Curriculum Vitae-Chuan He

Position

John T. Wilson Distinguished Service Professor of Chemistry
Director of Institute for Biophysical Dynamics
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Born 1972, in P. R. China

Education

- University of Science and Technology of China, Bachelor of Science in Chemistry, June, 1994.
- Massachusetts Institute of Technology, Ph.D. in Chemistry, August, 2000 (Adviser, Professor Stephen J. Lippard)
- Harvard University, Postdoc in Chemical Biology, 2000-2002 (Adviser, Professor Gregory L. Verdine)

Employment

- Massachusetts Institute of Technology, Teaching Assistant, 1995-1996
- Massachusetts Institute of Technology, Research Assistant, 1996-1997
- Massachusetts Institute of Technology, Merck/MIT Graduate Fellow, 1997-1999
- Massachusetts Institute of Technology, Research Assistant, 1999-2000
- Harvard University, Damon Runyon Cancer Foundation Postdoctoral Fellow, 2000-2002
- The University of Chicago, Assistant Professor, 2002-2008
- The University of Chicago, Associate Professor, 2008-2010
- The University of Chicago, Professor, 2010-
- The University of Chicago, Director of Institute for Biophysical Dynamics, 2012-
- Investigator of Howard Hughes Medical Institute, 2014-
- The University of Chicago, John T Wilson Distinguished Service Professor, 2014-
- Director of the Synthetic and Functional Biomolecules Center (SFBC) at Peking University, 2011-

Awards

- Merck/MIT Graduate Fellowship, MIT, 1997-1999.
- The Fourth Annual Davison Prize for the Best Thesis in Inorganic Chemistry, MIT, 2001.
- Postdoctoral Fellowship from the Damon Runyon Cancer Research Foundation, 2000-2002.
- Searle Scholar Award, 2003
- Research Corporation Research Innovation Award, 2003
- G&P Foundation for Cancer Research Young Investigation Award, 2004
- W. M. Keck Foundation Distinguished Young Scholar in Medical Research, 2004
- A.P. Sloan Fellow, 2005
- Arnold and Mabel Beckman Foundation Young Investigator, 2005
- Research Corporation Cottrell Scholar, 2005
- National Science Foundation CAREER Award, 2005
- Camille Dreyfus Teacher-Scholar Award, 2006

- CACPA Distinguished Junior Faculty Award, 2007
- Burroughs Wellcome Fund Investigator in the Pathogenesis of Infectious Disease Award, 2008
- Society of Biological Inorganic Chemistry Early Career Award, 2010
- American Chemical Society Akron Section Award, 2010
- Mr. and Mrs. Sun Chan Memorial Award in Organic Chemistry, 2012
- American Chemical Society Cope Scholar Award, 2015

Other Activity

- Member of the Cancer Research Center at the University of Chicago
- Member of the Institute for Biophysical Dynamics at the University of Chicago
- Co-director of the Chemical Biology Training Program at the University of Chicago
- Adjunct Professor, Department of Chemical Biology, Peking University, P. R. China
- Guest Professor, University of Science and Technology of China
- Guest Professor, Nanjing University of Technology
- SBCA Study Section member for National Institutes of Health; ad hoc reviewer for National Science Foundation, Department of Energy Office of Basic Energy Sciences, and Natural Science Foundation of China
- Searle Scholar Advisory Board 2014-
- Advisory Board of *Chem. Rev.*, *Curr. Opion. Chem. Biol.*, and *Curr. Opion. Struct. Biol.*

Selected peer-reviewed publications (in chronological order)

1. He, C. and Lippard, S. J. "Aminoguanidinium Hydrolysis Effected by a Hydroxo-Bridged Dicobalt(II) Complexes", *J. Am. Chem. Soc.* 1998, *120*, 105-113.
2. He, C. and Lippard, S. J. "Modeling Carboxylate-Bridged Dinuclear Active Sites in Metalloenzymes Using a Novel Naphthyridine-Based Dinucleating Ligand", *J. Am. Chem. Soc.* 2000, *122*, 184-185.
3. Kaminskaia, N. V.; He, C. and Lippard, S. J. "Reactivity of μ-Hydroxodizinc(II) Centers in Enzymatic Catalysis through Model Studies", *Inorg. Chem.* 2000, *39*, 3365-3373.
4. He, C.; Victoria, G.; Spingler, B. and Lippard, S. J. "Monodentate-Bridged Phosphodiester and Sulfate Complexes: Structural Insight into the Biological Activation of Phosphodiesters, Sulfate, and Sulfate Esters", *Inorg. Chem.* 2000, *39*, 4188-4189.
5. He, C. and Lippard, S. J. "Design and Synthesis of Multidentate Dinucleating Ligands Based on 1,8-Naphthyridine", *Tetrahedron* 2000, *56*, 8245-8252.
6. He, C. and Lippard, S. J. "Synthesis and Characterization of Several Dicopper(I) Complexes and a Spin-Delocalized Dicopper(I,II) Mixed-Valence Complex Using a 1,8-Naphthyridine-Based Dinucleating Ligand", *Inorg. Chem.* 2000, *39*, 5225-5231.
7. He, C.; Barrios, A. M.; Lee, D.; Kuzelka, J.; Davydov, R. M. and Lippard, S. J. "Diiron Complexes of 1,8-Naphthyridine-Based Dinucleating Ligands as Models for Hemerythrin", *J. Am. Chem. Soc.* 2000, *122*, 12683-12690.
8. He, C. and Lippard, S. J. "Synthesis and Electrochemical Studies of Diiron Complexes of 1,8-Naphthyridine-Based Dinucleating Ligands to Model Features of the Active Sites of Non-Heme Diiron Enzymes", *Inorg. Chem.* 2001, *40*, 1414-1420 (cover story).
9. He, C.; DuBois, J. L.; Hedman, B.; Hodgson, K. O. and Lippard, S. J. "A short Copper-Copper Distance in a (μ-1,2-Peroxo)dicopper(II) Complex Having 1,8-Naphthyridine Unit as an Additional Bridge", *Angew. Chem. Int. Ed.* 2001, *40*, 1484-1487.
10. He, C. and Verdine, G. L. "Trapping Distinct Structural States of a Protein/DNA Interaction through Disulfide Cross-linking", *Chem. Biol.* 2002, *9*, 1297-1303.
11. He, C.; Wei, H. and Verdine, G. L. "Converting the Sacrificial DNA Repair Protein N-Ada into a Catalytic Methyl Phosphotriester Repair Enzyme", *J. Am. Chem. Soc.* 2003, *125*, 1450-1451.

At the University of Chicago since Aug. 2002

12. Mishina, Y. and He, C. “Probing the Structure and Function of *E. coli* DNA Alkylation Repair AlkB Protein through Chemical Crosslinking”, *J. Am. Chem. Soc.* 2003, *125*, 8730-8731.
13. Duguid, E. M.; Mishina, Y. and He, C. “How Do DNA Repair Proteins Locate Base Lesions? A Chemical Crosslinking Method to Investigate O^6-Alkylguanine-DNA Alkyltransferases”, *Chem. Biol.* 2003, *10*, 827-835.
14. Cui, Y. and He, C. “Efficient Aziridination of Olefins Catalyzed by A Unique Disilver(I) Compound”, *J. Am. Chem. Soc*. 2003, *125*, 16202-16203.
15. Chen, P. and He, C. “Constructing Highly Sensitive and Selective Fluorescent Biosensors for Metal Ions by Using the MerR Family Proteins”, *J. Am. Chem. Soc*. 2004, *126*, 728-729.
16. He, C. and Mishina, Y. “Modeling Non-Heme Iron Proteins”, *Curr. Opin. Chem. Biol.* 2004, *8*, 201-208.
17. Mishina, Y.; Lee, C.-H. J. and He, C. “Potential DNA Preferences of Human and Bacterial AlkB Proteins as Revealed from Chemical Crosslink Studies”, *Nucleic Acids Res.* 2004, *32*, 1548-1554.
18. Shi, Z. and He, C. “An Au-Catalyzed Cyclialkylation of Electron Rich Arenes with Epoxides to Prepare 3-Chromanols”, *J. Am. Chem. Soc*. 2004, *126*, 5964-5965.
19. Shi, Z. and He, C. “Efficient Functionalization of Aromatic C–H Bonds Catalyzed by Gold(III) under Mild and Solvent Free Conditions”, *J. Org. Chem*. 2004, *69*, 3669-3671.
20. Cui, Y. and He, C. “A Silver-Catalyzed Intramolecular Amidation of Saturated C–H bonds”, *Angew. Chem. Int. Ed*. 2004, *43*, 4210-4212.
21. Shi, Z. and He, C. “Direct Functionalization of Arenes by Primary Alcohol Sulfonate Esters Catalyzed by Gold(III)”, *J. Am. Chem. Soc*. 2004, *126*, 13596-13597.
22. Mishina, Y.; Chen, L. X. and He, C. “Preparation and Characterization of the Native Iron(II)-Containing AlkB Protein Directly from *Escherichia coli*”, *J. Am. Chem. Soc*. 2004, *126*, 16930-16936.
23. Chen, P.; Greenberg, B.; Taghavi, S.; Romano, C.; van der Lelie, D. and He, C. “An Exceptionally Selective Lead(II)-Regulatory Protein from *Ralstonia Metallidurans*: Development of A Fluorescent Lead(II) Probe”, *Angew. Chem. Int. Ed.* 2005, *44*, 2715-2719.
24. Yang, C.-G. and He, C. “Gold(I)-Catalyzed Intermolecular Addition of Phenols and Carboxylic Acids to Olefins”, *J. Am. Chem. Soc*. 2005, *127*, 6966-6967.
25. Duguid, E. M.; Rice, P. A. and He, C. “Implications for How the Human DNA Repair Protein AGT Locates Damage as Revealed from A Unique X-ray Structure of Its DNA Bound Form”, *J. Mol. Biol*. 2005, *350*, 657-666.
26. He, C.; Hus, J.-C.; Sun, L. J.; Zhou, P.; Norman, D. P. G.; Dötsch, V.; Wei, H.; Gross, J. D.; Lane, W. S.; Wagner, G. and Verdine, G. L. “A Methylation-Dependent Electrostatic Switch Controls DNA Repair and Transcriptional Activation by *E. coli* Ada” *Mol. Cell*. 2005, *20*, 117-129.
27. Li, Z.; Shi, Z. and He, C. “Addition of Heterocycles to Electron Deficient Olefins and Alkynes Catalyzed by Gold(III)” *J. Organomet. Chem*. 2005, *690*, 5049-5054 (an invited contribution).
28. Mishina, Y.; Yang, C.-G. and He, C. “Direct Repair of the Exocyclic DNA Adduct $1,N^6$-Ethenoadenine by the AlkB Proteins” *J. Am. Chem. Soc.* 2005, *127*, 14594-14595.
29. Yang, C.-G.; Reich, N. W. and He, C. “Intramolecular Additions of Alcohols and Carboxylic Acids to Inert Olefins Catalyzed by Silver(I) Triflate” *Org. Lett.* 2005, *7*, 4553-4556.
30. Mishina, Y.; Duguid, M. E. and He, C. “Direct Repair of DNA Alkylation Damage” *Chem. Rev*. 2006, *106*, 215-232.
31. Zhang, J.; Yang, C.-G. and He, C. “Gold(I)-Catalyzed Intra- and Intermolecular Hydroamination of Unactivated Olefins” *J. Am. Chem. Soc.* 2006, *128*, 1798-1799.
32. Brouwer, C. and He, C. “Efficient Gold-Catalyzed Hydroamination of 1,3-Dienes” *Angew. Chem. Int. Ed.* 2006, *45*, 1744-1747.
33. Reich, N. W.; Yang, C.-G.; Shi, Z. and He, C. “Gold(I)-Catalyzed Synthesis of Dihydrobenzofurans from Aryl Allyl Ethers” *Synlett* 2006, *8*, 1278-1280 (an invited contribution).
34. Mishina, Y. and He, C. “Oxidative Dealkylation DNA Repair Mediated by the Mononuclear Non-Heme Iron AlkB Proteins” *J. Inorg. Biochem*. 2006, *100*, 670-678 (an invited review).

35. Li, Z. and He, C. “Recent Advances in Silver-Catalyzed Nitrene, Carbene, and Silylene-Transfer Reactions" *Euro. J. Org. Chem.* 2006, 4313-4322 (an invited review).
36. Li, Z.; Ding, X. and He, C. “Nitrene Transfer Reactions Catalyzed by Gold Complexes” *J. Org. Chem*. 2006, *71*, 5876-5880.
37. Li, Z.; Zhang, J.; Brouwer, C.; Yang, C.-G.; Reich, N. W. and He, C. “Brønsted Acid Catalyzed Addition of Phenols, Carboxylic Acids and Tosylamides to Simple Olefin” *Org. Lett*. 2006, *8*, 4175-4178.
38. Chen, P.; Bae, T.; Williams, W. A.; Duguid, E. M.; Rice, P. A.; Schneewind, O. and He, C. “An Oxidation Sensing Mechanism is Used by the Global Regulator MgrA in *Staphylococcus aureus*” *Nature Chem. Biol*. 2006, *2*, 591-595.
39. Wegner, S. V.; Okesli, A.; Chen, P.; and He, C. “Design of An Emission Ratiometric Biosensor from MerR Family Proteins: A Sensitive and Selective Sensor for Hg^{2+}” *J. Am. Chem. Soc*. 2007, *129*, 3474-3475.
40. Li, Z.; Capretto, D. A.; Rahaman, R. O. and He, C. “A Disilver-Catalyzed Intermolecular Amination of Saturated C–H Groups” *Angew. Chem. Int. Ed*. 2007, *46*, 5184-5186.
41. Brouwer, C.; Rahaman, R. and He, C. “Gold(I)-Mediated Hydrothiolation of Conjugated Olefins” *Synlett* 2007, *11*, 1785-1789 (invited contribution).
42. Li, Z.; Capretto, D. A.; Rahaman, R. O. and He, C. “Gold(III)-Catalyzed Nitrene Insertion into Aromatic and Benzylic C-H groups” *J. Am. Chem. Soc*. 2007, *129*, 12058-12059.
43. Chen, P. R.; Wasinger, E. C.; Zhao, J.; van derLelie, D.; Chen, L. and He, C. “Spectroscopic Insights into Lead(II) Coordination by the Selective Lead(II)-Binding Protein PbrR691” *J. Am. Chem. Soc.* 2007, *129*, 12350-12351.
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45. Shigdel, U. K.; Zhang, J. and He, C. “Diazirine–Based DNA Photocross–Linking Probes for Studying Protein–DNA Interactions” *Angew. Chem. Int. Ed*. 2008, *47*, 90-93.
46. Chen, C.-S.; Karabkova, E.; Chen, H.; Jian, X.; Zhu, J.; Tao, S.-C.; Hu, S.; He, C.* and Zhu, H.* “A Proteome Chip Approach Reveals New DNA Base Damage Recognition Activities in *Escherichia coli*” *Nature Methods*, 2008, *5*, 69-74.
47. Durek, T.; Zhang, J.; He, C. and Kent, S. B. H. “Synthesis of Photoactivatable Analogs of a Cystine Knot Trypsin Inhibitor Protein” *Org. Lett*. 2007, *9*, 5497-5500.
48. Chang, S.; Bray, S. M.; Li, Z.; Zarnescu, D. C.; He, C.; Jin, P. and Warren, S. T. “Identification of Small Molecules Rescuing Morphological, Biochemical and Behavioral Phenotypes of Fragile X Syndrome in *Drosophila*” *Nature Chem. Biol.* 2008, *4*, 256-263.
49. Yang, C.-G.; Yi, C.; Duguid, E. M.; Sullivan, C. T.; Jian, X.; Rice, P. A. and He, C. “Crystal Structures of DNA-RNA Repair Enzymes AlkB and ABH2 Bound to dsDNA” *Nature*, 2008, *452*, 961-965.
50. Chen, P. R. and He, C. “Selective Recognition of Metal Ions by Metalloregulatory Proteins”, *Curr. Opin. Chem. Biol.* 2008, *12*, 214-221.
51. Chen, H.; Hu, J.; Chen, P. R.; Lan, L.; Li, Z.; Hicks, L. M.; Dinner, A. R. and He, C. “The *Pseudomonas aeruginosa* Multidrug Efflux Regulator MexR Uses An Oxidation Sensing Mechanism” *Proc. Natl. Acad. Sci.* 2008, *105*, 13586-13591.
52. Li, Z.; Capretto, D. A. and He, C. “Gold Catalyzed Organic Transformations” *Chem. Rev.* (invited contribution), 2008, *108*, 3239-3265.
53. Li, X.; Ye, S.; He, C.; Yu, Z.-X. "Mechanisms of Brønsted Acid Catalyzed Additions of Phenols and Protected Amines to Olefins: A DFT Study" *Eur. J. Org. Chem.* 2008, *25*, 4296-4303.
54. Shan, G.; Li, Y.; Zhang, J.; Szulwach, K.; Li, Y.; Qin, Y.; Duan, R.; Faghihi, M. A.; Khalil, A.; Lu, L.; Chan, A.; Zhou, D.; Shi, Z.; Liu, Q.; Wahlestedt, C.; He, C. and Jin, P. “A Small Molecule Enhances RNA Interference and Promotes microRNA Processing” *Nature Biotech*. 2008, *452*, 961-965.
55. Jia, G.; Yang, C.-G.; Yang, S.; Jian, X.; Yi, C.; Zhou, Z.; He, C. "Oxidative Demethylation of 3-Methylthymine and 3-Methyluracil in Single-Stranded DNA and RNA by Mouse and Human FTO" *FEBS Letters* 2008, *582*, 3313-3319.

56. Qiu, Z.; Lu, L.; Jian, X.; He, C. "A Diazirine-Based Nucleoside Analogue for Efficient DNA Interstrand Photocross-Linking" *J. Am. Chem. Soc.* 2008, *130*, 14398-14399.
57. Shigdel, U. K. and He, C. "A New 1'-Methylenedisulfide Deoxyribose that Forms Efficient Cross-Link to DNA Cytosine-5 Methyltransferase (DNMT)" *J. Am. Chem. Soc*. 2008, *130*, 17634-17635.
58. Chen, P. R.; Nishida, S.; Poor C. B.; Cheng, A.; Bae,T.; Dunman, P.; Missiakas, D. and He, C. "A New Oxidative Sensing and Regulation Pathway Mediated by the MgrA Homologue SarZ in *Staphylococcus aureus*". *Mol. Microbiol*. 2009, *71*, 198-211.
59. Richter, S; Anderson, V.J.; Garufi, G.; Lu, L.; Budzik, J. M.; Joachimiak, A.; He, C.; Schneewind, O. and Missiakas, D. "Capsule Anchoring in *Bacillus anthracis* Occurs by a Transpeptidation Reaction that is Inhibited by Capsidin" *Mol. Microbiol.* 2009, *71*, 404-420.
60. Yi, C.; Yang, C.-G. and He, C. "A Non-Heme Iron-Mediated Chemical Demethylation in DNA and RNA" *Acc. Chem. Res*. 2009, *42*, 519-529 (invited contribution).
61. Lin, Y.; Zhao, T.; Jian, X.; Farooqui, Z.; Qu, X.; He, C.; Dinner, A. R. and Scherer, N.F. "Using the Bias from Flow to Elucidate Single DNA Repair Protein Sliding and Interactions with DNA" *Biophys. J. 2009*, *96*, 1911-1917.
62. Wegner, S. V.; Boyaci, H.; Chen, H.; Jensen, M. P. and He, C. "Engineering a uranyl specific binding protein from NikR". *Angew. Chem. Int. Ed*. 2009, *48*, 2339-2341.
63. Yang, C.-G.; Garcia, K.; He, C. "Damage Detection and Base Flipping in Direct DNA Alkylation Repair" *ChemBioChem* 2009, *10*, 417-423 (invited contribution).
64. Yang, S.; Li, Z.; Jian, X. and He, C. "Platinum(II)-Catalyzed Intramolecular Cyclization of *o*-Substituted Arylalkynes via sp^3 C-H Activation and 1,4-Hydrogen Migration" *Angew. Chem. Int. Ed*. 2009, *48*, 3999-4001.
65. Poor, C. B.; Chen, P. R.; Duguid, E. M.; Rice, P. A. and He, C. "Crystal Structures of the Reduced, Sulfenic Acid Form and Mixed Disulfide Form of SarZ, a Redox Active Global Regulator in *Staphylococcus aureus*" *J. Biol. Chem*. 2009, *284*, 23517-23524.
66. Jian, X.; Wasinger, E. C.; Lockard, J. V.; Chen, L. X. and He, C. "A Highly Sensitive and Selective Gold(I) Recognition by a Metalloregulator in *Ralstonia metallidurans*" *J. Am. Chem. Soc.* 2009, *131*, 10869-10871.
67. Budzik, J. M.[1]; Poor, C. B.[1]; Faull, K. F.; He, C.* and Schneewind, O.* "Sequential Synthesis of Amide Bonds Enables Pilus Formation on the Surface of Bacilli" *Proc. Natl. Acad. Sci.* 2009, *106*, 19992-19997.
68. Lan, L; Murray, T.S.; Kazmierczak, B. I. and He, C. "*Pseudomonas aeruginosa* OspR is an oxidative stress sensing regulator that affects pigment production, antibiotic resistance and dissemination during infection" *Mol. Microbiol*. 2010, *75*, 76-91.
69. Yi, C. and He, C. "AlkB recognition of a bulky DNA base adduct stabilized by chemical cross-linking" *Sci. China. Chem.* 2010, *53*, 86.
70. Wegner, S.; Arslan, H.; Sunbul, M.; Yin, J; He, C. "Dynamic Copper(I) Imaging in Mammalian Cells with a Genetically Encoded Fluorescent Copper(I) Sensor" *J. Am. Chem. Soc.* 2010, *132*, 2567-2569.
71. Lan, L.; Cheng, A.; Dunman, P. M.; Missiakas, D. and He, C. "Golden Pigment Production and Virulence Gene Expression Are Affected by Metabolisms in *Staphylococcus aureus*" *J. Bacteriol*. 2010, *192*, 3068-3077.
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74. Saikia, M.; Fu, Y.; Pavon-Eternod, M.; He, C.; Pan, T.; "Genome-wide Analysis of N1-methyl-adenosine Modification in Human tRNAs" *RNA* 2010, *16*, 1317-1327.
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77. Li, C.; Sun, F.; Cho, H.; Yelavarthi, V.; Sohn, C.; He, C.; Schneewind, O.; Bae, T.; "CcpA mediates proline auxotrophy and is required for the pathogenesis of *Staphylococcus aureus* infections" *J. Bacteriol.* 2010, *192*, 3883-3892.
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83. Wegner, S. V.; Ertem, E.; Sunbul, M.; He, C.; "Metal-binding properties of Hpn from *Helicobacter pylori* and implications for the therapeutic activity of bismuth" *Chem. Sci.* 2011, *2*, 451-456.
84. Song, C.X.; Szulwach, K.E.; Fu, Y.; Dia, Q.; Yi, C.; Li, X.; Li, Y.; Chen, C.-H.; Zhang, W.; Jian, X.; Wang, J.; Zhang, L.; Looney, T.J.; Zhang, B.; Godley, L.A.; Hicks, L.M.; Lahn, B.T.; Jin, P.*; He, C.* "Selective chemical labeling reveals the genome-wide distribution of 5-hydroxymethylcytosine" *Nat. Biotechnol.* 2011, *29*, 68-72.
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ribonucleotidemutase from Staphylococcus aureus. *Acta Crystallogr. D Biol. Crystallogr.* 2011, *67*, 707-715.
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Inventions

United States Patent 8,741,567
Composition and Methods Related to Modification of 5-Hydroxymethylcytosine (5-hmC) (licensed to Active Motif)

United States Patent Application 14/110,007
Composition and Methods Related to Modification of 5-Methylcytosine (5-mC) (licensed to Wisegene)

United States Patent Application 61/809,103
Single-base Resolution Sequencing of 5-Formylcytosine (5fC) and 5-Carboxylcytosine (5caC) (licensed to Wisegene)

United States Patent Application 61/755,845
Methods and Compositions for Inhibiting Human Copper Trafficking Proteins Atoxi and CCS

United States Patent Application 61/523,154
Protein Scaffolds for Selective Enrichment of Metal Ions

United States Patent Application 61/637,687
Identification of 5-Methyl-C in Nucleic Acid Templates (licensed to PacBio/Wisegene)

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