The visibility of Geography in the STEM field and its contribution to STEM education

Context: A national symposium for Geography and STEM is part of an actioned response to a recommendation in the strategic plan for Geography, *Geography: Shaping Australia’s Future* (National Committee for Geographical Sciences [NCGS], 2018). The intent of the symposium is to commence national dialogue from within the discipline. On this occasion the symposium is invitation-only; there will be future events open to a wider audience during 2021.

Recommendation: The National Committee for Geographical Sciences (NCGS) and Australian Geography Teachers Association (AGTA) will develop a case for submission to the Ministers of Education for Geography to be recognised as a partial STEM subject (NCGS, 2018, p. 87).

Format: The symposiums will be held for 3 hours via zoom on four separate occasions. Symposium proceedings include an opening address, panel-session presentations and break-out room discussion. For further information please contact Susan Caldis susan.caldis@hdr.mq.edu.au

Symposium co-chairs, opening address, and panel presenters

The symposium co-chairs are:
- Dr Grant Kleeman (member, NCGS; Immediate Past Chair AGTA); and
- Ms Susan Caldis (STEM Ambassador, Science & Technology Australia; Secretary, AGTA).

The opening address will be presented by Mr Trent Zimmerman MP (Member for North Sydney)

The panel presenters include (alphabetical order):
- Dr Karen Joyce (Education Director, She Maps; Senior Lecturer James Cook University);
- Ms Kimberley Parnis (Geography teacher, Parramatta Marist High School);
- Professor Ian Rutherfurd (University of Melbourne, Immediate Past President, Institute of Australian Geographers);
- Dr Kate Selway (Superstar of STEM; Senior Lecturer and ARC Future Research Fellow, Macquarie University);
- Professor Michael Solem (Co-Director, National Centre for Research in Geographical Education, Texas State University; Senior Education Advisor, American Association of Geographers).

The national symposium is proudly sponsored by the following professional associations:
- Australian Geography Teachers Association (AGTA);
- Geographical Society of NSW (GSNSW); and
- Institute of Australian Geographers (IAG).
Discussion
Discussion will focus on the proposition that Geography should be recognised as a partial STEM subject. To prompt thinking and promote discussion, the following overarching questions are posed:

1. What is ‘my Geography’ and how does ‘my Geography’ fit in to the STEM field?
2. What are the impacts and implications of ‘my Geography’ in the STEM field?
3. How can I use my sphere of influence to enhance the visibility of Geography in the STEM field and its contribution to STEM education?

Expected outcomes and next steps
Expected outcomes of the Symposium are to:

• promote awareness and dialogue about the discipline of Geography being recognized as a partial STEM subject and a contributor to the STEM field;
• provide advice ‘from-the-field’ to the NCGS and AGTA for use in a position paper to Ministers of Education;
• contribute to enhancing the visibility of Geography as a discipline in response to the dissemination of findings emerging from the symposiums; and
• provide an opportunity for future collaboration between Geography academics and Geography teachers to create and action a shared view of the discipline and subject.

In closing
In summary, the dynamic and interdisciplinary nature of Geography results in the discipline acting as a bridge between the sciences and social sciences. In Australian schools, however, Geography is typically identified as a subject based within the Social Sciences. In higher education, the discipline of geography is dispersed amongst Faculties, often forming smaller Departments which further diminishes its identity. Messaging in the media reinforces the relevance and rigour of STEM education, STEM-based research, and STEM related industry and career pathways. However, within such messaging, the role of Geography is often overlooked. The hazardous events of 2020, such as those related to bushfires and the pandemic have encouraged public debate about key areas of geographical research such as human wellbeing, the nature and effect of population mobilities, and environmental management and change. The lens of geographical thinking related to place-based analysis, spatial reasoning, human-environment interactions and future-focused problem-solving, together with an emphasis on gaining evidence through fieldwork provides a distinctly geographical view to interpreting global problems at a range of scales. Such a lens can also demonstrate how Geography adds depth to, intersects with and contributes to the STEM field. The time is appropriate for Geography and STEM discussions to occur.

With all best wishes, Dr Grant Kleeman and Susan Caldis (co-chairs of the national symposium)
**Information about the presenters: The co-chairs**

**Dr Grant Kleeman** is one of Australia's leading Geographical Educators. He is currently:
- Member, the Academy of Science's National Committee for the Geographical Sciences;
- Immediate Past Chair of the Australian Geography Teachers' Association Inc. (AGTA);
- Immediate Past Chair and Honorary Treasurer of AGTA;
- Vice President and Treasurer of the Geography Teachers' Association of NSW & ACT (GTANSW&ACT);
- a Fellow of the Royal Geographical Society (UK); and
- a Fellow of GTANSW&ACT.

In 2007, Grant was awarded the McDonald Holmes Medal by the Geographical Society of NSW (GSNSW) and GTA NSW&ACT for his 'Distinguished contribution to Geographical Education in Australia'. Grant retired in late 2015 as Director, Teacher Education, at Macquarie University. During his tenure Grant led a major review and restructuring of the Teacher Education Program - changes that consolidated the School of Education's reputation as one of Australia's leading and most innovative teacher education providers. Post-retirement Grant continued to supervise doctoral students as a Fellow of the University.

**Ms Susan Caldis** is a final-year PhD Candidate and sessional academic in the Macquarie School of Education at Macquarie University. She currently teaches the Geography Methodology course in the Initial Teacher Education Program and is a recently appointed STEM Ambassador for geographical education. For the second time, Susan holds the roles of President for the Geography Teachers Association of NSW & ACT and Secretary for the Australian Geography Teachers Association. During 2019, Susan's research and contribution to the field of geographical education was recognised in two prestigious ways:
- Susan was hosted in Singapore by the Ministry of Education and Academy of Singapore Teachers as the Outstanding Educator In Residence for geographical education; and
- Susan was the recipient of the inaugural Faculty of Human Sciences Excellence in Higher Degree Research Award. Susan’s research focuses on the transformation of pedagogical practice amongst Geography teachers as they transition into the profession from teacher education student into their early career years.

Prior to commencing doctoral studies, Susan held school-based leadership roles for Geography and HSIE education; Susan was also the national project officer at ACARA leading the development of the Australian Curriculum: Geography from shaping through to Ministerial endorsement and publication. In her STEM Ambassador role, Susan works alongside Mr Trent Zimmerman MP, Member for North Sydney.
**Dr Karen Joyce** is the Educational Director for She Maps and Senior Lecturer at James Cook University. I believe there’s a science for everyone, you just need to know where to look! I share my experiences drawn from more than 20 years as a geospatial scientist in academia, military, industry, and small business to help people discover science beyond lab coats and test tubes. But I have an ulterior motive. I am passionate about how we can use drones and geospatial technology to watch over our environment and its changes. So, the more people I can inspire to join me, the faster we can put plans in place to help keep our environment healthy into the future.

**Ms Kimberley Parnis** is a Geography teacher and Teaching & Learning Advisor at Parramatta Marist High School. During my four years of teaching I've had the opportunity to develop some fantastic Project Based Learning units of work to engage students in both Geography and History. I've been able to propose different ideas for projects, and experiment with different integrations between Key Learning Areas. The most recent project I’ve designed is *The Urban Mess*, a GeoSTEM initiative for Year 9 – it is time to explore the science, technology, engineering and mathematical aspects of Geography and show students the interdisciplinary nature of this subject. I've been fortunate to present *The Urban Mess* project via a webinar, as part of the accredited professional learning program organised by the Geography Teachers Association of NSW & ACT. I was also fortunate to have *The Urban Mess* showcased at Science Meets Parliament in 2019 as a living example of what Geography and STEM could look like in a school context. I was due to present *The Urban Mess* in Singapore during March 2020 until COVID-19 arrived! As Teaching and Learning Advisor, I assist with the design and facilitation of school-based teacher professional learning with a view to evaluating and improving pedagogical practice across the school.
Professor Ian Rutherfurd, School of Geography, University of Melbourne. Ian is a geographer and fluvial geomorphologist. He has worked for 25 years in the water sector as an academic and consultant, including several years working in state government. At present he is a Professor in the School of Geography at the University of Melbourne. Ian’s research interests relate to processes of erosion and sedimentation in river channels, particularly human impacts on rivers, interactions between vegetation and rivers, and the dynamics of fine and coarse sediment pulses in rivers. His work has turned increasingly to the physical and social dimensions of restoration of disturbed fluvial systems. He has published over 80 journal articles, 50 consulting reports, and has been involved in over $7 million in research grants, assisted by over 60 co-authors and 30 PhD students. His international work includes projects in South East Asia, China, the USA, Canada and South Africa. He has advised government through involvement in numerous committees and enquires. He has been the President of the Institute of Australian Geographers, as well as the Australia New Zealand Geomorphology Group.

Dr Kate Selway is an Earth scientist who is passionate about understanding how our amazing planet works. Like a doctor taking an x-ray, Kate makes measurements on the Earth's surface to see what is going on deep inside. She applies these results to understanding plate tectonics, knowing where to explore for ore deposits, and measuring the loss of ice sheets. Kate has led research teams in the deserts of central Australia, the savannas of East Africa, and the frozen expanses of the Greenland and Antarctic ice sheets. Through media and outreach work, Kate seeks to encourage others to share her excitement about our planet and she is a current Science & Technology Australia ‘Superstar of STEM’. After gaining her PhD from the University of Adelaide in 2007, Kate worked as a researcher in Australia (University of Adelaide), the USA (Yale and Columbia University) and Europe (the University of Oslo). She is currently an Australian Research Council Future Fellow and Senior Lecturer at Macquarie University in Sydney.
**Professor Michael Solem**, Department of Geography, Co-Director, National Centre for Research in Geography Education, Texas State University; Ph.D. (University of Colorado), M.S. B.S. (Penn State). From 2003-2017, I was a full-time staff member at the Association of American Geographers (AAG), holding the positions of Educational Affairs Director and Deputy Director for Research and Education. I currently serve AAG as Senior Advisor for Geography Education and co-Director of the National Centre for Research in Geography Education. Since 2002, I have contributed to the AAG’s annual Geography Faculty Development Alliance workshops for early career faculty. As an AAG representative for the Geography Education National Implementation Project (GENIP), I chaired study groups for an Advanced Placement course in Geographic Information Science & Technology (AP GIS&T) and a Trends in International Geography Assessment Study.

I currently serve as co-Chair for the International Geographical Union’s Commission on Geographical Education and am a member of the editorial board for the *Journal of Geography in Higher Education* and *Review of International Geographical Education Online*. I am the 2015 recipient of the AAG Gilbert Grosvenor Honors in Geographic Education. I have twice received the *Journal of Geography in Higher Education*’s award for promoting excellence in teaching and learning for research on faculty development and graduate education in geography. In 2003, I received the National Council for Geographic Education Distinguished Teaching Achievement Award. I have been principal investigator on several large-scale, federally funded projects supporting geography and geographers at all levels of education. My grants include 16 awards from NSF totalling $6 million. My research and teaching interests include Geography education, particularly 1) curriculum theory, 2) teacher education and professional development, 3) large-scale educational assessment studies, 4) diversity and inclusion, and 5) professional development for geography students and early career faculty. My publications include articles in the *Annals of the Association of American Geographers*, *The Professional Geographer*, *Research in Higher Education*, *Education About Asia*, *The Geography Teacher*, the *Journal of Geography in Higher Education*, and the edited books *Aspiring Academics*, *Teaching College Geography*, *Practicing Geography*, and *Learning Progressions for Maps, Geospatial Technology and Spatial Thinking: A Research Handbook*.

**Symposium dates**

Academic audience: Tuesday 27 October, 12pm – 3pm (AEDST ['Sydney time']); Thursday 29 October 6.30pm – 9.30pm (AEDST ['Sydney time'])

Teacher audience: Tuesday 3 November, 4.30pm – 7.30pm (AEDST ['Sydney time']); Thursday 5 November, 6.30pm – 9.30pm (AEDST ['Sydney time'])

The symposium co-chairs would like to acknowledge and thank the following professional associations for funding the symposium: AGTA, GSNSW, IAG

For further information please contact symposium co-chair Susan Caldis: susan.caldis@hdr.mq.edu.au