**ACADEMIC QUALIFICATIONS**

**2020** **D.Sc.**  Institute of Biochemistry and Biophysics, Polish Academy of Sciences

Copper binding of misfolding proteins and peptides implicated in neurodegenerative diseases

**1998–2002** **PhD**  Monash University, Australia
Electron paramagnetic resonance spectroscopy of metalloproteins, radicals, disordered materials

**1994–1997** **Bachelor of Science (Honours)** Monash University, Australia
First class honours (physics), chemistry, applied mathematics

**EMPLOYMENT**

**2022–** Chargé Recherche Expert

Department of Immunology

Pasteur Institute, France

**2018–2021** Group leader

Institute of Biochemistry and Biophysics

Polish Academy of Sciences, Warsaw, Poland

**2017–2018** Senior Research Fellow

Department of Medicine (Royal Melbourne Hospital)

The University of Melbourne, Australia

**2012–2016** ARC Future Fellow (Senior Research Fellow)

Florey Department of Neuroscience and Mental Health

The University of Melbourne, Australia

**2011−2012** Senior Research Fellow

Mental Health Research Institute of Victoria, Australia

**2010−2011** Research Fellow

Max Planck Institute for Bioinorganic Chemistry

Mülheim an der Ruhr, Germany

**2006−2009** Research Fellow

Department of Pathology

The University of Melbourne, Australia

**2004−2006** Research Officer

Centre for Magnetic Resonance

The University of Queensland, Australia

**2002−2004** Postdoctoral Research Fellow

Centre for Magnetic Resonance

The University of Queensland, Australia

**PROJECT**

**Biological chemistry of N-truncated β-amyloid peptides**

Alzheimer’s disease (AD) is widely believed to be caused by a series of pathological events starting with the aggregation of the β-amyloid (Aβ) peptide, typically 40 or 42 residues in length. This amyloid cascade hypothesis focuses on a gain of toxic function in response to impaired Aβ clearance. However, Aβ may have normal biological functions that are lost during ageing and AD. An abundance of Aβ species are N-truncated at Phe4, and these can bind Cu2+ in a redox-silent site with an affinity comparable with those of physiological cuproproteins (*K*a ~1014 M−1). Such N-truncated Aβ species may therefore play a role in binding copper at the synapse, and this function may be lost if Aβ proteostasis is impaired during ageing and AD. This project focusses on the development of Cu2+-sensitive Aβ immunoassays to assess the physiological relevance of this copper binding and its potential as a biomarker of AD.

**FUNDING**

**2021–2023** S.C. Drew(**PLN 1,373,532**), National Science Centre (OPUS-19, NCN, Poland), *Creation and characterisation of synthetic prions*, 2020/37/B/ST4/03722

**2019**  S.C. Drew(**AUD 13,000**), Australian Creutzfeldt-Jakob Disease Support Group Network, Award in memory of Silva Coelho, *Characterisation of spontaneously generated synthetic prions*

**2018** S.C. Drew (**AUD 50,000**),Australian Creutzfeldt-Jakob Disease Support Group Network, “*Grant in memory of Frank Burton, Bassil Gianniodis, Primo Monaci, Rhonda Sanders, Cesarina Stilla and Ross Glasscock and others lost to CJD*”

**2017** S.C. Drew (**AUD 214,148**),MDHS Faculty Research Fellowship, University of Melbourne

**2016** C.L. Haigh, S.C. Drew **(AUD 55,000**), Medicine/Science Grant, CASS Foundation, *Cerebral organoid 'mini-brain' models of Alzheimer's and prion diseases*

**2015** S.C. Drew, C.L. Haigh (**AUD 20,000**), Australian Creutzfeldt-Jakob Disease Support Group Network, Award in Memory of Silva Coelho, *What can we learn from making synthetic prions in a test tube and can we use this knowledge to identify triggers for human prion disease?*

**2013** S.C. Drew et al, (**AUD 710,000**), Australian Research Council, *Extending frontiers of structural chemistry and biology through high resolution pulsed electron paramagnetic resonance*, LE130100061

**2013–2015** S.C. Drew, C.L. Haigh, V.A. Lawson **(AUD 301,931**) National Health & Medical Research Council, *Non-invasive near-infrared optical imaging of neurodegeneration*, APP1044264

**2012–2016** S.C. Drew **(AUD 767,217**), Future Fellowship, Australian Research Council, *Understanding Metallochemistry in Neurobiology using Modern EPR Spectroscopy,* FT110100199

**2009** S.C. Drew, V.A. Lawson, C.L. Haigh **(AUD 23,000**) ANZ Trustees Medical Research & Technology in Victoria Grant, *Optical Imaging of Brain Cell Death in a Live Animal Model*

**2008** S.C. Drew (**AUD 27,324**) Early Career Researcher Grant, University of Melbourne *Unravelling the copper binding properties of Alzheimer’s amyloid β peptide*

**PUBLICATIONS** (**\*** denotes corresponding author)

71. K. Bossak-Ahmad, W. Bal, T. Frączyk, **S.C. Drew\***, *Ternary Cu2+ Complexes of Human Serum Albumin and Glycyl‑L‑histidyl‑L‑lysine*, Inorg. Chem. **2021**,*60*, 16927–16931.

70. I. Ufnalska, **S.C. Drew**, I. Zhukov, K. Szutkowski, U.E. Wawrzyniak, W. Wróblewski, T. Frączyk, W. Bal, *Intermediate Cu(II)-Thiolate Species in the Reduction of CuIIGHK by Glutathione: A Handy Chelate for Biological CuII Reduction*, Inorg. Chem. **2021**,*60*, 18048–18057.

69. **S.C. Drew\***, *Aldehyde production as a calibrant of ultrasonic power delivery during protein misfolding cyclic amplification*, Prot. J. **2020**, *39*, 501–508.

68. K. Bossak-Ahmad, T. Frączyk, W. Bal, **S.C. Drew\***, *The sub-picomolar Cu2+ affinity of human serum albumin*, ChemBioChem **2020**, *21*, 331–334.

67. K. Bossak-Ahmad, M. Wiśniewska, W. Bal, **S.C. Drew**, T. Frączyk, *Ternary Cu(II) complex with GHK peptide and cis-urocanic acid as a potential physiologically functional copper chelate*, Int. J. Mol. Sci. **2020**, *21*,6190.

66. M. Mital, K. Szutkowski, K. Bossak-Ahmad, P. Skrobecki, **S.C. Drew**, J. Poznański, I. Zhukov, T. Frączyk,W. Bal, *ThePalladium(II) Complex of Aβ4−16 as Suitable Model for Structural Studiesof Biorelevant Copper(II) Complexes of N-Truncated Beta-Amyloids*, Int. J. Mol. Sci. **2020**, *21*, 9200.

65. K. Bossak-Ahmad, M. Mital, D. Płonka, **S.C. Drew\***, W. Bal, *Oligopeptides generated by neprilysin degradation of β-amyloid (Aβ) have the highest Cu(II) affinity in the whole Aβ family*, Inorg. Chem. **2019**, *53*, 932–943.

64. M. Akter, N. Drinkwater, S.M. Devine, **S.C. Drew**, C.O. Debono, G. Wang, K. Bankala, P.J. Scammells, S. McGowan, C.A. MacRaild, R.S. Norton, *Identification of the binding site of apical membrane antigen 1 (AMA1) inhibitors using a paramagnetic probe*, ChemMedChem **2019**, *14*, 603–612.

63. M. Mital, W. Bal, T. Frączyk, **S.C. Drew\***, *Interplay between copper, neprilysin and N-truncation of β-amyloid*, Inorg. Chem. **2018**, *57*, 6193–6197.

62. V.A. Streltsov, R. Ekanayake, **S.C. Drew**, C.T. Chantler, S.P. Best, *Structural Insight into Redox Dynamics of Copper Bound N-truncated Amyloid-β Peptides from in situ X-ray Absorption Spectroscopy*, Inorg. Chem. **2018**, *57*, 11422–11435.

61. E. Stefaniak, D. Płonka, **S.C. Drew**, K. Bossak-Ahmad, K.L. Haas, M.J. Pushie, P. Faller, N. E. Wezynfeld, W. Bal, *The N-terminal 14-mer peptide of human Ctr1 can collect Cu(II) from albumin,* Metallomics **2018**, *10*, 1723–1727.

60. S.J. Collins, C. Tumpach, **S.C. Drew**, C.L. Haigh, *Prion protein cleavage fragments regulate adult neural stem cell quiescence through redox modulation of mitochondrial fission and SOD2 expression*, Cell. Mol. Life. Sci. **2018**, *75*, 3231–3249.

59. K. Bossak, **S.C. Drew**, E. Stefaniak, D. Płonka, A. Bonna, W. Bal, *The Cu(II) affinity of the N-terminus of human copper transporter Ctr1: comparison of human and mouse sequences*, J. Inorg. Biochem. **2018**, *182*, 230–237.

58. **S.C. Drew\***, *The case for abandoning therapeutic chelation of copper ions in Alzheimer’s disease*, Front. Neurosci. **2017**, *11*, 317.

57. V.A. Lawson, C. Tumpach, C.L. Haigh, **S.C. Drew\***, *In vivo imaging of neurodegeneration*, Meth. Mol. Biol. **2017**, *1658*, 253–262.

56. **S.C. Drew\***,*An isotopic dilution strategy for characterisation of paramagnetic metal bridging of proteins and peptides*,Biol. Magn. Reson. **2017**, *33*, 1–12.

55. D.A. Simpson, R.G. Ryan, L.T. Hall, E. Panchenko, **S.C. Drew**, S. Petrou, P.S. Donnelly, P. Mulvaney, L.C. L. Hollenberg, *Electron paramagnetic resonance microscopy using spins in diamond under ambient conditions*, Nat. Commun. **2017**, *8*, 458.

54. A. Young, **S.C. Drew**, Si-X. S. Maniam, S.J. Langford, *Systematically Studying the Effect of Fluoride on the Properties of Cyclophanes Bearing Naphthalene Diimide and Dialkoxyaryl Groups*, Chem. Asian J. **2017**, *12*, 1668–1675.

53. M. Mital, I.A. Zawisza, M.Z. Wiloch,U.E. Wawrzyniak,V. Kenche, W. Wróblewski, W. Bal, **S.C. Drew\***, *Copper exchange and redox activity of a prototypical 8-hydroxyquinoline – implications for therapeutic chelation*, Inorg. Chem. **2016**, *55*, 7317–7319.

52. C.L. Haigh, C. Tumpach, S.J. Collins, **S.C. Drew\***, *A 2-substituted 8-hydroxyquinoline stimulates neural stem cell proliferation by modulating ROS signalling*, Cell Biochem. Biophys. **2016**, *74*, 297–306.

51. N.E. Wezynfeld, E. Stefaniak,K. Stachucy, A. Drozd, D. Płonka, **S.C. Drew**, A. Krężel, W. Bal, *Resistance of Cu(Aβ4-16) to copper capture by metallothionein-3 supports a function of Aβ4-42 peptide as synaptic CuII scavenger*, Angew. Chem. Int. Ed. **2016**,*55*, 8235–8238.

50. **S.C. Drew\***, *Probing the quaternary structure of metal-bridged peptide oligomers*, J. Inorg. Biochem. **2016**, *158*, 5–10.

49. M.Z. Wiloch, U.E. Wawrzyniak, I. Ufnalska, A. Bonna, W. Bal, **S.C. Drew**, W. Wróblewski, *Tuning the redox properties of copper(II) complexes with amyloid-β peptides*, J. Electrochem. Soc., **2016**, *163*, G196–G199.

48. K. Bossak, M. Mital, J. Poznańskia, A. Bonna, **S.C. Drew**, W. Bal, *Interactions of α-factor-1, a yeast pheromone, with copper(II) ions and low molecular weight ligands yield very stable complexes*, Inorg. Chem. **2016**, *55*, 7829–7831.

47. T. Frączyk, I. Zawisza, W. Goch, E. Stefaniak, **S.C. Drew**, W. Bal, *On the ability of Cu(Aβ1-x) peptides to form ternary complexes: glutamate is not a ternary partner but may be a relevant competitor*, J. Inorg. Biochem. **2016**, *158*, 30–34.

46. M. Mital, N.E. Wezynfeld,T. Frączyk, M.Z. Wiloch, U.E. Wawrzyniak, A. Bonna, C. Tumpach, K.J. Barnham, C.L. Haigh, W. Bal, **S.C. Drew\***, *A Functional Role for Aβ in Metal Homeostasis? N-Truncation and High-Affinity Copper Binding*, Angew. Chem. Int. Ed. **2015**, *54*, 10460–10464.

45. C.L. Haigh, C. Tumpach, **S.C. Drew**, S.J. Collins, *The prion protein N2 fragment binds to phosphatidylserine and phosphatidic acid; relevance to stress-protection responses*, PLOS ONE **2015**, *10*(8): e0134680.

44. C.L. Haigh, **S.C. Drew\***, *Cavitation during the protein misfolding cyclic amplification (PMCA) method - the trigger for de novo prion generation?* Biochem. Biophys. Res. Commun. **2015**, *461*, 494–500.

43. S.J. Collins, C. Tumpach, Q-X. Li, V. Lewis, T.M. Ryan, B. Roberts, **S.C. Drew**, V.A. Lawson, C.L. Haigh, *The prion protein regulates β-amyloid mediated self-renewal of neural stem cells*, Stem Cell Res. Therap. **2015**, *6*(1):60.

42. **S.C. Drew\***, *α-synuclein and β-amyloid form a bridged copper complex*, Appl. Magn. Reson. **2015**,*46*, 1041–1052.

41. **S.C. Drew\***, *The N terminus of α-synuclein forms CuII-bridged oligomers*, Chem. Eur. J. **2015**, *21*,7111–7118. (“Hot Paper”, including cover art:Chem. Eur. J. **2015**, *21*,7307)

40. G.J. Troup, L. Navarini, F.S. Liverani, **S.C. Drew\***, *Stable Radical Content and Anti-Radical Activity of Roasted Arabica Coffee: From Intact Bean to Coffee Brew*, PLOS ONE **2015**, *10*(4), e0122834.

39. C.L. Haigh, V.A. Lawson, **S.C. Drew**, *Blood vessel cell death during prion disease: implications for disease management and infection control*, Exp. Hematol. **2014**, *42*, 939–940.

38. A.P. Le Brun, C.L. Haigh, **S.C. Drew**, M. James, M.P. Boland, S.J. Collins, *Neutron reflectometry studies define prion protein N-terminal peptide membrane binding,* Biophys. J. **2014**, *107*, 2313–2324.

37. V.B. Kenche, C. Tumpach, K.J. Barnham, S.J. Collins, C.L. Haigh, **S.C. Drew\***, *Development of a neuroprotective antioxidant by a "mix-and-match" strategy*, Oxid. Antioxid. Med. Sci. **2013**, *2*, 255–264.

36. V.B. Kenche, I. Zawisza, C.L. Masters, W. Bal, K.J. Barnham, **S.C. Drew\***, *Mixed Ligand Cu2+ Complexes of a Model Therapeutic with Alzheimer’s Amyloid-β Peptide and Monoamine Neurotransmitters*, Inorg. Chem. **2013**, *52*, 4303−4318.

35. **S.C. Drew\***, W.M. Kok, C.A. Hutton, K.J. Barnham, *Cu2+ Coordination of Covalently Cross-linked β-Amyloid Dimers*, Appl. Magn. Reson. **2013**, *44*, 927–939.

34. X-L. Hou, J-L. Li, **S.C. Drew**, B. Tang, L. Sun, X-G. Wang, *Tuning Radical Species in Graphene Oxide in Aqueous Solution by Photoirradiation*, J. Phys. Chem. C **2013**,*117*, 6788−6793.

33. K.G. Alley, G. Poneti, P.S.D. Robinson, A. Nafady, B. Moubaraki, J.B. Aitken, **S.C. Drew**, C. Ritchie, B.F. Abrahams, R.K. Hocking, K.S. Murray, A.M. Bond, H.H. Harris, L. Sorace, C. Boskovic, *Redox Activity and Two-Step Valence Tautomerism in a Family of Dinuclear Cobalt Complexes with a Spiroconjugated Bis(dioxolene) Ligand*, J. Am. Chem. Soc. **2013**, *135*, 8304–8323.

32. G. Buncic, Z. Xiao, **S.C. Drew**, J.M. White, A.G. Wedd, P.S. Donnelly, *Copper complexes of a novel non-innocent quadridentate ligand*, Chem. Comm. **2012**, *48*, 2570–2572.

31. **S.C. Drew\***, K.J. Barnham, *The Heterogeneous Nature of Cu2+ Interactions with Alzheimer’s Amyloid-β Peptide*, Acc. Chem. Res. **2011**, *44*, 1146–1155.

30. **S.C. Drew\***, J. Baldas, J.F. Boas, *The Unusual Magnetic Resonance Properties of Trigonal Prismatic Tc and Re Complexes*, Appl. Magn. Reson. **2011**, *40*, 427–440.

29. **S.C. Drew\***, E. Reijerse, A. Quentmeier, D. Rother, C.G. Friedrich, W. Lubitz, *Spectroscopic Characterization of the Molybdenum Cofactor of the Sulfane Dehydrogenase SoxCD from Paracoccus pantotrophus*, Inorg. Chem. **2011**, *50*, 409–411.

28. **S.C. Drew**, C.L. Haigh, H. Klemm, C.L. Masters, S.J. Collins, K.J. Barnham, V.A. Lawson, *Optical Imaging of Apoptosis in the Brain and Peripheral Organs of Prion-Infected Mice*, J. Neuropathol. Exp. Neurol. **2011**, *70*, 143–150.

27. G.D. Ciccotosto, D.J. Tew, **S.C. Drew**, D.G. Smith, T. Johanssen, V. Lal, T-L. Lau, K. Perez, C.C. Curtain, J. Wade, F. Separovic, C.L. Masters, J. Smith, K.J. Barnham, *Stereospecific interactions are necessary for Alzheimer's Disease Amyloid-β toxicity*, Neurobiol. Aging **2011**, *32*, 235–248.

26. **S.C. Drew\***, C.L. Masters, K.J. Barnham, *Alzheimer’s Amyloid-β Peptides with Disease-Associated N-Terminal Modifications: Influence of Isomerisation, Truncation and Mutation of Residues on Cu2+ Coordination*, PLoS ONE **2010**, *5*(12): e15875.

25. V.A. Lawson, C.L. Haigh, B. Roberts, H.M.J. Klemm, V.B. Kenche, C.L. Masters, S.J. Collins, K.J. Barnham, **S.C. Drew\***, *Near Infra-Red Fluorescence Imaging of Apoptotic Neuronal Cell Death in a Live Animal Model of Prion Disease*, ACS Chem. Neurosci. **2010**, *1*, 720–727.

24. **S.C. Drew\***, J. Baldas, J.F. Boas, *Theoretical Calculation of the Magnetic Resonance Parameters of Trigonal Prismatic Tris(o-aminobenzenethiol)technetium and-rhenium Complexes*, Inorg. Chem. **2010**, *49*, 6799–6801.

23. A. Rekas, R.K. Knott, A. Sokolova, K.J. Barnham, K. Perez, C.L. Masters, **S.C. Drew**, R. Cappai, C.C. Curtain, C.L.L. Pham, *The structure of dopamine induced alpha-synuclein oligomers*, Eur. Biophys. J. **2010**, *39*, 1407–1419.

22. **S.C. Drew\***, C.L. Masters, K.J. Barnham, *Alanine-2 is an Oxygen Ligand in Cu2+ Coordination of Alzheimer’s Aβ Peptide – Relevance to N-terminally Truncated Forms*, J. Am. Chem. Soc. **2009**, *131*, 8760–8761.

21. **S.C. Drew\***, C.J. Noble, C.L. Masters, G.R. Hanson, K.J. Barnham, *Pleomorphic copper coordination by Alzheimer’s amyloid-β peptide*, J. Am. Chem. Soc. **2009**, *131*, 1195–1207.

20. **S.C. Drew\***, D.J. Tew, C.L. Masters, R. Cappai, K.J. Barnham, *Copper coordination by familial mutants of Parkinson’s disease-associated α-synuclein*, Appl. Magn. Reson. **2009**, *36*, 223–229.

19. **S.C. Drew\***, G.R. Hanson, *Determination of the metal-dithiolate fold angle in molybdenum(V) centers by EPR spectroscopy*, Inorg. Chem.**2009**, *48*, 2224–2232.

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17. **S.C. Drew**, S.L. Leong, C.L.L. Pham, D.J. Tew,C.L. Masters, L.A. Miles, R. Cappai, K.J. Barnham, *Cu2+ Binding Modes of Recombinant α-Synuclein – Insights from EPR Spectroscopy*, J. Am. Chem. Soc. **2008**, *130*, 7766–7773.

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12. **S.C. Drew\***, C.G. Young, G.R. Hanson, *A Density Functional Study of the Electronic Structure and Spin Hamiltonian Parameters of Mononuclear Thiomolybdenyl Complexes*,Inorg. Chem. **2007**, *46*, 2388–2397.

11. **S.C. Drew**, J.P. Hill, I. Lane, G.R. Hanson, R.W. Gable, C.G. Young, *Synthesis*, *Structural Characterization, and Multifrequency Electron Paramagnetic Resonance Studies of Mononuclear Thiomolybdenyl Complexes*, Inorg. Chem. **2007**, *46*, 2373–2387.

10. D.P. Smith, D.G. Smith, C.C. Curtain, J.F. Boas, J.R. Pilbrow, G.D. Ciccotosto, T-L Lau, D.J. Tew, K. Perez, J.D. Wade, A.I. Bush, **S.C. Drew**, F. Separovic, C.L. Masters, R. Cappai, K.J. Barnham, *Copper-mediated Amyloid-β Toxicity Is Associated with an Intermolecular Histidine Bridge*, J. Biol. Chem. **2006**, *281*, 15145–15154.

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6. **S.C. Drew\***, J.F. Boas, J.R. Pilbrow, P.D.W. Boyd, P. Paul, C.A. Reed, *Spin states of C603- and C120On- (n=2-4) anions using electron spin transient nutation spectroscopy*, J. Phys. Chem. B **2003**, *107*, 11353–11359.

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1. J.R. Pilbrow, **S.C. Drew**, *An idea for modelling EPR due to spin probes in disordered systems*, Mol. Phys. Rep. **1999**, *26*, 109–116.