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# Craig D. Boyle, Ph.D.

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## Overview

Craig D. Boyle, Ph.D., focuses his practice on patent prosecution in the pharmaceutical, life sciences, chemical, and biotechnology industries. In addition to the preparation and prosecution of patent applications, Craig manages patent portfolios and provides assistance with due diligence, freedom to operate, and landscape review.

Prior to joining Fish & Richardson, Craig had over six years of experience as an intellectual property legal intern and an associate at an international law firm, where he assisted in the drafting and prosecution of patent applications, freedom to operate opinions, and due diligence analyses relating to small molecule therapeutics, oligonucleotides, antibody-drug conjugates, polymers, and formulations.

Prior to his legal career, Craig spent 16 years as a medicinal chemist at Schering-Plough and Merck in roles ranging from laboratory scientist to cross-functional team leader, and he successfully designed, synthesized, and advanced several novel drug candidates to clinical trials. His life science research experience spans several disease areas, including central nervous system, cardiovascular, and metabolic disorders.

Craig is a co-inventor of approximately 30 issued U.S. patents and 30 PCT applications and is an author of numerous scientific articles. He has received several awards, including the Research & Development Council of New Jersey Thomas Alva Edison Patent Award for the discovery of late-phase clinical Parkinson's disease treatments and the Schering-Plough President's Award for the discovery of a novel Alzheimer's disease therapy.

**Admitted only in New York. Not admitted to practice in Delaware. Work conducted in Delaware is directly supervised by a member of the Delaware bar or is limited to U.S. federal courts or agencies listed in admissions or otherwise authorized by law.*

## Experience

**U.S. Patents**

Boyle, Craig D.; Lankin. Claire M.; Greenlee, William J.; Harris, Joel M.; "Substituted biaryl derivatives and methods of use thereof"; U.S. Patent 9,301,929, issued 2016.

Boyle, Craig; Greenlee, William; Chackalamannil, Samuel; Lankin, Claire; "Factor IXa inhibitors"; U.S. Patent 9,161,924, issued 2015.

Xia, Yan; Boyle, Craig D.; Greenlee, William J.; Chackalamannil, Samuel; Jayne, Charles Lee; "Bicyclic heterocycle derivatives and their use as modulators of the activity of GPR119"; U.S. Patent 8,907,095, issued 2014.

Neelamkavil, Santhosh Francis; Boyle, Craig D.; Chackalamannil, Samuel; Greenlee, William J.; Neustadt, Bernard R.; Stamford, Andrew W.; "Bicyclic heterocycle derivatives and use thereof as GPR119 modulators"; U.S. Patent 8,822,480, issued 2014.

Neelamkavil, Santhosh Francis; Boyle, Craig D.; Neustadt, Bernard R.; Chackalamannil, Samuel; Greenlee, William J.; "Bicyclic heterocycle derivatives and methods of use thereof"; U.S. Patent 8,815,876, issued 2014.

Shah, Unmesh; Boyle, Craig D.; Chackalamannil, Samuel; "Substituted bicyclic piperidinyl- and piperazinyl-sulfonamides useful to inhibit 11b-hydroxysteroid dehydrogenase type-1"; U.S. Patent 8,604,195, issued 2013.

Boyle, Craig D.; Lankin, Claire M.; Shah, Unmesh G.; Greenlee, William J.; Chackalamannil, Samuel; "Bicyclic piperidine and piperazine derivatives as GPCR modulators for the treatment of obesity, diabetes and other metabolic disorders"; U.S. Patent 8,580,807, issued 2013.

Boyle, Craig D.; Chackalamannil, Samuel; Shah, Unmesh; Lankin, Claire M.; "6-substituted sulfonyl azabicyclo[3.2.1]octanes useful to inhibit 11b-hydroxysteroid dehydrogenase type-I"; U.S. Patent 8,466,149, issued 2013.

Neustadt, Bernard R.; Lindo, Neil; Greenlee, William J.; Tulshian, Deen; Silverman, Lisa S.; Xia, Yan; Boyle, Craig D.; Chackalamannil, Samuel, "Adenosine $A_{2a}$ receptor antagonists"; U.S. Patent RE44,205, issued 2013.

Boyle, Craig D.; Chackalamannil, Samuel; Shah, Unmesh; Lachowicz, Jean E., "7-[2-[4-(6-fluoro-3-methyl-1,2-benzisoxazol-5-yl)-1-piperazinyl]ethyl]-2-(- 1-propynyl)-7H-pyrazolo-[4,3-E]-[1,2,4]-triazolo-[1,5-C]-pyrimidin-5-amine"; U.S. Patent 8,389,532, issued 2013.

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Neustadt, Bernard R.; Hao, Jinsong; Liu, Hong; Boyle, Craig D.; Chackalamannil, Samuel; Shah, Unmesh G.; Stamford, Andrew; Harris, Joel M., "Pyrazolo-[4,3-e]-1,2,4-triazolo-[1,5-c]-pyrimidine Adenosine $A_{2a}$ Receptor Antagonists"; U.S. Patent 7,709,492, issued 2010.

Boyle, Craig D.; Chackalamannil, Samuel; Shah, Unmesh; Lachowicz, Jean E., "7-[2-[4-(6-fluoro-3-methyl-1,2-benzisoxazol-5-yl)-1-piperazinyl]ethyl]-2-(1-propynyl)-7H-pyrazolo-[4,3-e]-[1,2,4]-triazolo-[1,5-C]-pyrimidin-5-amine"; U.S. Patent 7,572,802, issued 2009.

Chackalamannil, Samuel; Wang, Yuguang; Boyle, Craig D.; Stamford, Andrew W., "Xanthine Phosphodiesterase V Inhibitors"; U.S. Patent 7,531,544, issued 2009.

Neustadt, Bernard R.; Boyle, Craig D.; *et al.,* "2-Heteroaryl-pyrazolo-[4,3-e]-1,2,4-triazolo-[1,5-c]-pyrimidine Adenosine $A_{2A}$ Receptor Antagonists"; U.S. Patent 7,465,740, issued 2008.

Neustadt, Bernard R.; Boyle, Craig D.; *et al.,* "2-Alkynyl- and 2-Alkenyl-pyrazolo-[4,3-e]-1,2,4-triazolo-[1,5-c]-pyrimidine Adenosine $A_{2A}$ Receptor Antagonists"; U.S. Patent 7,368,449, issued 2008.

Ghosal, Anima; Boyle, Craig D.; *et al.,* "Metabolite of Xanthine Phosphodiesterase 5 Inhibitor and Derivatives Thereof Useful for Treatment of Erectile Dysfunction"; U.S. Patent 7,312,223, issued 2007.

Chackalamannil, Samuel; Wang, Yuguang; Boyle, Craig D.; Stamford, Andrew W., "Xanthine Phosphodiesterase V Inhibitors"; U.S. Patent 7,268,141, issued 2007.

Dahanukar, Vilas H.; Boyle, Craig D.; *et al.*, "Xanthine Phosphodiesterase V Inhibitor Polymorphs"; U.S. Patent 7,192,962, issued 2007.

Boyle, Craig D.; Chackalamannil, Samuel; Greenlee, William J.; Shah, Unmesh; Xia, Yan, "Adenosine $A_{2A}$ Receptor Antagonists"; U.S. Patent 6,916,811, issued 2005.

Neustadt, Bernard R.; Boyle, Craig D.; *et al.,* "2-Alkynyl- and 2-Alkenyl-pyrazolo-[4,3-e]-1,2,4-triazolo-[1,5-c]-pyrimidine Adenosine $A_{2A}$ Receptor Antagonists"; U.S. Patent 6,897,217, issued 2005.

Neustadt, Bernard R.; Boyle, Craig D.; *et al.,* "Adenosine $A_{2A}$ Receptor Antagonists"; U.S. Patent 6,897,216, issued 2005.

Boyle, Craig D.; Greenlee, William J.; Chackalamannil, Samuel, "Muscarinic Antagonists"; U.S. Patent 6,890,936, issued 2005.

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Stamford, Andrew W.; Boyle, Craig D.; Huang, Ying, "Substituted Imidazole Neuropeptide Y Y5 Receptor Antagonists"; U.S. Patent 6,632,828, issued 2003.

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Stamford, Andrew W.; Boyle, Craig D.; Huang, Ying, "Substituted Imidazole Neuropeptide Y Y5 Receptor Antagonists"; U.S. Patent 6,444,687, issued 2002.

Lowe, Derek B.; Boyle, Craig D.; *et al.,* "Muscarinic Antagonists"; U.S. Patent 6,043,255, issued 2000.

Lowe, Derek B.; Boyle, Craig D.; *et al.,* "Preparation of Muscarinic Antagonists"; U.S. Patent 5,889,006, issued 1999.

## Recognitions & awards

New York Metro Rising Star

*Super Lawyers* 2025

## Additional insights

### Publications

- Neelamkavil, Santhosh F.*; Boyle, Craig; *et al.,* "Discovery of MK-8282 as a Potent G-Protein-Coupled Receptor 119 Agonist for the Treatment of Type 2 Diabetes"; *ACS Med. Chem. Lett.* 2018, *9.*
- Shah, Unmesh*; Boyle, Craig D.; *et al.,* "Azabicyclic Sulfonamides as Potent 11b-HSD1 Inhibitors"; *Med. Chem. Lett.* 2010, *20,* 1551.
- Neelamkavil, Santhosh F.*; Boyle, Craig D.; *et al.,* "The Discovery of Azepane Sulfonamides as 11b-HSD1 Inhibitors"; *Med. Chem. Lett.* 2009, *19,* 4563.
- Boyle, Craig D.*; Kowalski, Timothy J., "11b-HSD1 Inhibitors: A Review of Recent Patents"; *Expert Opin. Ther. Patents* 2009, *19(6)*, 801: *invited review.*
- Shah, Unmesh; Lankin, Claire M.; Boyle, Craig D.*; Chackalamannil, Samuel; *et al.,* "Design, Synthesis, and Evaluation of Fused Heterocyclic Analogs of SCH 58261 as Adenosine A2A Receptor Antagonists"; *Med. Chem. Lett.* 2008, *18,* 4204.
- Shah, Unmesh; Boyle, Craig D.*; Chackalamannil, Samuel; *et al.,* "Biaryl and Heteroaryl Derivatives of SCH 58261 as Potent and Selective Adenosine A2A Receptor Antagonists"; *Med. Chem. Lett.* 2008, *18,* 4199.
- Boyle, Craig D.*, "Recent Advances in the Discovery of 11b-HSD1 Inhibitors"; *Opin. Drug Discov. Devel.* 2008, *11,* 495: *invited review.*
- Boyle, Craig D.*; Kowalski, Timothy J.; Zhang, Lili, "11b-Hydroxysteroid Dehydrogenase Type 1 Inhibitors"; *Rep. Med. Chem.* 2006, *41,* 127: invited review.
- Boyle, Craig D.*; Xu, Ruo*; *et al.,* "Optimization of a Purine Based PDE1/PDE5 Inhibitor to a Potent and Selective PDE5 Inhibitor for the Treatment of Male ED"; *Med. Chem. Lett.* 2005, *15,* 2365.

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- Wang, Yuguang*; Boyle, Craig D.; *et al.,* "Improving the Oral Efficacy of CNS Drug Candidates: Discovery of Highly Orally Efficacious Piperidinyl Piperidine M2 Muscarinic Receptor Antagonists"; *Med. Chem.* 2002, *45,* 5415.
- Boyle, Craig D.*; Vice, Susan; *et al.,* "Enhancement of Pharmacokinetic Properties and In Vivo Efficacy of Benzylidene Ketal M2 Muscarinic Receptor Antagonists via Benzamide Modification"; *Med. Chem. Lett.* 2002, *12,* 3479.
- Wang, Yuguang*; Boyle, Craig D.; *et al.,* "Design and Synthesis of Xanthine Analogues as Potent and Selective PDE5 Inhibitors"; *Med. Chem. Lett.* 2002, *12,* 3149.
- Boyle, Craig D.*; Lachowicz, Jean E., "Orally Active and Selective Benzylidene Ketal M2 Muscarinic Receptor Antagonists for the Treatment of Alzheimer's Disease"; *Drug Dev. Res.* 2002, *56,* 310: *invited review.*
- Tagat, Jayaram R.*; Boyle, Craig D.; *et al.,* "Synthesis of Mono- and Difluoronaphthoic Acids"; *Org. Chem.* 2002, *67,* 1171.
- Boyle, Craig D.*; Chackalamannil, Samuel; *et al.,* "Metabolic Stabilization of Benzylidene Ketal M2 Muscarinic Receptor Antagonists via Halonaphthoic Acid Substitution"; *Med. Chem. Lett.* 2001, *11,* 2311.
- Boyle, Craig D.*; Chackalamannil, Samuel; *et al.,* "Benzylidene Ketals as M2 Muscarinic Receptor Antagonists"; *Med. Chem. Lett.* 2000, *10,* 2727.
- Boyle, Craig D.; Kishi, Yoshito*, "Absolute Configuration at the Tricarballylic Acid Moieties of Fumonisin B1 and AAL Toxin TA"; *Tetrahedron Lett.* 1995, *36,*
- Boyle, Craig D.; Kishi, Yoshito*, "Absolute Configuration at the Tricarballylic Acid Moieties of Fumonisin B2"; *Tetrahedron Lett.* 1995, *36,*
- Harmange, Jean-Christophe; Boyle, Craig D.; Kishi, Yoshito*, "Relative and Absolute Stereochemistry of the Fumonisin B2 Backbone"; *Tetrahedron Lett.* 1994, *35,*
- Boyle, Craig D.; Harmange, Jean-Christophe; Kishi, Yoshito*, "Novel Structure Elucidation of AAL Toxin TA Backbone"; J. *Am. Chem. Soc.* 1994, *116,* 4995.

## Speaking engagements

- Neelamkavil, Santhosh F.*; Boyle, Craig D.; *et al.,* "Pyridopyrimidinone Analogs as Orally Efficacious GPR119 Agonists"; *Abstracts of Papers,* 243rd American Chemical Society National Meeting, San Diego, CA, March 25-29, 2012; Division of Medicinal Chemistry Poster Abstract 423.
- Shah, Unmesh*; Boyle, Craig D.; *et al.*, "Discovery of Structurally Distinct Analogs of SCH 420814 (Preladenant) as Adenosine $A_{2A}$Receptor Antagonists"; *Abstracts of Papers*, 239$^{th}$ American Chemical Society National Meeting, San Francisco, CA, March 21-25, 2010; Division of Medicinal Chemistry Oral Poster Abstract 547.
- Neelamkavil, Santhosh F.*; Boyle, Craig D.; *et al.,* "Discovery of a Potent and Orally Efficacious Agonist of the G-protein Coupled Receptor 119"; *Abstracts of Papers,* 239th American Chemical Society National Meeting, San Francisco, CA, March 21-25, 2010; Division of Medicinal Chemistry Poster Abstract 182.
- Shah, Unmesh*; Boyle, Craig D.; *et al.,* "Design, Synthesis, and Evaluation of Fused Heterocyclic Analogs as Adenosine A2A Receptor Antagonists"; *Abstracts of Papers,* 235th American Chemical Society National Meeting, New Orleans, LA, April 6-10, 2008; Division of Medicinal Chemistry Oral Poster Abstract 179.
- Neelamkavil, Santhosh F.*; Boyle, Craig D.; *et al.,* "Synthesis and Biologic Evaluation of Selective Inhibitors of 11b-HSD1 as a Potential Treatment for Metabolic Disorders"; *Abstracts of Papers,* 234th American Chemical Society National Meeting, Boston, MA, August 19-23, 2007; Division of Medicinal Chemistry Poster Abstract 53.
- Lankin, Claire M.*; Boyle, Craig D.; *et al.,* "Discovery and SAR of Novel Derivatives as 11b-Hydroxysteroid Dehydrogenase Type 1 Inhibitors"; *Abstracts of Papers,* 234th American Chemical Society National Meeting, Boston, MA, August 19-23, 2007; Division of Medicinal Chemistry Poster Abstract 52.
- Shah, Unmesh*; Boyle, Craig D.; *et al.,* "Novel Analogs as 11b-HSD1 Inhibitors"; *Abstracts of Papers,* 234th American Chemical Society National Meeting, Boston, MA, August 19-23, 2007; Division of Medicinal Chemistry Poster Abstract 49.
- Boyle, Craig D.*; *et al.,* "Biaryl and Heteroaryl Derivatives of SCH 58261 as Potent and Selective Adenosine A2A Receptor

Antagonists"; *Abstracts of Papers,* AMRI Frontiers in Drug Discovery Symposium, Albany, NY, October 5-6, 2006.

- Boyle, Craig D.*; *et al.,* "Biaryl and Heteroaryl Derivatives of SCH 58261 as Potent and Selective Adenosine A2A Receptor Antagonists"; *Abstracts of Papers,* Targeting Adenosine A2A Receptors in Parkinson's Disease and Other CNS Disorders, Boston, MA, May 17-19, 2006; Poster Abstract 1.
- Shah, Unmesh*; Boyle, Craig D.; *et al.,* "Biaryl and Heteroaryl Derivatives of SCH 58261 as Potent and Selective Adenosine A2A Receptor Antagonists"; *Abstracts of Papers,* 230th American Chemical Society National Meeting, Washington, DC, August 28-September 1, 2005; Division of Medicinal Chemistry Poster Abstract 76.
- Boyle, Craig D.*; *et al.,* "Discovery of a PDE5 Inhibitor for the Treatment of Male ED"; *Abstracts of Papers,* 227th American Chemical Society National Meeting, Anaheim, CA, March 28-April 1, 2004; Division of Medicinal Chemistry Oral Paper Abstract 12; part of "First-Time Disclosures of Clinical Candidates" symposium. Featured in C&E News: May 10, 2004; 82(19); p. 43.
- Boyle, Craig D.*; "Piperidino Piperidine M2 Muscarinic Receptor Antagonists for the Treatment of Alzheimer's Disease"; *Invited Guest Lecture,* Columbia University Department of Medicine, February 19, 2004.
- Wang, Yuguang*; Chackalamannil, S.; Boyle, Craig D.; *et al.,* "The Discovery of Sch 444877, A Potent, Selective and Orally Active Cyclic Guanine PDE5 Inhibitor"; *Abstracts of Papers,* 226th American Chemical Society National Meeting, New York, NY, September 7-11, 2003; Division of Medicinal Chemistry Oral Paper Abstract 367.
- Boyle, Craig D.*; *et al.,* "Piperidino Piperidine M2 Muscarinic Receptor Antagonists for the Treatment of Alzheimer's Disease"; *Abstracts of Papers,* 225th American Chemical Society National Meeting, New Orleans, LA, March 23-27, 2003; Division of Medicinal Chemistry Oral Paper Abstract 332; part of "Subtype Selective Muscarinic Receptor Ligands" symposium: invited lecture.
- Boyle, Craig D.*; Lankin, Claire*; *et al.,* "2,4-Diarylimidazoles as Neuropeptide Y Y5 Receptor Antagonists"; *Abstracts of Papers,* 224th American Chemical Society National Meeting, Boston, MA, August 18-22, 2002; Division of Medicinal Chemistry Poster Abstract 335.
- Boyle, Craig D.*, "Pharmacokinetic Improvement of Benzylidene Ketal M2 Muscarinic Receptor Antagonists via Aryl Amide Modification"; 4th Annual Cambridge Healthtech Institute Smarter Lead Optimization Conference, Philadelphia, PA, May 6-8, 2002: *invited lecture.*
- Boyle, Craig D.*; Chackalamannil, Samuel; *et al.,* "Pharmacokinetic Improvement of Benzylidene Ketal M2 Muscarinic Receptor Antagonists via Aryl Amide Modification"; *Abstracts of Papers,* 222nd American Chemical Society National Meeting, Chicago, IL, August 26-30, 2001; Division of Medicinal Chemistry Oral Paper Abstract 11.
- Boyle, Craig D.*; Chackalamannil, Samuel; *et al.,* "Benzylidene Ketal Derivatives as M2 Muscarinic Receptor Antagonists"; *Abstracts of Papers,* 220th American Chemical Society National Meeting, Washington, DC, August 20-24, 2000; Division of Medicinal Chemistry Poster Abstract 114.
- Tagat, J. R.*; McCombie, S. W.; Nazareno, D. V.; Kozlowski, J. A.; Boyle, C.; Josien, H.; Wang, Y.; Zhou, G., "Synthesis of Mono- and Difluoro-1-Naphthoic Acids"; *Abstracts of Papers,* 36th National Organic Chemistry Symposium, Madison, WI, 1999; Abstract 259.

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## Services

Patent
Patent Prosecution
Strategic Patent Counseling & Opinions
Patent Portfolio Management

## Industries

Energy & Chemicals
Life Sciences

## Admissions

U.S. Patent and Trademark Office (2013)
New York (2018)

## Education

J.D., Fordham University School of Law (2017)
Ph.D., Chemistry, Harvard University (1995) Lederle Predoctoral Fellow
B.S. *summa cum laude*, *Phi Beta Kappa*, Chemistry, Lehigh University (1989) National Merit Scholar

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