David Annetts

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Professional Experience

2025–Present **Consultant**, *Aegis Geophysics*

2010–2024 **Senior Research Scientist**, *CSIRO (Kensington, WA)*

- Designed a large forward modelling study then used the results to make the case for the development of dc SQUID DHEM sensors;
- Project leader: Thin plates electromagnetic modelling kernel;
- Project leader: Layered-earth electromagnetic modelling kernel;
- Project leader: Thick plates electromagnetic modelling kernel;
- Initiated industry and academic support for electromagnetic modelling codes (AMIRA P223 Suite);
- Set up web pages for team & research program & trained staff to maintain them;
- Team leader (between four and six people) between 2018 and 2019;
- Established baseline target detectability requirements for airborne electromagnetic (AEM) prospecting surveys;
- Showed limitations of electric field based geophysical prospecting for the exploration for palaeochannel-hosted uranium;
- Showed limitations of AEM for the exploration for palaeochannel-hosted uranium;
- Applied machine-learning techniques to automatically interpret geology from AEM data in the La Grange Allocation Area, WA;
- Characterised sea-water intrusion and parameters of the La Grange aquifer in the La Grange Allocation Area, WA;
- Interpreted palaeochannel geometries for uranium exploration in Frome Embayment, SA;
- Lead research project investigating the applications of multi-dimensional Bayesian inversion of AEM data to mineral exploration.

2007–2010 **Electromagnetics Geophysicist**, *CSIRO (North Ryde, NSW and Kensington, WA)*

- Lead multi-organisation research project investigating geophysical monitoring and verification of CO_2 sequestration in off and on-shore deep saline aquifers.
- Numerically-modelled EM response of SQUID gradiometers for marine CSEM hydrocarbon surveys; and
- Provided user support to industry for legacy electromagnetic (EM) modelling codes (AMIRA P223 Suite);

2005–2006 **Geophysicist**, *Midspar Systems (Cronulla, NSW)*

- Derived bathymetry near entrance to St Vincent Gulf, SA from AEM data using layered earth inversions.

2001–2004 **Electromagnetics Modelling Analyst**, *CSIRO (North Ryde, NSW)*

- Showed the benefits of using realistic geological models in typical exploration scenarios;
- Designed, implemented & maintained a 10-node computing farm which replaced a multi-million dollar super computer, saving costs and increasing modelling throughput; and
- Introduced and implemented cost-effective visualisation of current flow in 3D models;
- Conducted industry training programs for use of complex EM modelling packages (*Maxwell* & *EMGUI*); and
- Rigorously tested the accuracy of forward electromagnetic modelling codes

2000 **Geophysicist**, *Lamontagne Geophysics (Dural, NSW)*

- Derived bathymetry for Geographé Bay, WA from AEM data using layered earth inversions; and
- Showed the limitations of AEM methods when used for direct detection of sunken ships.

1995–2000 **PhD Student** / **Network administrator**, *Macquarie University (North Ryde, NSW)*

- Combined studies with network administration for a 20-person workgroup.

Professional Experience (ctd.)

1993–1994 **Geophysicist**, *Geoterrex Pty. Ltd. (Artarmon, NSW)*

- Improved reporting of survey results to clients from months to less than a week by streamlining reporting procedures;
- Designed & implemented data processing system in Geosoft *Oasis* which improved all aspects of EM, IP & magnetics data processing through consistent interface and sensible default values; and
- Managed client liaison, data collection & processing for down-hole electromagnetic data as a crew chief on down hole EM & frequency-domain EM environmental surveys.
- Responsible for data processing & collection as a crew member on TEM & IP surveys.

1989 **Experimental Scientist**, *BHP-Utah Pty. Ltd. (North Ryde, NSW)*

- Catalogued CSIRO's analogue modelling studies for ease of use; and
- Modelled the TEM response of a Kambalda-style NiS deposit for a novel ground survey configuration using scale-modelling techniques.

Education

1995–2000 Doctor of Philosophy, *Exploration Geophysics*
Macquarie University
Analysis and interpretation of the AEM response of the regolith

1989–1992 Master of Science, *Exploration Geophysics*
The University of Sydney
Applications and interpretation of multiple-coverage moving fixed-loop transient electromagnetic surveys

1984–1988 Bachelor of Science (Honours), *Exploration Geophysics & Mathematics*
The University of Sydney
Analogue modelling of current channelling and inductive interaction using TEM

Professional service

2023–Present	Society of Research Software Engineering (Active Member)
2021–Present	European Association of Geoscientists and Engineers (Active Member)
2021–2022	Australian Society of Exploration Geophysicists Immediate Past President
2020–2021	Australian Society of Exploration Geophysicists President (Director)
2019–2020	Australian Society of Exploration Geophysicists President Elect (Director)
2019–2021	Australian Geoscience Council Representative (ASEG)
2018–Present	Association of Computing Machinery Fortran Special Interest Group
2016–2018	Associate Editor, *Exploration Geophysics*
2015–2021	Australian Society of Exploration Geophysicists Federal Executive
2015–2018	Australian Society of Exploration Geophysicists Webmaster
2013–2015	European Society of Exploration Geophysicists (Active Member)
2007–2023	Australian Society of Exploration Geophysicists (Active member)
2007–2021	Society of Exploration Geophysics (Active member)

Conference organisation

2018–2023	Conference Organising Committee, 8th International Airborne Electromagnetics Workshop, Fitzroy Island, Qld.
2019–2020	Technical committee, 3rd Asia Pacific Meeting on Near Surface Geoscience & Engineering, Chiang Mai, Thailand
2019	Co-convenor, Forum on the relevance of geophysical uncertainty in exploration, 2nd Australian Exploration Geosciences Conference, Perth, WA.
2013–2015	Conference Organising Committee, 24th International Geophysical Conference and Exhibition, Perth, WA. (Conference USB & Workshops)

Awards

2010	Outstanding Reviewer, Society of Exploration Geophysicists
1989–1992	BHP-Utah Scholarship

Project leader

2022	*Thin plates electromagnetic modelling kernel* CSIRO Strategic project
2021	*Layered-earth electromagnetic modelling kernel* CSIRO Strategic project
2020	*Thick plate electromagnetic modelling kernel* CSIRO Strategic project
2018	*Forward modelling the responses of ground-based electrical prospecting systems for palaeochannel-hosted uranium mineral systems* Industry-sponsored project (Heathgate Resources Pty. Ltd.) with RMIT
2017	*Forward modelling airborne EM system responses for palaeochannel hosted uranium mineral systems* Industry-sponsored project (Heathgate Resources Pty. Ltd.)
2014-2015	*Bayesian Inversion of AEM data for a multidimensional earth* MRIWA Project M435: 9 months, two staff from CSIRO; Three industry sponsors + WA Government
2011-2012	*A deployment strategy for effective geophysical remote sensing of CO_2 sequestration* ANLEC R&D Project 3-0510-0030: 18 months, nine staff from two organisations; one consultant Industry consortium + WA Government
2011	*Interpretation of an AEM survey at Cronje Dam, South Australia* MegaHindmarsh: 6 months

Teaching

2011	Curtin University, *Electromagnetics and Radiometrics, 302/602*

Student supervision

2014–2020	Sasha Banaszczyk, PhD, University of Western Australia, *25%* with Dentith (50%) & Aitken (25%)
2012–*2017*	Javier Gonzalez-Garcia, PhD, University of Western Australia, *20%* with Jessell (50%), Dentith (10%) & Hauser (20%, CSIRO).

Continuing education

2025	*Professional Certificate in Cyber Security*, Curtin University / Institute of Data
2024	*Google Cybersecurity Certificate*, Google
2020	*Innovation Through Design: Think, Make, Break, Repeat*, The University of Sydney
2020	*Communication strategies for the virtual age*, University of Toronto
2020	*Research management and leadership training*, University of Colorado
2020	*Successful Negotiation: Essential Strategies and Skills*, University of Michigan
2020	*The Manager's Toolkit*, Birbeck University of London
2020	*Learning to Learn*, McMaster University/UC San Diego
2014	*Magnetotellurics*, University of Western Australia
2000	*Unix System administration*, The University of Sydney
1989	*C programming*, Macquarie University

Publications

2023	Banaszczyk, S., Piña-Varas, P., Dentith, M. **Annetts, D.**, 'Multiscale studies of electrical conductivity variations, Yerrida Basin, Capricorn Orogen, Western Australia: implications for geological mapping in sedimentary basins', Exploration Geophysics, 55(3), 10.1080/08123985.2023.2201427
2021	Banaszczyk, S., **Annetts, D.**, Dentith, M., Aitken, A. 'Extracting meaningful geological and structural features from 1D AEM inversions in conductive terrains', Exploration Geophysics, 53(1) 1-25.
2016	Hauser, J. Gunning, J. **Annetts, D.**, 'Probabilistic inversion of airborne electromagnetic data for basement conductors', Geophysics, 81(5), E389–E400.
2015	Hauser, J. Gunning, J. **Annetts, D.**, 'Probabilistic inversion of airborne electromagnetic data under spatial constraints', Geophysics, 80(2), E135–E146.
2005	Vrbancich, J., Sattel, D., **Annetts, D.**, Macnae, J., Lane, R., 'A case study of AEM bathymetry in Geographé Bay and over Cape Naturaliste, Western Australia, Part 1: 25 Hz QUESTEM', Exploration Geophysics, 36(3) 301-309.
2000	**Annetts, D.**, Sugeng, F., Macnae, J. and Raiche, A., 'Modelling the airborne electromagnetic response of a vertical contact', Exploration Geophysics, 31, 115-125.

Reports

2024 **Annetts, D.**, A forward model study of the DHEM step response of a thin plate, CSIRO EP2024-2446

2022 **Annetts, D.**, *lyr* v2.0, CSIRO. Software Collection. https://data.csiro.au/collection/csiro:56358

2019 **Annetts, D.**, J. Macnae, T. Munday, J. Ross, Targeting undercover palaeochannel systems using electrical prospecting systems (Tups-elps), CSIRO Report EP193795.

2017 **Annetts, D.** and T. Munday, 'Forward modelling airborne EM system responses for palaeochannel hosted uranium mineral systems', CSIRO Report EP179338.

2016 **Annetts, D.**, Munday, T., George, R, and Wright, N., 'The application of AEM to mapping the aquifer and groundwater characteristics of the La Grange groundwater area, WA: Final Report', CSIRO Report EP165299, 98pp

2015 Gilfedder M, Munday T, Bestland E, Cahill K, Davies PJ, Davis A, Heinson G, Ibrahimi T, Lamontagne S, Ley-Cooper Y, Love A, Olifent V, Pichler M, Robinson N, Smith S, Sørensen C, Suckow A, Taylor AR, Thompson J, **Annetts D.**, Facilitating Long-term Outback Water Solutions (G-FLOWS Stage-2) Final Report, Goyder Institute for Water Research Technical Report Series ISSN: 1839-2725

2015 **Annetts, D.** and Hauser, J. 'Bayesian Inversion of AEM data for a multidimensional earth', CSIRO Report 151736, 58pp.

2014 **Annetts, D.**, Munday, T., George, R, Ibrahimi, T., Cahill, K. and Davis, A., 'The application of AEM to mapping the aquifer and groundwater characteristics of the La Grange groundwater area, WA: Milestone 1 Report', CSIRO Report EP149583, 127pp

2014 **Annetts, D**, 'Interpretation of an AEM survey at Cronje Dam, South Australia', CSIRO Report EP132829, 119pp

2013 Höhn, K., Ramanaidou, E., Coghill, P., Yaroshcyk, P., **Annetts, D.**, Josh, M., Hislop, G. and Fraser, S., 'FMG – Material Characterisation Scoping Study Stage 2 Testing Report', CSIRO Restricted Report EP1312978, 50pp.

2013 **Annetts, D.** and Josh, M., 'Short note: Results of FMG sample conductivity testing'. CSIRO Restricted Report EP1310861, 10pp.

2012 **Annetts, D.**, Hauser, J., Gunning, J., Gurevich, B., Bona, A., Pevzner, R., Harris, B., Urosevic, M., al Ajami, M., Cant, J., 'A deployment strategy for effective geophysical remote sensing of CO_2 sequestration', CSIRO Report, EP12597, 182pp.

2010 Johns, S., Schmid, S., Dyt, C., **Annetts, D.**, Fisher, L., Robinson, J. Hill, J., 'JSU – MegaHindmarsh – Cronje Dam Project Final Report', CSIRO Report EP102153.

1990 Buselli, G. and **Annetts, D.**, 'Model profiles of the down-hole TEM response of a plate-like target in conductive host rock', CSIRO Report 92R.

1990 Buselli, G., **Annetts, D.**, and Rutter, H. 'Surface and down-hole modelling of the TEM response of the Thalanga orebody and its environment', CSIRO Report 93R.

1990 **Annetts, D.** and Buselli, G. 'Catalogue of CSIRO analogue TEM model profiles', CSIRO Report 94R.

1989 Buselli, G. and **Annetts, D.**, 'Surface measurements of current channelling and inductive interaction between a conductive overburden and a target', CSIRO Report 38R.

Conference presentations

2021 **Annetts, D** and J. Hauser, 'Almost automatic geological mapping from AEM surveys', 3rd Australian Exploration Geosciences Conference, Brisbane, Qld.

2021 Banaszczyk, S., M. Dentith, A. Aitken and **D. Annetts**, 'Interpretation of magnetotelluric and airborne electromagnetic inversions from the Proterozoic basins of the Capricorn Orogen, WA', 3rd Australian Exploration Geosciences Conference, Brisbane, Qld.

2020 **Annetts, D**, 'Electromagnetic techniques in exploration targeting for orthomagmatic systems', Centre for Exploration Targeting, Perth, WA.

2019 **Annetts, D.** and J. Hauser, 'Target detectability in regional-scale AEM surveys', 2nd Australian Exploration Geosciences Conference, Perth, WA.

2018 **Annetts, D.** and J. Cucuzza, 'Ten years in the wild: The P223 experiment', 1st Australian Exploration Geosciences Conference, Sydney, NSW.

2018 **Annetts, D.** and J. Hauser, 'On the validity of the 2.5D assumption when modelling airborne electromagnetic data', Australian Geoscience Council Convention, Adelaide, South Australia.

2018 Banaszczyk, S., **Annetts, D.**, Dentith, M. and Aitken, A. 'Characterising the AEM response of base metal deposits in the Capricorn Orogen through synthetic modelling', EAGE 80th Conference and Exhibition, Copenhagen, Denmark.

2018 Costelloe, M., M. Nightingale, D. Burns, T. Tyne, A. Rutley, K. McKenna, K. Frankcombe, **D. Annetts**, M. Pervukhina, K. Robertson, L. Atkinson and A. Squelch, 'The Australian Society of Exploration Geophysicists: Diversity of thought, Diversity through Membership', Australian Geoscience Council Convention, Adelaide, South Australia.

2018 Davis, A., **D. Annetts**, J. Hauser and R. Thorne,'Running for Cover in the Capricorn Orogen: Mapping regolith thickness on a regional scale', Australian Geoscience Council Convention, Adelaide, South Australia.

2018 Hauser, J., J. Gunning and **D. Annetts**, 'Targeted Inversions of Airborne Electromagnetic Data for Mineral Exploration', Australian Geoscience Council Convention, Adelaide, South Australia.

2018 Hauser, J., J. Gunning and **D. Annetts**, 'The Bayesian Parametric Bootstrap - A Practical Compromise for the Quantification of Model Robustness in Inversions of AEM Data', 7th International Workshop on Airborne Electromagnetics, Kolding, Denmark.

2016 **Annetts, D.** and J. Hauser, 'Summarising AEM data for mapping applications', 25th ASEG-PESA Geophysical Conference and Exhibition, Adelaide.

2016 Hauser, J., J. Gunning and **D. Annetts**, 'Practical Quantification of Uncertainties in the Inversion of Airborne Electromagnetic Data Under Spatial Constraints', General Assembly of the European Geophysical Union, Vienna, Austria.

2016 **Annetts, D.** and J, Hauser, 'Bayesian lithological inversion of AEM data for geologically-meaningful models', MinEx Seminar, Perth, WA.

2015 Hauser, J, **Annetts, D.**, Gunning, J. 'Bayesian lithological inversion', Society of Economic Geologists International Conference, Hobart, Tas.

2015 **Annetts, D.**, Munday, T., George, R, Ibrahimi, T., Cahill, K. and Davis, A., 'The application of AEM to mapping sea-water intrusion at La Grange, WA', 24th International Geophysical Conference and Exhibition, Perth, WA.

2013 **Annetts, D.** and Hauser, J., 'Sampling the transient decay', 6th International Workshop on Airborne Electromagnetics, Skukuza, South Africa.

2013 **Annetts, D.** and Hauser, J., 'Effects of the choice of transient sampling scheme on AEM-derived electrical conductivity models', 40th International Association of Hydrologists Congress, Perth, WA.

2013 Hauser, J. and **Annetts, D.** and Gunning, J., 'A Bayesian approach to the inversion of airborne electromagnetic data for a multidimensional exploration', 6th Airborne EM Conference, Skukuza, South Africa.

2013 Hauser, J. **Annetts, D.** and Gunning, J., 'Probabilistic inversion of airborne electromagnetic data for a multidimensional earth', 23rd ASEG Geophysical Conference and Exhibition, Melbourne.

2012 **Annetts, D.**, 'Inversion of surface and downhole electromagnetic data for a 3D earth', 22nd ASEG Geophysical Conference and Exhibition, Brisbane.

2011 Esteban, L., Clennell, B., Josh, M., **Annetts, D.**, Schmid, S., 'Electrical effects of pyrite on Formation Evaluation of Giant Gas Fields from cores, logs and models', FESAUS Gas Petrophysics New Technology Forum & Topical Conference, Perth.

2010 **Annetts, D.**, 'Inversion of crosshole EM data for a 3D earth', ASEG Inversion Workshop, Perth, WA.

Conference presentations (ctd.)

2010	**Annetts, D.**, 'Modelling tensor magnetic gradient responses in marine CSEM', 21st ASEG Geophysical Conference and Exhibition, Sydney.
2010	**Annetts, D.**, 'Magnetic tensor gradiometry and marine CSEM', 50th APPEA Conference, Brisbane
2004	Vrbancich, J., J. E. Reid, A. Pfaffling, **Annetts, D.**, and A. P. Worby, '3D EM modeling of Antarctic sea ice pressure ridges': 17th ASEG Geophysical Conference and Exhibition, Sydney.
2004	**Annetts, D.**, Sugeng, F. and Raiche, A., 'The EM response of a wedge', 17th ASEG Geophysical Conference and Exhibition, Sydney.
2003	**Annetts, D.**, Sugeng, F. and Raiche, A., 'Current flow in 3D models', 3rd International Symposium in Three-Dimensional Electromagnetics (3DEM), Adelaide.
2003	**Annetts, D.**, Sugeng, F. and Raiche, A., 'Modelling the AEM response of Nickel sulphide orebodies', 3rd International Symposium in Three-Dimensional Electromagnetics (3DEM), Adelaide
2003	**Annetts, D.**, Sugeng, F. and Raiche, A., 'Modelling and matching the AEM response at Harmony', 16th ASEG Geophysical Conference and Exhibition.
2001	Raiche, A., **Annetts, D.** and Sugeng, F., 'Modelling EM in complex environments', 15th ASEG Geophysical Conference and Exhibition, Brisbane.
2001	Vrbancich, J., **Annetts, D.**, Macnae, J.C., Lane, R.L. and Sattel, D., 'Time domain electromagnetic reconnaissance for sea depth measurements and shipwreck location', 15th ASEG Geophysical Conference and Exhibition, Brisbane.
1998	**Annetts, D.**, Sugeng, F. and Raiche, A., 'The effect of topography on AEM response', Society of Exploration Geophysicists 68th Annual meeting, New Orleans.
1998	**Annetts, D.**, Sugeng, F., Munday, T. and Raiche, A., 'The effect of topography and irregular regolith on AEM response', International Conference on Airborne Electromagnetics, Manly, NSW.