxystyrene"  
Application No: 08/003,350, Publication No: US Patent 5232995, Application Date: 1993-01-12, Publication Date: **1993-08-03**.
98. "Amphoteric Copolymer Derived from Vinylpyridine and Acetoxystyrene"  
Application No: 07/968,741, Publication No. U.S. Patent: 5210149, Application Date: 1992-10-30, Publication Date: **1993-05-11**.
99. "Amphoteric Copolymer Derived from Vinylpyridine and Acetoxystyrene"  
Application No: 08/042,358, Publication No: U. S. Patent: 5304610, Application Date: 1993-04-02, Publication Date: **1994-04-19**.
100. "Amphoteric copolymer derived from vinylpyridine & acetoxystyrene | Copolymere amphotere derive de la vinylpyridine et de l'acetoxystyrene" Publication No: Canadian Patent CA 2158555, Application Date: 1994-03-23, Publication Date: **1994-10-13**.
101. "Amphoteric copolymer derived from vinylpyridine & acetoxystyrene" Application No: PCT/US1994/003133, Publication No: WO 1994/022929, Application Date: 1994-03-23, Publication Date: **1994-10-13**.
102. "Amphoteric copolymer derived from vinylpyridine & acetoxystyrene" Application No: EP19940914722 19940323, Publication No: European Patent EP 0691990 (A1), Publication Date: **1996-01-17**.
103. "Methods for synthesizing benign prostatic hypertropic agents and their intermediates | Methode de synthese d'agents prostatiques benins hypertrophiques et de leurs intermediaires" Application No: 615350, Publication No: Canadian Patent CA 1326013, Application Date: 1989-09-29, Publication Date: **1994-01-11**.
104. "Dehydrogenation process | Procede de deshydrogenation" Application No: 570228, Publication No: Canadian Patent CA 1331601, Application Date: 1988-06-23, Publication Date: **1994-08-23**.
105. "Methods of synthesizing benign prostatic hypertropic agents and their intermediates" Application No: 07/264,652, Publication No: US Patent 5237061, Application Date: 1988-10-31, Publication Date: **1993-08-17**.
106. "Dehydrogenation process and intermediates" Application No: Singapore Patent 1995911020.
107. "Precipitation-Induced Asymmetric Transformation of Chiral Alpha-Amino Acids and salts thereof" Application No: European Patent EP19920300648 19920124, Publication No European Patent EP-0499376 (A1), Publication Date: **1992-08-19**.
108. "Racemization of an Enantiomerically Enriched  $\alpha$ -Aryl Carboxylic Acid" Application No: 07/985,083, Publication No: US Patent; 5332834, Application Date: 1992-12-02, Publication Date: **1994-07-26**.
109. "Selective Precipitation of alpha arylcarboxylic acid salts" Application No: 08/139,245, Publication No U.S. Patent: 5380867, Application Date: 1993-10-19, Publication Date: **1995-01-10**.
110. "Selective Precipitation of alpha arylcarboxylic acid salts" Application No: 08/257,412, Publication No. U.S. Patent 5399707, Application Date: 1994-06-10, Publication Date: **1995-03-21**.
111. "Selective precipitation of (a)-aryl carboxylic acid salts" Application No: PCT/US1993/011520, Publication No: WO 1994/012451, Application Date: 1993-11-29, Publication Date: **1994-06-09**.
112. "Selective precipitation of (a)-aryl carboxylic acid salts." Application No: EP19940903318 19931129, Publication No: European Patent EP 0672029 (A1), Publication Date: **1995-09-20**.

113. "Process for the Productton of Calcium Salts of Hydantoic Acid. Application No: 08/016,628, Publication No: U.S. Patent 5338859, Application Date: 1993-02-12, Publication Date: **1994-08-16**.

114. "Process for preparing cyclic ketones" Application No: 08/334,822, Publication No: US Patent 5489712, Application Date: 1994-11-04, Publication Date: **1996-02-06**.

115. "Process for preparing cyclic ketones" Application No: PCT/US1995/013760, Publication No: WO 1996/014284, Application Date: 1995-10-25, Publication Date: **1996-05-17**.

116. "Process for preparing cyclic ketones" Application No: EP19950939583 19951025, Publication No: European Patent EP 0789680 (A1), Publication Date: **1997-08-20**.

117. "Process for the preparation of dialkali metal cromoglycates" Application No: 08/271,804, Publication No: US Patent 5508451, Application Date: 1994-07-07, Publication Date: **1996-04-16**.

118. "Preparation of 4-quinazolinones from N-acyl- $\beta$ -aminoacids" Application No: 08/596,794, Publication No: US Patent 5739330, Application Date: 1996-02-05, Publication Date: **1998-04-14**.

119. "Process for preparing quinazolones" Application No: PCT/US1997/001861, Publication No: WO 1997/028134, Application Date: 1997-01-30, Publication Date: **1997-08-07**.

120. "Preparation of 5,6-dihydro-3H-pyrimidin-4-one derivatives" Application No: 08/595,885, Publication No: US Patent 5763608, Application Date: 1996-02-05, Publication Date: **1998-06-09**.

121. "Process for preparing pyrimidin derivatives" Application No: PCT/US1997/001860, Publication No: WO 1997/028132, Application Date: 1997-01-30, Publication Date: **1997-08-07**.

122. "Three step process for preparing anthranilic acids from aniline" U.S. Patent 96-593536.

123. "Process for preparing anthranilic acids" Application No: PCT/US1997/001862, Publication No: WO 1997/028118, Application Date: 1997-01-30, Publication Date: **1997-08-07**.

124. "Precipitation-induced asymmetric transformation of chiral alpha-amino acids and salts thereof | Transformation d'acides chiraux du type alpha-amino et de leurs sels, induits par la precipitation" Publication No: Canadian Patent CA 2060051, Application Date: **1992-01-27**.

125. "Methods of synthesizing benign prostatic hypertrophic agents" Application No: Hong Kong HK 98101898, Publication No: 1002707, Application Date: 1998-03-09, Publication Date: **1998-09-11**.

126. "Process for azole antifungal intermediate" Document No: 6326509, Application No: 09/568,874, Publication No: US Patent 6326509, Application Date: 2000-05-09, Publication Date: **2001-12-04**.

127. "Improved process for azole antifungal intermediate" Document No: 2000/071498, Application No: PCT/US2000/012740, Publication No: WO/2000/071498, Application Date: 2000-05-10, Publication Date: **2000-11-30**.

128. "Method of producing organic compounds in presence of oxyethylene ether catalyst and in a solvent minimized environment" Document No: 6969775, Application No: 10/666,543, Publication No: US Patent 6969775, Application Date: 2003-09-19, Publication Date: **2005-11-29**.

129. "Method of producing organic compounds in presence of oxyethylene ether catalyst and in a solvent minimized environment" Document No: 20040138509, Application No: 666543, Publication No: US Patent 20040138509, Application Date: 2003-09-19, Publication Date: **2004-07-15**.
130. "Preparation of 4-(2-Bromoethoxy)phenol". Patent applied in collaboration with Johnson & Johnson (2003 pending).
131. "Method for preparing pyrrolotriazine compounds via in situ amination of pyrroles" Document No: 20060229449, Application No: 396888 Publication No US Patent, Application Date: 2006-04-03 Publication Date: **2006-10-12**
132. "Method of preparation of nitroaminopyridine compounds" Document No: 2007/019259 Application No: PCT/US2006/030347 Publication No: WO/2007/019259 Application Date: 2006-08-02 Publication Date: **2007-02-15**.
133. "Method of preparation of nitroaminopyridine compounds" Document No: 20070032657, Application No: 492730, Publication No: US Patent 20070032657, Application Date: 2006-07-25, Publication Date: **2007-02-08**.
134. "One-pot reductive acetamidation of aryl nitro compounds", Document No: 2006/023763, Application No: PCT/US2005/029611, Publication No: WO/2006/023763, Application Date: 2005-08-18, Publication Date: **2006-03-02**.
135. "One-pot reductive acetamidation of aryl nitro compounds", Document No: 20060052638, Application No: 208474, Publication No: US Patent 20060052638, Application Date: 2005-08-19, Publication Date: **2006-03-09**.
136. "One Pot Reductive Acetaminidation of Aryl Nitro Compounds", Document No: 7173152, Application No: 11/208,474 Publication No: US Patent 7173152 Application Date: 2005-08-19 Publication Date: **2007-02-06**
137. "Purification process using co-crystal approaches"-*US provisional application 60/827,259 on 28 Sep 2006*
138. "Process for preparing fosphenytoin" Document No: 20070249563, Application No: 737783, Publication No: US Patent 20070249563, Application Date: 2007-04-20, Publication Date: **2007-10-25**.
139. "Method for preparing pyrrolotriazine compounds via in situ amination of pyrroles" Document No: 7534882 Publication No: US Patent 7534882. Application Date: 2006-04-03. Publication Date: **2009-05-19**.

#### **IV. Published Abstracts and Meeting Proceedings**

140. "Efficient Asymmetric Alkylations via Chiral Phase-Transfer Catalysis". For presentation at : American Chemical Society 190th National Meeting, Chicago, Illinois, 9/8/85-9/13/1985.
141. "Quarternary Ammonium Ions Derived From Cinchona Alkaloids as Chiral Phase-Transfer Alkylation Catalysts: Applications and mechanisms".: Heterocyclic Chemistry 10th International Congress, Waterloo, Ontario, Canada, 8/11/85-8/16/1985.
142. "Efficient Asymmetric Alkylations via Chiral Phase-Transfer Catalysis. A Novel

144. "Quinone Oxidation in Synthesis; Fascination New Mechanistic Aspects":: U. of Texas at Austin, Austin, Texas, November 5, **1987**.
145. "Silicon Assisted Quinone Oxidation: Mechanisms and application to aza-steroid synthesis":: U. of Houston, Houston, Texas, November 6, **1987**.
146. "Quinone Oxidation: Mechanism and application in steroid synthesis":: Texas A&M Univ. College Station, Texas, November 9, 1987.
147. "Silylation Mediated Quinone oxidation":: Merck-Bucknell Symposium, March 16, **1988**.
148. "Oxidation of Lactum Derived TMS-Imidates With Quinones Proceeds Via Unprecedented Quinone-Substrate Adducts":: Heterocyclic Chemistry 12th International Congress, Jerusalem, Israel, 8/13/89-8/17/**1989**.
149. "Synthesis of  $\Delta^1$ -4-Aza Steroids via Silylation Mediated Quinone Oxidation":: Lakeland Heterocyclic symposium, Grasmere. Royal Society of Chemistry: Perkin Division May 4-8 **1989**.
150. "Quinone Oxidation of TMS Imidates and

166. "The Role of Bristol-Myers Squibb in Educating the Next Generation: Process R&D at Texas A&M Kingsville. Part I
167. Development of Proscar. Part II". Bristol Myers Squibb Pharmaceutical Research Institute, New Brunswick, NJ, February 20, **2004**.
168. "Process Research and Development in Texas A&M Kingsville: Educating the Next Generation". Novartis Pharmaceutical. East Hanover, NJ, February 19, **2004**.
169. "Application of Quinone oxidation in developing and alfa reductase inhibitor candidate". Ambion Pharmaceutical, Austin Texas. April 1, **2004**.
170. Development of a BPH candidate: Synthesis

185. "Application of Green Technology in Pharmaceutical Process Development" Current Research Trends and Developments in Heterocyclic Chemistry. Osmania University, Hyderabad, India. March 17-18, **2006**.
186. "Essentials of Process Research & Development". University of Texas at Arlington, Arlington, Texas, May 9, **2006**.
187. "The Application of Green Technology in Pharmaceutical Process Development". The 4<sup>th</sup> Annual Congress of International Drug Discovery Science and Technology. Northwestern University, Xi-An, China. May 31-June 2, **2006**.
188. "Green Technology in Pharmaceutical Process Development" Developing Chemical Processes for Active Pharmaceutical Ingredients. Scientific Update Conference, N. C. L. Pune, India. December 13-14. **2006**.
189. "Green Chemistry" Chemistry & Life. Osmania University College for Women Koti, Hyderabad, India. January 5, **2007**.
190. "Green Technology in Pharmaceutical Development" National Conference on Drug Designing & Synthesis. Dr. Ambedkar College, Nagpur, India. January 19-20, **2007**.
191. "Total Synthesis of (-)-Galanthamine Hydrobromide" 234<sup>th</sup> American Chemical Society Conference, Boston (19-23 August), **2007**.
192. "Principles of Green Chemistry in API synthesis" Green Chemistry in Conference on Green Chemistry in Drug Synthesis, Department of Chemistry, MNR Degree and PG College Hyderabad India. January 29, **2008**,
193. "Application of Green Principles in API Synthesis" National Symposium on Emerging Trends in Medicinal Chemistry, India – A Global Hub" Department of Chemistry, C.K.M. Arts & Science College, Warangal, Hyderabad, India. February 2-3, **2008**.
194. "Crystal engineering: Application in the development of Finasteride" Developing Chemical Processes for APIs Scientific Update Conference, February 14-15 **2008**, Hyderabad, India
195. "De novo synthesis of Rimonabant and its regioisomer" 9<sup>th</sup> Annual Florida Heterocyclic and Synthetic IUPAC-Sponsored Conference Register online for FloHet IX conference. March 9<sup>th</sup> - 12<sup>th</sup>, **2008**. Gainesville. Fl.
196. "Green Chemistry and the Global Pharmaceutical Industry" CHEMICAL SCIENCES ROUNDTABLE, May 19-20, **2008**. The National Academies, Keck Building. Washington, DC.
197. "Green chemistry in the Generic Pharmaceutical Industry" 2<sup>nd</sup> International Symposium on Green Processing in the Pharmaceutical & Fine Chemical Industries May 29-30, **2008**. Yale University, New Haven, Connecticut, USA
198. "Application of Green Technology in the Generic Pharmaceutical Process Development" Science Week, Jan 4-7, **2010**. Dr Reddy's Laboratories, Hyderabad, India.
199. "Development of Finasteride: A BPH inhibitor" August 1, **2010**. **Chirotech** Technology Ltd, 162 Science Park, Milton Road, Cambridge, Cambridgeshire, CB4 0GH.
200. "Application of Green Technology in the Generic Pharmaceutical Development" Symposium on New Directions in Green Chemistry; SWRM 2011, 67<sup>th</sup> Southwest Regional ACS, Nov. 10, **2011**, Austin, Texas.
201. "Green Chemistry" Green Chemistry Workshop December 23, **2011**. Bhavan's Vivekananda College of Science, Humanities & Commerce, Secundrabad, India.
202. "Green Chemistry in Generic Pharmaceutical Development" May 25, **2012**. Daiichi Sankyo Ranbaxy Laboratories, New Delhi, India.

203. "Why Does Chemistry Matter" February 1, 2013. Texas A&M Kingsville, Kingsville, Texas.
204. "Pharmaceutical Development for Health Professionals. "Future Health Professionals Conference" February 28, 2013. Texas A&M Kingsville, Kingsville, Texas.
205. "Green Chemistry in the Pharmaceutical Industry: A Generic Perspective" 33<sup>rd</sup> Annual Faculty Lecture, April 11, 2013, Texas A&M Kingsville, Kingsville, Texas.

#### **Student Presentations.**

1. "Environmentally Friendly Solvent-Free Processes: Preparation of Nitro Alcohols, A Class of Valuable Drug Intermediates" **Vikram Purohit**, Hilda Argulin, Apurba Bhattacharya\*. IUCCP symposium October 1-4, 2001. College Station, Texas.
2. "Environmentally Friendly Synthesis of Benzoin; a Valuable Intermediate in Organic Synthesis" **Stephanie Nichols**, Vikram Purohit, , Apurba Bhattacharya\*. American Chemical Society South Texas Section, November 10, 2001.
3. "Environmentally Processes in Organic Synthesis: Zeolite Mediated selective O-Methylation of Phenols under Salt-free conditions" **James Ogle**, Apurba Bhattacharya\*. American Chemical Society South Texas Section, November 10, 2001.
4. "Environmentally Processes in Organic Synthesis Solvent –free Hydrolysis of Esters" **Nishant Joshi**, Apurba Bhattacharya\*. American Chemical Society South Texas Section, November 10, 2001.
5. "Environmentally Processes in Organic Synthesis: Novel Surfactant Mediated Solvent Free Ether Cleavage/trans-Etherification under Neutral Conditions" **Ritesh Tichkule**; Gaurang Parmer, Vikram Purohit, Apurba Bhattacharya\*. IUCCP symposium September 23-25, 2002; College Station, Texas.
6. "Environmentally Friendly Processes in Organic Synthesis: Novel Surfactant Mediated Solvent-Free Ester Cleavage/trans-Esterifications under neutral conditions" **Nishant Joshi**, Apurba Bhattacharya\*. IUCCP symposium September 23-25, 2002; College Station, Texas.
7. "Surfactant Mediated Dual Catalysis in Organic Synthesis: A novel Solvent-Free Transformation of Nitro to Amides" **Gaurang Parmer**, Apurba Bhattacharya\*. IUCCP symposium September 23-25, 2002; College Station, Texas.
8. "Environmentally Friendly Processes in Organic Synthesis: Novel Surfactant Mediated Solvent Free Ether Cleavage / Trans-Etherification under Neutral Conditions" **Ritesh Tichkule**; Savitha Muramulla; Gaurang Parmar; & Apurba Bhattacharya\*. South Texas Section, American Chemical Society, Second Resaek6Unr Tc-.0Free

**Gaurang Parmar**, Diego Saenz, Tamara Hussein & Apurba Bhattacharya\*. South Texas Section, American Chemical Society, Second Research Symposium, Kingsville, Texas, November 21, 2003.

10. “Environmentally friendly waste-free Acetoxylation of Alcohols”

**Sankara R Cherukuri**

**Richard Sanchez Jr.**, Ritesh Tichkule, Apurba Bhattacharya\*. IUCCP symposium October 13-15, 2003; College Station, Texas.

20. “Environmentally Friendly Aliphatic Bromination of Substituted Acetophenones and Benzocyclic Ketones” **Mario E. Gomez**, Madeline Fair, Ritesh Tichkule, Apurba Bhattacharya\*. IUCCP symposium October 13-15, 2003; College Station, Texas.

21. “Zeolite-HBr-H<sub>2</sub>O<sub>2</sub> mediated Waste Free Bromination of Aromatic Compounds. **Madeline R Fair**, Ritesh Tichkule, Apurba Bhattacharya\*. IUCCP symposium October 13-15, 2003; College Station, Texas. *[Received the best presentation award in the symposium]*.

22. “HBr-H<sub>2</sub>O<sub>2</sub> mediated, Zeolite Catalyzed Waste-Free Bromination of Aromatic Compounds” **Madeline R Fair**, Ritesh Tichkule, Apurba Bhattacharya\*. First Pathways Research Symposium. November 14-15, 2003; Galveston, Texas. *[Received the best presentation award in the symposium]*.

23. “Environmentally Friendly Processes in Organic Synthesis: Novel Surfactant-mediated Solvent-free Reactions in a Catalytic System”. **Tomas Vasques**, Nitin Patel, Victor Villarreal, Omar Vela, and Apurba Bhattacharya\*. Natural Sciences Research Poster Session at the University Of Texas at Austin, Austin, Texas April 2, 2004.

24. “Surfactant Mediated Dual Catalysis in Green Chemistry, Solvent Free Transformation of Nitro to Amides: One Step Synthesis of Tylenol. **Ritesh Tichkule**, Guarang Parmar, and Apurbah Bhattacharya\*. Natural Sciences Research Poster Session at the University Of Texas at Austin, Austin, Texas April 2, 2004.

25. “Remarkable Solvent Effect in Barton-Zard Pyrrole Synthesis: Improved Synthesis of 3,4-dialkyl-1-H-pyrrole-2-carboxylate”. **Sankara Cherukuri**, Ritesh Tichkule, Victor Tamez, Vikram Purohit, and Apurba Bhattacharya\*. Natural Sciences Research Poster Session at the University Of Texas at Austin, Austin, Texas April 2, 2004.

26. “Application in Green Chemistry: Ether Cleavage/Trans-etherification Under Neutral Conditions”. **Ritesh Tichkule**, Guarang Parmar, Savitha Muramulla, and Apurbah Bhattacharya\*. Natural Sciences Research Poster Session at the University Of Texas at Austin, Austin, Texas April 2, 2004.

27. “One Pot Transformation of Nitriles & Carboxylic Acids to Amides”. **Victor Villarreal**, Savitha Muramulla, Rick Sanchez, Sankara Cherukuri, and Apurba Bhattacharya\*. Natural Sciences Research Poster Session at the University Of Texas at Austin, Austin, Texas April 2, 2004.

28. “Zeolite Catalyzed, Microwave Induced, Waste-Free Etherification, Formylation, Methylation and Ester Hydrolysis” **Sanchez, Richard**; Tichkule, Ritesh; Tamez, Victor; Vasques, Tomas; Villarreal, Victor; Bhattacharya, Apurba\*. Abstracts, 60th Southwest Regional Meeting of the American Chemical Society, Fort Worth, TX, United States, September 29-October 4 (2004).

29. "Zeolite catalyzed Waste-free Bromination of Aromatic Compounds"  
**Fair, Madeline Rosa**; Tichkule, Ritesh; Bhattacharya, Apurba\*. Abstracts, 60th Southwest Regional Meeting of the American Chemical Society, Fort Worth, TX, United States, September 29-October 4 (2004), SEPT04-066. Publisher: American Chemical Society, Washington, D. C.
30. "Waste-Free Environmentally Friendly Halogenation of Substituted Acetophenones and Benzocyclic Ketones" **Plata, Erik**; Gomez, Mario; Bhattacharya, Apurba\*. Abstracts, 60th Southwest Regional Meeting of the American Chemical Society, Fort Worth, TX, United States, September 29-October 4 (2004), SEPT04-069. Publisher: American Chemical Society, Washington, D. C.
31. "Surfactant mediated, solvent free oxidation of aryl alcohols to aldehydes"  
**Pedraza, Fernando**; Tichkule, Ritesh; Bhattacharya, Apurba\*. Abstracts, 60th Southwest Regional Meeting of the American Chemical Society, Fort Worth, TX, United States, September 29-October 4 (2004), SEPT04-070. Publisher: American Chemical Society, Washington, D. C.
32. "Solvent Free Processes In Organic Synthesis" **Patel, Nitinchandra**; Pedraza, Fernando; Vela, Omar; Bhattacharya, Apurba\*. Abstracts, 60th Southwest Regional Meeting of the American Chemical Society, Fort Worth, TX, United States, September 29-October 4 (2004), SEPT04-075. Publisher: American Chemical Society, Washington, D. C.
33. "Remarkable Solvent Effect In Barton - Zard Pyrrole Synthesis: An Efficient And Environmentally Friendly Synthesis Of 3,4-Dialkyl-1-H-Pyrrole-2-Carboxylates"  
**Cherukuri, Sankara**; Tichkule, Ritesh; Tamez, Victor; Bhattacharya, Apurba\*. Department of Chemistry, Abstracts, 60th Southwest Regional Meeting of the American Chemical Society, Fort Worth, TX, United States, September 29-October 4 (2004), SEPT04-074. Publisher: American Chemical Society, Washington, D. C.
34. "One Pot Synthesis of Amides from Nitriles" **Villarreal, Victor**; Muramulla, Savitha; Bhattacharya, Apurba\*. Department of Chemistry, Texas A&M University Kingsville, Kingsville, TX, USA. Abstracts, 60th Southwest Regional Meeting of the American Chemical Society, Fort Worth, TX, United States, September 29-October 4 (2004), SEPT04-160. Publisher: American Chemical Society, Washington, D. C.
35. "Environmentally Friendly Organic Synthesis: a Novel Surfactant Mediated Solvent Free Ether Cleavage/Trans-Etherification under Neutral Conditions" **Tichkule, Ritesh**; Muramulla, Savitha; Pedraza, Fernando; Parmar, Gaurang; Bhattacharya, Apurba\*. Abstracts, 60th Southwest Regional Meeting of the American Chemical Society, Fort Worth, TX, United States, September 29-October 4 (2004), SEPT04-067. Publisher: American Chemical Society, Washington, D. C.
36. "Environmentally Friendly Organic Syntheses: a Transformation of Nitro to Amides: One Step Syntheses of Acetaminophen<sup>TM</sup>" **Tamez, Victoriano**; Suarez, Victor H.; Parmar, Gaurang; Tichkule, Ritesh; Bhattacharya, Apurba\*. Abstracts, 60th Southwest Regional Meeting of the American Chemical Society, Fort Worth, TX, United States,

September 29-October 4 (2004), SEPT04-068. Publisher: American Chemical Society, Washington, D. C

37. "Amidation of Acids" **Muramulla, Savitha**





7. “Zeolite catalysis in organic synthesis: applications in etherification, formylation, ester hydrolysis and heteroaromatic synthesis” by Richard Sanchez, Jr.

- **Advanced Environmental Chemistry**
- **Advanced Analytical Chemistry**
- **Advanced Instrumentation**
- **Advanced Asymmetric Synthesis**
- **Advanced Organic Synthesis**
- **Physical Organic Chemistry**
- **Graduate Seminar**
- **Green Chemistry**
- **Heterocyclic Chemistry**

#### **Undergraduate Courses.**

- **Environmental Chemistry (and lab)**
- **CHEM 3323, Organic Chemistry I and Chem 3123 (Lab).**
- **CHEM 3425, Organic Chemistry II and Chem 3125 (Lab).**
- **Chem Lit 3181(Literature Search).**
- **Chem 1481.**

#### **Ph.D. Committee:**

- **Mr. Bob Castro (Env. Engineering: Student of Dr. John Kuruvilla)**
- **Ms. Ji Marie (Env. Engineering: Student of Dr. Ni-Bin Chang)**
- **Ms Christy Cole (Env. Engineering Student of Dr. Alvaro Martinez)**

#### **RESEARCH INTERESTS:**

##### Pharmaceutical Process Research and Development.

Process chemistry, the practice of scaling up chemical production from gram and kilograms to thousands of gallons while always of vital importance, has lately become a highly visible enterprise in the pharmaceutical sector. In the pharmaceutical industry, once the medicinal chemist defines the target molecule, the process chemist finds the most efficient, economical and safe route to make the molecule and its analogues. We have established collaborative programs with several leading pharmaceutical companies (e.g. Bristol-Myers Squibb Pharmaceuticals Research Institute, Johnson & Johnson, Texas BioTechnology and Pharmeco) whereby the research students are be involved in identifying and solving process related problems and issues of potential mutual interest. This involves synthesizing initial quantities of drug candidates using the existing-route as well as improving the existing synthesis, possibly following a completely different strategy from the medicinal route so that it can be scaled up for commercial production.

##### Environmentally Benign Processes in Organic Synthesis.

Over the past few years significant amount of research activities in the chemical community have been directed towards the development of new technologies and methodologies for environmentally benign processes. This area of chemistry has received

extensive attention and is often referred to as "green chemistry". "Green chemistry" focuses on the design, manufacture, and use of chemicals and processes that have little or no pollution potential or environmental risk and are both economically and technologically feasible. The principle of green chemistry can be applied to broad areas of chemistry including synthesis, catalysis, reaction conditions, separations, analysis and monitoring. Green Chemistry differs from conventional chemistry in several different categories including nature of starting materials, reagents, reaction conditions and target molecule. The scope of Research and Development in this area is enormous. We intend to concentrate on the following specific areas of chemistry.

- Solvent Minimization
- Reactions on Zeolite as Solid Support: Waste-free Catalytic Technology
- Organic Reactions in Water.
- Atom-Economy
- Energy conservation: Application of Microwave and Sonication in Organic Synthesis
- Chiral Phase-Transfer Catalysis.

#### **Grants (Funded).**

##### **Year 2003.**

- **“Instrumental Grant” (Department of Defense).** **\$400,000.**
- **“Texas Bridges to Doctorate” (National Institute of Health).** **\$600,000/3yrs**
- **“Solvent-free Processes in Green Chemistry: Application of Surfactants in Unique Dual Catalysis” (American Chemical Society-Petroleum Research Fund)**  
**\$50,000/3 yrs**
- **Texas Excellence in Research FY2003 formula funding (HB 1839).**  
**\$7540.00**
- **University of Texas Medical Center, Galveston Award for Environmental Chemistry.** **\$5000.00**
- **Deans Sharing Fund, 2003.** **\$500.00**

##### **Year 2002.**

- **Tamuk-Bristol Myers Squibb Collaboration** **\$25,000.00.**
- **Texas Excellence Fund FY 2003** **\$3,100.00**
- **Deans Sharing Fund, 2002.** **\$500.00**

**Year 2001.**

- **Tamuk-Bristol Myers Squibb Collaboration** **\$25,000.00.**
- **A&S indirect cost sharing fund.** **\$5000.00.**
- **Excellence in Research.** **\$1091.00.**
- **Dean's Sharing Fund.** **\$600.00.**

**Graduate Students.**

**MS students Graduated.**

**2002.**

1. Virkram Purohit (Finished Ph.D. in Texas A&M Currently at Teva Pharmaceutical).
2. James Ogle (Finished Ph.D. Texas A&M currently employed in Halliburton).

**2003.**

3. Nishant Joshi (Industry, Iowa Chemical)
4. Mark Davis. (Industry, Novartis Pharmaceutical)

**2004.**

5. Senthil Kumar (Industry, Glaxo)
6. Gaurang Parmer (Industry, Ambion)
7. Tomas Vasques (MD PhD; U. Texas Medical Center Galveston).
8. 10. Ritesh Tichkule (Industry, Novartis Pharmaceutical)

**2005.**

9. Nitin Patel (Industry, Boehringer Ingelheim Pharmaceutical)
10. Rick Sanchez (Currently pursuing Ph.D. in Texas A&M)
11. Sankara Rao Chirikuri (Boehringer\_Ingelheim Pharmaceutical)
12. Victor Villareal (Currently pursuing Ph.D. at U. North Texas)

13. Savitha Muramulla (Currently pursuing Ph.D. at UT San Antonio)

### **Undergraduate Students**

1. Jackie Besinoiz (McNair) (finished PhD at A&M, currently at P&G)
2. Madeline Fair (McNair)
3. Yvonne Jimenez (McNair)
4. Omar Vela
5. Tamara Hussein
6. Diego Armando Sanchez
7. Ambarish Kamdhar
8. Poonam Villabhavai
9. Jose A. Mendoza II
10. Sohum Kiran Desai
11. Celina Garcia (MS at Texas A&M Kingsville)
12. Venessa Lynn Garcia (MS at Texas A&M Kingsville)
13. Veronica Jiminez