

Zhaoshan Chang

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Working Experience:

2018 –	Professor and Charles Fogarty Endowed Chair	Department of Geology and Geological Engineering, Colorado School of Mines, USA
2012 – 18	Director, EGRU	EGRU (Economic Geology Research Centre), James Cook University
2015 – 18	Associate Professor (Level D)	College of Science and Engineering, James Cook University, Australia
2011 – 14	Senior Lecturer (Level C)	School of Earth and Environmental Sciences, James Cook University, Australia
2008 – 11	Senior Research Fellow (Level C) in Economic Geology	CODES, ARC Centre of Excellence in Ore Deposits, University of Tasmania, Australia
2004 – 08	Research Fellow (Level B) in Economic Geology	CODES, ARC Centre of Excellence in Ore Deposits, University of Tasmania, Australia
2004 – 04	Postdoc Research Associate	Department of Geology, Washington State University, USA
2000 – 03	Teaching Assistant	Department of Geology, Washington State University, USA <i>Nominated for Teaching Assistant Excellence Award in 2001</i>
1997 – 2000	Assistant Professor	Department of Geology, Peking University, China.
1997 –	Consulting	For Ivanhoe (China), Yunnan Datong Exploration (China), Copper Mines Tasmania, Australian Solomons Gold, Venture Minerals, Teck Cominco, Asia Now Resources, Bass Metals, Redriver Resources, Centerra Gold, Torex Gold, Nyrstar, Evolution, Anglo American, Orion Gold, Laguna Gold, etc.

Education:

2000 – 03	Ph.D. degree Economic Geology	Department of Geology, Washington State University, USA.
1992 – 97	Ph.D. degree Economic Geology	Department of Geology, Peking University, China
1988 – 92	B.Sc. degree Petro., Miner., Min. Dep., and Geochem.	Department of Geology, Peking University, China

Professional services:

Editorial activities:

- 2018-2023: Associate Editor, Economic Geology
- 2019-2024: Editorial Board member, Acta Geologica Sinica (English Edition)
- 2015- Associate Editor, Mineralium Deposita
- 2013-2018: Editorial Board member, Acta Geologica Sinica (English Edition)
- 2015-2019: Co-editor, SEG Special Publication v. 22 Mineral Deposits in China
- 2011: Guest editor: An Economic Geology special issue on the geology and mineral deposits of the Philippines

Conference chair or organizing committee member:

- 2017: Chair, FUTORES II conference (Future Understanding of Tectonics, Ores, Resources, Environment and Sustainability), Townsville, Queensland, Australia, 4-7 June 2017 (280 participants from 16 countries).
- 2017: Organising Committee Member, SEG 2017 conference in Beijing, China, 17-20 September 2017
- 2015: Organising Committee Member, SEG 2015 conference in Hobart, Tasmania, 27-30 September 2015
- 2015: Organising Committee Member, AusIMM PACRIM 2015 Congress in Hong Kong, 18-21 March 2015
- 2013: Chair, FUTORES (Future Understanding of Ores, Resources, Environment and Sustainability) conference, 2-5 June 2013, Townsville, Queensland, Australia (247 delegates from 15 countries)
- 2011: Chair, North Queensland Resources Development, 19-20 July 2011, Townsville, Australia

Session convener at international conferences:

- 2018: Session Convener, Special Session S1 New discoveries and new research on skarn deposits, 15th IAGOD Quadrennial Symposium, Salta, Argentina; 28-31 August 2018
- 2018: Session Chair, Mineral Resources of China, PDAC (Prospectors & Developers Association of Canada) conference, Toronto, Canada; 4-7 March 2018
- 2017: Session Chair, Skarn Deposits – Metal Content and Zonation, SEG 2017 Conference, Beijing, China, 17-20 September 2017
- 2016: Convener, Deposit to Camp Scale Ore Systems: Zonation in Space and Time Session chair, AESC (Australian Earth Science Convention), Adelaide, Australia, 26-30 June 2016
- 2015: Chair, Plenary-Keynote session, SEG 2015 conference in Hobart, Tasmania, 27-30 September 2015
- 2015: Co-convener, Skarn and Carbonate Replacement Deposit session, AusIMM PACRIM 2015 Congress in Hong Kong, 18-21 March 2015
- 2013: Co-convener, Skarn deposits – 138 years after Törnebohm session, SGA 2013 conference, 12–15 August 2013, Uppsala, Sweden
- 2008: Convener: Skarns and Replacement Deposits session, PacRim Congress, 24-27 Nov 2008, Gold Coast, Queensland, Australia

Committee chair/coordinator or member of professional organizations:

- 2019 SEG Nominating Committee member
- 2018- SEG (Society of Economic Geologists) mentor
- 2014 - Chair, IAGOD (International Association on the Genesis of Ore Deposits) Working Group on Skarn Deposits
- 2013-2018: QEC (Queensland Exploration Council) Research Working Group member
- 2012-2018: AusIMM North Queensland Branch Committee member
- 2012-2018: SEG (Society of Economic Geologists), Publications Board member
- 2017: Coordinator of the SEG International Exchange Lecturer Sub-committee
- 2015-2016: SEG International Exchange Lecturer Sub-Committee member
- 2013: SEG Nominating Committee member
- 2012: SEG (Society of Economic Geologists), Committee on Committees member

- Judge:** Student poster judge at the SEG 2018 Conference at Keystone, CO, USA; September 22-25, 2018
- Reviewer:** Manuscripts for international journals including Geology, Economic Geology, Mineralium Deposita, Ore Geology Reviews, Geochemical Journal, Journal of Geochemical Exploration, Journal of Asian Earth Sciences, Mineralogical Magazine, SEG (Society of Economic Geologists) Special Publications, and SEG Newsletter.
- Reviewer:** Scientific proposal for the Swiss National Science Foundation (2007) and US National Science Foundation (2019)
- Reviewer:** SEG Student Research Grant (2012-2016; reviewed 92 proposals)
- External examiner:** PhD and MSc theses for University of Tasmania, University of Dar es Salaam, Tanzania, University of Papua New Guinea, and Lakehead University, Canada
- Assessor:** CODES Masters and Honours theses; JCU Honours theses
- Participant:** Theo Murphy High Flyers Think Tank 2010 on 'Searching the Deep Earth: The Future of Australian Resource Discovery and Utilisation', organized by the Australian Academy of Science, Canberra, 19-20 August 2010

Short courses / workshops taught:

Summary: 2007 – 2019, taught in 45 short courses / workshops with 3,416 participants

- 2019: Short course The Geology of Hydrothermal Mineral Deposits, 3-7 January 2019; Golden, Colorado, USA. 70 participants.
- 2018: Short course Indicators, discriminators and vectors for the exploration of skarn, porphyry, epithermal and IOCG deposits, at the Alaska Miners Association 2018 conference, 4 November 2018; Anchorage, Alaska, USA. 48 participants.
- 2018: Short course Skarn Deposits, at CODES, University of Tasmania, Australia. 25 October 2018. 45 participants.
- 2018: Taught in workshop WS04 - Mineral Vectoring in Hydrothermal Ore Deposits: A Multiscale Approach at the SEG 2018 conference, 21-22 September 2018; Keystone, CO, USA. Delivered two presentations. 50 participants.
- 2018: Workshop Skarn Deposits for Compania de Minas Buenaventura, 6-7 September 2018; Lima, Peru. 24 geologists.
- 2018: Short course Exploration for Skarn Deposits, at the 15th IAGOD (International Association on the Genesis of Ore Deposits) Symposium, 27 August 2018; Salta, Argentina. 19 participants.
- 2017: SEG-SGA Workshop Ore Deposit Models and Exploration, Changsha, Hunan, China, 13-17 November 2017. 180 participants. I covered Skarn Deposits and High-Sulfidation Epithermal Deposits.
- 2017: Skarn Deposits, SEG 2017 Conference, Beijing, China. 21 September 2017. 28 participants.
- 2017: Skarn Deposits, FUTORES II Conference, Townsville, Australia. 3 June 2017. 20 participants.
- 2016: Skarn Deposits, for 12 Laguna Gold geologists at the El Toqui mine, Chile. 24 November 2016.
- 2016: SEG-SGA Workshop Ore Deposit Models and Exploration, Guiyang, Guizhou, China, 7-11 November 2016. ~260 participants. I covered Skarn Deposits and High-Sulfidation Epithermal Deposits.
- 2016: IOCG and Other Mineral Systems in the Cloncurry District workshop, 16-18 March 2016, Cloncurry, Queensland, Australia; 78 participants. I am the leading organiser and I gave the introduction and 2 technical presentations.
- 2016: SWIR (Short Wavelength Infra-Red) Techniques Workshop, James Cook University, Townsville, Queensland, Australia. 20-21 April 2016. 10 participants.
- 2015: SEG-SGA Workshop Ore Deposit Models and Exploration, Xi'an, Shaanxi, China, 9-14 November 2015. ~200 participants. I taught Skarn Deposits and High-Sulfidation Epithermal Deposits.
- 2015: Skarn Deposits short course at the SEG 2015 conference, Hobart, Australia; 27 September 2015; 34 participants
- 2015: Skarn Deposits workshop, for Anglo American, 12-13 January 2015, Townsville, Australia; 7 participants
- 2015: Skarn Deposits workshop at the AusIMM PacRim 2015 Conference, 17 March 2015, Hong Kong, China; 21 participants
- 2015: IOCG Deposits – The Cloncurry Experience workshop, 4-6 March 2015, Cloncurry, Queensland, Australia; 47 participants. I am the leading organiser and gave the introduction.
- 2015: Alteration and textures in skarn and porphyry deposits: Recognition and interpretation. James Cook

- University, Townsville, Queensland, Australia. 25-26 June 2015. 37 participants.
- 2014: SEG-SGA Workshop Ore Deposit Models and Exploration, Shanghang, Fujian, China, 10-15 December 2014. 300 participants. I covered Skarn Deposits and High-Sulfidation Epithermal Deposits.
- 2014: Skarn Deposits short course, Lima, Peru, 29 June – 1 July 2014; 50 participants
- 2014: Alteration and textures in skarn and porphyry deposits: Recognition and interpretation. James Cook University, Townsville, Queensland, Australia. 19-20 June 2014. 47 participants.
- 2014: SWIR (Short Wavelength Infra-Red) Techniques Workshop, James Cook University, Townsville, Queensland, Australia. 24-25 April 2014. 10 participants.
- 2013: SEG-SGA Workshop Ore Deposit Models and Exploration, Hefei, China, 10-16 January 2014. 320 participants. I taught Skarn Deposits and High-Sulfidation Epithermal Deposits.
- 2013: Skarn Deposits, Universidad Nacional de Ingenieria, Lima, Peru, 30 June 2013; 45 participants
- 2013: SEG-SGA Workshop Ore Deposit Models and Exploration, Guangzhou, China, 14-19 January 2013. >200 participants. I taught Porphyry Deposits and Skarn Deposits.
- 2013: Geochemistry in Mineral Exploration. James Cook University, Townsville, Queensland, Australia. 25 April 2013. 11 participants.
- 2012: SEG 2012 post-meeting short course Skarn Deposits, Lima, Peru, 27 September 2012. 45 participants.
- 2011: SGA 2011 pre-meeting short course Skarn Deposits, Antofagasta, Chile, 25 September 2011. 13 participants.
- 2011: SEG-SGA-CGS Workshop Ore Deposit Models and Exploration, Beijing, China, 31 October - 3 November 2011. >200 participants. I taught Skarn Deposits and High-Sulfidation Epithermal Deposits.
- 2011: CODES Masters Short Course Ore Deposit Geochemistry, Hydrology and Geochronology, Hobart, Australia, 30 May - 10 June 2011. 37 participants. I taught Fluid Inclusions and Deep Resources Exploration: Lessons from Mankayan, Philippines
- 2011: SWIR (Short Wavelength Infra-Red) Techniques Workshop, University of Tasmania, Hobart, Tasmania. 20 April 2011. 9 participants.
- 2011: SWIR (Short Wavelength Infra-Red) Techniques Workshop, James Cook University, Townsville, Queensland, Australia. 25 November 2011. 11 participants.
- 2010: CODES Masters Short Course Ore Deposit Models and Exploration Strategies, Hobart, Australia, 1-12 November 2010. 37 participants. I taught Skarn Deposits and High-Sulfidation Epithermal Deposits
- 2010: SEG-SGA-CUG Workshop Ore Deposit Models and Exploration, Wuhan, China, 24-29 May 2010. 262 participants. I taught Skarn Deposits and High-Sulfidation Epithermal Deposits.
- 2010: AMIRA P765A Workshop Geochemical and Geological Halos in Green Rocks and Lithocaps, Manila, Philippines, 17-18 May 2010, for 25 Freeport-McMoran geologists from Philippines, Indonesia and USA. I presented on lithocaps.
- 2010: AMIRA P765A Workshop Geochemical and Geological Halos in Green Rocks and Lithocaps, Lima, Peru, 16 June 2010, for 32 geologists from 9 companies. I presented on lithocaps.
- 2010: AMIRA P765A Workshop Geochemical and Geological Halos in Green Rocks and Lithocaps, Lima, Peru, 21 June 2010, for 34 geologists from 10 companies. I presented on lithocaps.
- 2010: SWIR (Short Wavelength Infra-Red) Techniques Workshop, in University of Tasmania, Hobart, Tasmania. 04 June 2010. 8 participants.
- 2010: SWIR (Short Wavelength Infra-Red) Techniques Workshop, in University of Tasmania, Hobart, Tasmania. 19 February 2010. 8 participants.
- 2009: SEG-SGA-CUGB Short Course on Ore Deposit Models and Exploration, Beijing, China, 4-8 Nov 2009. > 200 participants. I lectured on Skarn Deposits.
- 2009: SWIR (Short Wavelength Infra-Red) Techniques Workshop, in University of Tasmania, Hobart, Tasmania. 08 September 2009. 8 participants.
- 2008: SEG-SGA-CUGB Short Course on Ore Deposit Models and Exploration, Kunming, China, 1-5 Nov 2008 (Report in SEG Newsletter, No. 78, July 2009, p. 26). ~300 participants. I lectured on Skarn Deposits.
- 2008: SWIR (Short Wavelength Infra-Red) Techniques Workshop, in University of Tasmania, Hobart, Tasmania. 19 June 2008. 7 participants.
- 2007: SWIR (Short Wavelength Infra-Red) Techniques Workshop, in University of Tasmania, Hobart, Tasmania, 17 June 2007. 7 participants.

External field trips led:

Summary: 2005 – 2017, led 11 field trips with 113 participants

- 2017: Post-FUTORES II conference field trip: Epithermal and Porphyry Au-Cu Deposits in the Mt Carlton - Ravenswood - Pajingo District, NE Queensland, Australia; 8-10 June 2017. 12 participants.
- 2017: SEG Student Chapter (JCU) international field trip: Fijian Porphyry and Epithermal Deposits, 12-18 June 2017. 8 participants.
- 2016: SEG Student Chapter (JCU) international field trip: Low-Sulfidation systems of Patagonia, 22 November – 5 December 2016. 18 participants. I led 4 days in the first half.
- 2016: SEG Student Chapter (JCU) domestic field trip: Mt Wright Au deposit, NE Queensland, Australia, 25 September 2016. 17 participants.
- 2014: SEG Student Chapter (JCU) domestic field trip: Pajingo low-sulfidation epithermal Au deposit, NE Queensland, Australia, 10 October 2014. 15 participants.
- 2013: Post-FUTORES conference field trip: IOCG, SEDEX and Skarn Deposits in the Mt Isa – Cloncurry Region, North Queensland, Australia; 6-10 June 2013. 13 participants.
- 2013: SEG Student Chapter (JCU) domestic field trip: Mt Carlton high-sulfidation epithermal Au-Cu-Ag deposit, NE Queensland, Australia, 9 November 2013. 12 participants.
- 2013: SEG Student Chapter (JCU) domestic field trip: Ravenswood mineral district, NE Queensland, Australia, 23 June 2013. 15 participants.
- 2013: SEG Student Chapter (JCU) domestic field trip: Charters Towers Gold Field / Warrior underground Au mine, NE Queensland, Australia, 25 May 2013. 9 participants.
- 2012: SEG Student Chapter (JCU) domestic field trip: Pajingo epithermal gold deposit, NE Queensland, Australia, 14 September 2012. 15 participants.
- 2005: AMIRA Project P765 field conference and trips in northern Luzon, Phillipines. I led the trip to the Mankayan District on 14 April 2015. 20 participants.

Invited presentations (43):

- 2019: Keynote presentation: “Zonation in Skarn Deposits”. 33rd International Mining Convention; Acapulco, Mexico. 22-25 October 2019.
- 2019: Invited presentation: “High-sulfidation (HS) epithermal deposits”. BHP Regional office Regional Office at Santiago, Chile. 19 July 2019.
- 2019: Invited presentation: “Skarn Deposits”. Candelaria Mine, Chile. 18 July 2019.
- 2019: Invited presentation: “Ernest Henry Iron oxide Cu-Au (IOCG) deposits, Cloncurry District, Queensland, Australia”. Candelaria Mine, Chile. 17 July 2019.
- 2018: Invited presentation “Metal Transportation for High-Sulfidation Epithermal Deposits: A New Model”, Gordon Research Conference on Geochemistry of Mineral Deposits, Waterville Valley, NH, USA. 5-10 August 2018
- 2018: Keynote presentation “Skarn deposits of the MLYB – a global perspective”, MLYB (Middle and Lower Yangtze Metallogenic Belt) Conference, Hefei, China. 9-14 July 2018
- 2018: Invited presentation “Skarn Deposits of China”, PDAC (Prospectors & Developers Association of Canada) conference, March 3 - 6, Toronto, Canada
- 2018: Invited presentation “Endoskarns”, at the Institute of Geology, Chinese Academy of Geological Sciences, Beijing. 18 September 2018.
- 2018: Invited presentation “Mineral geochemistry and its application in exploration”, at the Chinese University of Geosciences, Beijing. 17 July 2018.
- 2018: Invited presentation “Skarn deposits replacing igneous rocks”, at the Institute of Geology and Geophysics, Chinese Academy of Science, Beijing. 16 July 2018.
- 2017: Invited presentation “An overview of Sn-W Metallogeny in NE Queensland” at the Mines and Wines Conference, Orange, New South Wales, Australia. 7-8 September 2017.
- 2017: Invited presentation “Mineral geochemistry and its application in exploration” at China University of Geosciences, Wuhan. 10 May 2017
- 2016: Invited presentation at the Queensland Exploration Council 2016 Seminar “Exploration outside the Box”, Brisbane, Queensland, Australia. 17 February 2016
- 2015: Invited presentation at the Queensland Exploration Council 2015 Seminar “New Initiatives in Exploration”, Brisbane, Queensland, Australia. 18 February 2015

- 2014: Invited presentation to geologists at Mt Isa Mines, a Glencore-Xstrata company in Queensland, on skarn deposits. 5 March 2014
- 2013: Keynote speaker, The Papua and Maluku Resources 2013 conference, organized by the Indonesian Society of Economic Geologists (MGEI), Bali, Indonesia, 30 November – 3 December 2013
- 2013: AIG (Australian Institute of Geologists) / BEDG (Brisbane Exploration Discussions Group) symposium Geochemistry in Exploration – Geochemistry Is the New Black, Brisbane, Australia, 22 February 2013: **Chang, Z.**, White, N.C., Hedenquist, J.W., and Cooke, D.R., New geochemical tools for porphyry and high-sulfidation epithermal deposits exploration (Keynote)
- 2013: Invited presentations, Institute of Geochemistry, Guiyang, Chinese Academy of Science, 17-18 December 2013
- 2013: Invited presentation: Chinese Academy of Geological Sciences, Beijing, 19 December 2013
- 2013: Invited presentation: Peking University, Beijing, China, 20 December 2013
- 2013: Invited presentation: Institute of Mineral Resources, Chinese Academy of Geological Sciences, 7 January 2013: **Chang, Z.**, White, N.C., Hedenquist, J.W., and Cooke, D.R., New methods for porphyry deposit exploration
- 2013: Invited presentation: China University of Geosciences, Beijing, 8 January 2013: **Chang, Z.**, Porphyry deposits
- 2013: Invited presentation: Hefei University of Technology, 13 January 2011: **Chang, Z.**, White, N.C., Hedenquist, J.W., and Cooke, D.R., New methods for porphyry deposit exploration
- 2013: Hefei University of Technology, 12 January 2011: **Chang, Z.**, SWIR spectral techniques and their geological applications
- 2012: Invited presentation: IGC, Brisbane, 5-10 August 2012: **Chang, Z.**, Hedenquist, J.W., White, N.C., Cooke, D.R., Deyell, C., Garcia, J., Jr., and Cuison, A.L., Exploring for buried porphyry and high-sulfidation epithermal deposits using signals in lithocaps: Implications from the Lepanto-FSE system, Philippines
- 2011: Keynote presentation: Frontiers in Mineral Systems: The Inaugural Solomon Meeting, Caves House, Yallingup, Western Australia, 8 - 13 May 2011: **Chang, Z.**, White, N.C., Hedenquist, J.W., Cooke, D.R., Ana Liza Cuison, Garcia, J. Jr., and Deyell, C.L., The Lepanto – FSE system, Philippines: Implications for exploration and high sulfidation mineralisation
- 2011: Invited presentation: Institute of Geology, Chinese Academy of Geological Sciences, 14 November 2011: **Chang, Z.**, White, N.C., Hedenquist, J.W., Cooke, D.R., Ana Liza Cuison, Garcia, J. Jr., and Deyell, C.L., Exploration and genesis of high sulfidation epithermal deposits: Implications from the Lepanto – FSE system, Philippines
- 2009: Invited presentation: ProExplo 2009 – 6th International Congress of Prospectors and Explorers, Lima, Peru: **Chang, Z.**, Hedenquist, J.W., White, N.C., Cooke, D.R., Deyell, C.L., and Garcia, J. Jr., New tools for exploring lithocaps: Example from the Mankayan intrusion-centered Cu-Au district, Luzon, Philippines
- 2009: Invited presentation: Hefei University of Technology, China: High Sulfidation Epithermal Deposits
- 2009: Invited presentation: Zijin Mining Group Co., Ltd.: 1) High Sulfidation (HS) Epithermal Deposits; 2) Zonation in skarns and the controlling factors
- 2008: Keynote presentation: The 9th National Conference on Mineral Resources of China, Beijing, 7-10 November 2008: **Chang, Z.**, and Meinert, L.D., Zonation in skarns: Complexities and controlling factors
- 2008: Invited presentation: University of Cajamarca, Cajamarca, Peru: Alteration and mineralization in the Mankayan District, Philippines
- 2005: Invited presentation: Institute of Geology and Geophysics, Chinese Academy of Science, Beijing, China: The magmatic-hydrothermal transition - evidence from quartz phenocryst textures and endoskarn abundance in Cu-Zn skarns at the Empire Mine, Idaho, USA
- 2005-2014: Presentations to geologists at Batu Hijau (Indonesia), Yanacocha (Peru; twice), Tantahatay (Peru), Cerro Corona (Peru), Antamina (Peru), Timok (Serbia), Chelopech (Bulgaria)

Countries worked in:

Australia, Argentina, Bulgaria, Canada, Chile, China, Côte d'Ivoire, Fiji, Indonesia, Laos, Mexico, Mongolia, Peru, PNG, Philippines, Russia, Serbia, USA (18 countries)

Professional Societies:

Society of Economic Geologists (SEG), Fellow
Geological Society of America (GSAm), Member
Society for Geology Applied to Mineral Deposits (SGA), Member
Australian Institute of Geoscientists (AIG), Member
AusIMM, Member

Honors and Awards:

2020 SEG (Society of Economic Geologists) International Exchange Lecturer
2017 Award for Excellence in Research, James Cook University, Australia
2012 AMIRA (Australian Mineral Industries Research Association) Award 2012 for Geoscience Research Excellence, for research into geochemical vectors as used in exploration for porphyry-related mineralisation, as a member of the P765/P75A team
2011 – Guest Research Fellow, Institute of Geology, Chinese Academy of Geological Sciences
2009 – 2012 Guest Professor, China University of Geosciences, Beijing
2003 Bronze Medal, Remick Poster Awards competition, Annual meeting of Geological Association of Canada (GAC) (top 3 out of approximately 175 posters)
2003 The Joseph W. Mills Endowment Award, Geology Department, Washington State University
2002 2nd prize in student poster contest. Annual meeting of NWMA (Northwest Mining Association, USA)
2002 The Joseph W. Mills Endowment Award, Geology Department, Washington State University
2001 The Roger V. LeClerc Fellowship “Outstanding Graduate Student in Geology”, Geology Department, Washington State University
1999 The Gangsong Award for teaching excellence, Peking University, China

Supervision:

- Postdoctoral research associates: 4, including 2 completed and 2 on-going
- PhD: 15, including 6 completed (1 at Peking University; 2 at CODES, U Tas; 3 at JCU); 9 on-going (JCU; 7 as primary supervisor and 2 as co-supervisor).
- Honours: 15 completed (2 at CODES; 13 at JCU)

Computer and GIS Skills:

- ArcGIS, MapInfo
- Programming with Visual Basic Application in Microsoft Excel
- Microsoft Office, Photoshop, Adobe Illustrator, Acrobat, CorelDraw, etc., on PC and MAC

Lab Experience:

- LA-ICP-MS (Laser Ablation – Inductively Coupled Plasma – Mass Spectrometry) U-Pb dating of zircons (- Publication in G^3 – Geochemistry, Geophysics, Geosystems)
- LA-ICP-MS in situ trace element analysis of minerals
- PIXE trace element imaging and quantification
- SWIR (Short Wavelength Infra-Red) spectral analysis, using PIMA, ASD TerraSpec, spectTERRA and PNIRS
- Cu isotope analysis; solution preparation and measurement with Multi-Collector ICP-MS (ThermoFinnigan Neptune)
- O isotope measurement with laser fusion sample introducing system
- Fluid inclusion thermometric measurements; managing:
 - Linkam MDS 600 stage, University of Tasmania, Australia
 - Linkam THMSG 600 stage, and USGS gas flow stage at Washington State University, USA

- Chaixmeca heating/freezing stage, and USGS 1350 heating stage at Peking University, China

- XRD analysis
- Microprobe, BSE, SEM, and cathodoluminescence analysis
- Clay separation
- Feldspar staining

Research Projects:

2019	Distal signatures and vectors of hydrothermal systems in carbonates	NSF I/U CRC Center CASERM (US\$60,710)
2017	Geological characteristics and genesis of the Artemis Cu-Au deposit, Cloncurry District, Queensland, Australia – Honours project	Minotaur Exploration Ltd (AU\$8,500)
2016	North Queensland Raman Spectroscopy for Tropical Applications – participation	JCU + EGRU (AU\$99,985)
2015	Magnetite geochemistry and its implication on the genesis of magnetite in laminated rocks in the E1 IOCG deposit, Cloncurry District, Queensland, Australia	Mt Isa Mines, Glencore Xstrata (AU\$7,700)
2014-17	Characterising and assessing prospectivity of intrusion-related hydrothermal mineral systems in north-east Queensland – Chief Investigator	Geological Survey of Queensland (AU\$1,779,480)
2014-17	Geological characteristics and genesis of Mt Carlton high-sulfidation epithermal deposit, and the implications for exploration – Chief investigator	Evolution Mining (AU\$150,000)
2014	Geological characteristics and ore genesis of the Buck Reef West gold deposit, Ravenswood, Queensland, Australia – Honours project	Carpentaria Gold Pty Ltd (AU\$10,130)
2014	Sr isotope compositions of carbonates in the Ernest Henry deposit, Queensland, Australia – Honours project	Glencore Xstrata (AU\$6,320)
2013-16	Uplift history, intrusive sequence, and skarn mineralisation at the giant Antamina deposit, Peru (PhD project) – Primary supervisor	Compañía Minera Antamina S.A. (AU\$200,250)
2013	Sources of metals and sulfur for post-collisional porphyry Cu deposits: A case study from the Qulong copper deposit, Tibet (Zhiming Yang, Zhaoshan Chang , Liangsheng Ge)	National Natural Sciences Foundation of China (850,000 Chinese Yuan = ~AU\$130,000)
2013-16	Intraplate Mineralization Research Team (KZZD-EW-TZ-20), hosted in the Institute of Geochemistry, Guiyang, Chinese Academy of Science – Participation	Chinese Academy of Science and State Administration of Foreign Experts Affairs, the P.R. of China, International Partnership Program for Creative Research Teams (~AU\$1,000,000)
2013	Alteration zonation in the Tennant Creek Mineral Field, Northern Territory (Honours Project) – Main supervisor	Emmerson Resources Limited (AU\$7,030)
2012	Ore Genesis and Alteration Paragenesis of the E1 Group of IOCG Deposits, Cloncurry Region, North West Queensland	Xstrata Copper Exploration (AU\$94,000)

2012	Mineralisation processes in high-sulfidation epithermal Au-Cu deposits: Insight from quartz fluid inclusion, stable isotope, and trace element compositions	JCU Faculty of Science and Engineering Grant (AU\$13,000)
2012	Purchase of a SWIR instrument - specTERRA	JCU Research Infrastructure Block Grants (AU\$25,000)
2012	Trace elements in garnet and the implications to skarn and porphyry exploration	JCU Level 2 Research Centre project (AU\$3,125)
2012	Mineralisation process in high-sulfidation epithermal Au-Cu deposits: insight from pyrite geochemistry	AINSE (AU\$17,575)
2012	Study of the Ben Lomond uranium and molybdenum deposit, Hervey Range, Queensland, Australia (Honours Project) – Main supervisor	- Mega UMVI Ltd. (AU\$8,555)
2012	Zonation, paragenesis, and origin of the Iron Glen Fe skarn, Queensland, Australia (Honours Project) – Main supervisor	Terra Search (AU\$5,200)
2012	Paragenesis and alteration zonation of the Candelabro porphyry Cu-Mo project, Chile (Honours Project) – Main supervisor	Chinalco Yunnan Copper Resources Limited (CYU) (AU\$6,460)
2012	Geological characteristics and ore genesis of the Welcome gold Prospect, Mingela, Queensland, Australia (Honours Project) – Main supervisor	Carpentaria Gold Pty Ltd (AU\$10,745)
2011	Geology and exploration of the Morelos Au skarn prospect, Guerrero, Mexico – Consultant	Minera Media Luna SA de CV (US\$7,410)
2011	Training on SWIR techniques and PNIRS operation - Consultant	Centerra Gold (US\$3,000)
2010	Efficiency in ore-forming processes - Chief investigator	CODES Project P2.A3 (AU\$14,000)
11/2009 – 05/2010	Geological and Geochemical Vectors to Epithermal Silver-Gold Mineralization, Ares Mine, Araquepa, Peru - Co-supervisor of a postdoc	Compania Minera Ares S.A.C (AU\$95,014, half a year)
2008-2010	Geochemical and geological halos in green rocks and lithocaps – The explorers’ tool box for porphyry and epithermal districts - Co-leader Study sites include: Peru : Yanacocha, Minas Conga and Tantahuatay; Chile : El Teniente, Collahuasi and Cerro Casale; Mexico : Ixhuatan; Mongolia : Shuteen; Serbia : Timok district; Bulgaria : Chelopech; Indonesia : Batu Hijau; Philippines : Baguio district and Mankayan district	AMIRA P765A (AU\$2,091,600) Sponsored by 18 companies: Anglo American, AngloGold Ashanti, Barrick, Buenaventura, Codelco, Dundee, Equinox, Freeport-McMoran, Gold Fields, Kinross, MMG, Newcrest, Newmont, Rio Tinto, St Barbara, Teck, Vale and Xstrata Copper
2009	Application of PIXE technologies to hydrothermal processes: mineral trace element zoning and composition of single fluid inclusions - Chief investigator	CODES Project P5.F5 (AU\$9,300)
2008	Trace element mapping in alunite by PIXE and its implications to the genesis of lithocaps - Chief investigator	CODES Project P5.F5 (AU\$11,000)

04/2007 – 03/2009	Caijiaying Zn-Au deposit, China: Geological characteristics and their implications for exploration - Chief investigator	Industry funding (AU\$100,000, 2 years)
2006-2007	Zn and Au mineralization in the Caijiaying deposit: geologic characteristics and genesis - Chief investigator	CODES Project P2.N2 (AU\$18,000)
2005-2007	Controls on the formation and sulfide trace element signatures of sediment-hosted gold deposits - Worked on the Sukhoi Log deposit, Russia	AMIRA P923 (AU\$297,000) Sponsors: Barrick, Golden Gryphon, Newcrest, Newmont, Perseverance, Placer Dome, St Barbara
2004-2006	Transitions and zoning in porphyry – epithermal districts: Indicators, discriminators and vectors - Responsible for studies on porphyry–epithermal districts in SW Pacific (Philippines and Indonesia)	AMIRA/ARC P765 (AU\$793,080) Sponsors: Anglo American, AngloGold Ashanti, Barrick, Gold Fields, Newcrest, Newmont, and Teck Cominco
2001-2002	The influence of source, temperature, and mineralogy on Cu isotope compositions and fractionation - Chief investigator	Funded by Geological Society of America (GSA) Student Research Grant
2000-2003	Magmatic-hydrothermal transition, skarn formation and mineralization at the Empire Mine, Idaho, USA. - Chief investigator - Worked closely with Sultana Resources, LLC	Funded by WSU Geology Department Research mini-grant (2002, 2003), and SEG Student Research Grant (2002)
1999-2000	Structural-thermal evolution of the Yagan Metamorphic Core Complex - Constrained P-T conditions using fluid inclusions	Funded by National Science Foundation of China
1997-2000	Metallogeny of Cu-Au deposits in the Tiange'r–Baluntai district - Investigated Cu deposits in the Gongnaisi area	Funded by Project 305, Chinese Science Foundation
1997-1998	Late stage evolution of Mesozoic intermediate–acidic magmas in southern Taihang Mountains and western Shandong Province - Chief investigator	Funded by Peking University Young Scientist Foundation

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1. Mrozek, S., **Chang, Z.**, Spandler, C., Windle, S., Raraz, C., and Paz, A., 2020, Using whole rock geochemistry to optimize skarn classification and evaluate element mobility during skarn formation: An example from the Antamina deposit, Peru: *Economic Geology*, v. 115, p. 177-188.
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