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# Transdisciplinary Research and Practice for Sustainability Outcomes

Edited by  
Dena Fam, Jane Palmer, Chris Riedy and  
Cynthia Mitchell

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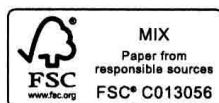
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# Transdisciplinary Research and Practice for Sustainability Outcomes

We know that the complex sustainability challenges facing our society today, including water and food security, poverty and climate change impacts, cannot be effectively tackled from a single disciplinary perspective. 'Transdisciplinarity' has emerged as a way of addressing these apparently intractable problems. Growing international interest in transdisciplinary approaches to research and practice, four decades of academic discourse and a significant body of work in this area, provide the background and opportunity for a specific focus on the practical application of transdisciplinary approaches to sustainability issues.

*Transdisciplinary Research and Practice for Sustainability Outcomes* examines the role of transdisciplinarity in the transformations needed for a sustainable world. After an historical overview of transdisciplinarity, Part I focuses on tools and frameworks to achieve sustainability outcomes in practice and Part II consolidates work by a number of scholars on supporting transdisciplinary researchers and practitioners. Part III is a series of case studies including several international examples that demonstrate the challenges and rewards of transdisciplinary work. The concluding chapter proposes a future research pathway for understanding the human factors that underpin successful transdisciplinary research.

As Emeritus Professor Valerie Brown AO notes in her Preface, this book moves transdisciplinary inquiry into the academic and social mainstream. It will be of great interest to researchers and practitioners in the fields of sustainability, qualitative research methods, environmental impact assessment and development studies.

**Dena Fam** is Research Director and UTS Chancellor's Post Doctoral Research Fellow at the Institute for Sustainable Futures, University of Technology Sydney, Australia.

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### **Transdisciplinary Research and Practice for Sustainability Outcomes**

*Edited by Dena Fam, Jane Palmer, Chris Riedy and Cynthia Mitchell*



# Contributors

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**Gabriele Bammer** is developing the new discipline of Integration and Implementation Sciences (I2S) to improve research strengths for tackling complex real world problems through the synthesis of disciplinary and stakeholder knowledge, understanding and managing diverse unknowns and providing integrated research support for policy and practice change (see [i2s.anu.edu.au](http://i2s.anu.edu.au) and [I2Insights.org](http://I2Insights.org)). She is a professor in the Research School of Population Health at the Australian National University (ANU), an ANU Public Policy Fellow, an inaugural Fulbright New Century Scholar alumna and has held visiting appointments at Harvard University's John F. Kennedy School of Government (2001–14), ETH-Zurich and the University of Natural Resources and Life Sciences in Vienna. She co-convenes (with Michael Smithson) an edX Massive Open Online Course (MOOC) on 'Ignorance!'. Her books include *Disciplining interdisciplinarity: integration and implementation sciences for researching complex real-world problems* (2013), *Change! Combining analytic approaches with street wisdom* (2015), *Research integration using dialogue methods* (2009), and *Uncertainty and risk: multidisciplinary perspectives* (2008).

**Bill Bellotti** is the Director of the Food Systems Program in the Global Change Institute at the University of Queensland. He has more than 30 years experience in leading agricultural production system research in southern Australia, western China, and eastern India. His expertise includes agronomy, climate variability and change, farming systems and integrated approaches to food systems. Professor Bellotti's research in China and India has focused on sustainability and food security, and more recently on the linkages between diversification of cropping systems, dietary diversity and empowerment of women farmers. His research interests include the application of life cycle assessment approaches to Australian food systems. This interest includes the development of concepts such as sustainable diets and food footprints. At the Global Change Institute he is responsible for engaging the diversity of views and expertise across the University of Queensland and other stakeholders to promote more healthy, sustainable and equitable food systems.



**Valerie A. Brown** is currently Professorial Fellow and Director, Local Sustainability Project, at the Fenner School of Environment and Society, Australian National University. She is Emeritus Professor of the University of Western Sydney after being its Foundation Chair of Environmental Health 1996–2002. The Local Sustainability Project is a collective action research program, working in Australia and internationally with organisations, local government and communities on whole-of-community change 1989–2016. Her recent books include: with John Harris, *The human capacity for transformational change* (Routledge 2014) and *Tackling wicked problems through the transdisciplinary imagination* (Earthscan 2010); with Judy Lambert, *Collective learning and transformational change* (Routledge 2013); with John Grootjans et al., *Sustainability and health* (Allen and Unwin 2005); and with Meg Keen and Robert Dyball, *Social learning and environmental management* (Earthscan 2005). Her website is [www.valeriebrown.com.au](http://www.valeriebrown.com.au).

**Dana Cordell** leads and undertakes international and national research projects on sustainable food and resource futures. Many projects involve high-level stakeholder engagement to improve societal relevance and foster mutual-learning. Dr Cordell co-founded and leads the Global Phosphorus Research Initiative – the first global platform to undertake transdisciplinary research, policy and public engagement to ensure food systems are resilient to the emerging global challenge of phosphorus scarcity. She currently leads the Sydney's Food Futures transdisciplinary project, which brings together key agriculture, urban planning and health stakeholders. As a global food security expert, Dr Cordell provides expert advice and commentary to the United Nations Environment Programme and to Australia's Chief Scientist. Dr Cordell's research contributions have led to numerous prestigious awards including one of Australia's top science prizes, the Eureka Prize for Environmental Research and a position in by the 100 Women of Influence (AFR/Westpac). She is frequently interviewed for media, including the BBC and the ABC.

**Dena Fam** is a systems thinker and transdisciplinary collaborator at the Institute for Sustainable Futures at the University of Technology Sydney. Over the last decade Dena has worked with industry, government and community actors to collaboratively manage, design, research and trial alternative water and sanitation systems with the aim of sustainably managing sewage and reducing its environmental impact on the water cycle. Her consulting/research experience over has spanned socio-cultural (learning for sustainability) institutional (policy analysis), technological aspects of environmental management. With experience in transdisciplinary project development, Dena is involved in developing processes for teaching and learning in transdisciplinary programs and projects. In particular she has been involved in documenting and synthesizing processes/methods/techniques supporting the development of transdisciplinary educational programs and projects. Dena has led and co-led international transdisciplinary

networking events, grants and projects including an Australian-funded teaching and learning grant.

**Ray Ison** is Professor of Systems in the School of Engineering and Innovation, the Open University, UK. From 2008–15 he was also Professor at the Monash Sustainability Institute, Monash University, Australia, where he developed and led the Systemic Governance Research Program, an interdisciplinary, systems-based research program focusing on water governance, climate change adaptation and social learning. At the Open University he is a key member of the Applied Systems Thinking in Practice Group, and also contributes to the taught Masters in Systems Thinking in Practice. Through various commissioned projects and initiatives, his collaborative research demonstrates how social learning, including systemic inquiry, can be employed as an alternative governance mechanism for managing complex situations such as water governance, program and project governance, climate change adaptation, food security research, social learning, systems thinking and the purposeful creation of communities of practice. He is the author of the book (2010), *Systems practice: How to act in a climate-change world* (Springer & OU).

**David M. Iwaniec** is an Assistant Research Professor and Senior Sustainability Scientist at the Julie Ann Wrigley Global Institute of Sustainability, Arizona State University. David leads the Sustainable Futures initiative, funded by the NSF Urban Resilience to Extreme Events (UREx SRN) and the NSF Central Arizona-Phoenix Long Term Ecological Research Program (CAP LTER). His work pursues a transformational agenda to guide and shape our urban futures through transdisciplinary research to improve the governance and planning of urban environments.

**Julie Thompson Klein** is Professor of Humanities Emerita at Wayne State University. She has also been a Visiting Foreign Professor in Japan, a Fulbright Professor in Nepal, a Foundation Visitor at The University of Auckland in New Zealand, and Mellon Fellow in Digital Humanities at the University of Michigan. Holder of a Ph.D. in English from the University of Oregon, Klein is past president of the Association for Interdisciplinary Studies (AIS), former editor of the AIS journal *Issues in Interdisciplinary Studies*, and recipient of the Kenneth Boulding Award for outstanding scholarship on interdisciplinarity. Her books include *Interdisciplinarity* (1990), *Interdisciplinary studies today* (1994), *Crossing boundaries* (1996), *Transdisciplinarity* (2001), *Interdisciplinary education in K-12 and college* (2002), *Humanities, culture, and interdisciplinarity* (2005), *Creating interdisciplinary campus cultures* (2010), and *Interdisciplining digital humanities* (2015). She is also associate editor of the *Oxford handbook on interdisciplinarity* (2010, 2016) and co-editor of the University of Michigan Press series *Digital Humanities@digitalculturebooks*.

**Roderick J. Lawrence** graduated from the University of Adelaide (Australia) with First Class Honours. He has a master's degree from the University of

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**Abby Mellick Lopes** is a design theorist with 15 years' practical and academic experience in the field of design for sustainability. She is currently senior lecturer in the visual communications program at Western Sydney University, and a member of the Digital Humanities Research Group and the Institute for Culture and Society (ICS). Her current research projects explore the liveability of Western Sydney in a climate-changed future, and repair cultures in Sydney. She also researches in visual communications and has a long-standing interest in how image ecologies mediate socio-material relationships, which was the topic of her PhD titled 'Ecology of the image' (2005). She publishes widely, most recently contributing several chapters to *The Bloomsbury Encyclopedia of Design* (2016). In 2015 she co-edited a special issue on design and social practice theory for the international *Journal of Design Research* (with Dr Dena Fam), and another for the *Global Media Journal: Australian Edition*, entitled 'Initiating change by design'.

**Catherine Manathunga** is a historian in the College of Education at Victoria University, Melbourne. She draws together expertise in historical, sociological and cultural studies research to bring an innovative, interdisciplinary perspective to educational research, particularly focusing on the higher education sector. She has current research projects on intercultural doctoral supervision pedagogy and the history of university teaching and learning in Australia and Aotearoa/New Zealand. Her most recent book, *Intercultural postgraduate supervision: reimagining time, place and knowledge*, was published in 2014 by Routledge. She has also co-authored: a monograph on educational history, *A class of its own: a history of Queensland University of Technology*; a co-edited oral history monograph, *Making a place: an oral history of academic development in Australia*; and has published in Australian, Irish, North American and British journals in the fields of international relations, higher education and academic development.

**Geneviève S. Metson** is a USA National Research Council post-doctoral researcher focused on sustainable resource management with a particular interest in food systems, waste and urban ecosystems. Drawing on systems

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**Cynthia Mitchell's** passion for improving our collective ability to articulate, do, and value transdisciplinary research began when an engineering professor said of her research student's work, 'I just can't see a PhD in this', and an education professor said 'I can see three'. Cynthia is Deputy Director and Professor of Sustainability at the Institute for Sustainable Futures at the University of Technology Sydney, where she has been pioneering transdisciplinary research since 2001, principally in learning, water services and international development. She founded, and for 13 years directed, the Institute's higher degree research program. Her research has won national and international awards from academia and industry. She has an honorary doctorate from Chalmers University in Sweden for her interdisciplinary work for the environment, and is a fellow of the Academy of Technological Sciences and Engineering, a fellow of Engineers Australia, and a fellow of the Institute of Community Directors of Australia.

**Jane Palmer** is a Research Fellow at the Institute for Resilient Regions, University of Southern Queensland. She has degrees in philosophy and architecture, and a doctorate from the Institute for Sustainable Futures, University of Technology Sydney. Her doctoral research was based on ethnographic fieldwork in Indonesia, and she has since been appointed to research fellowships at the University of Newcastle (Australia) and the University of Southern Queensland to undertake ethnographic projects in regional and remote Australia. Prior to her academic career, she worked for several years in northern Australia with Indigenous communities as an architect and project manager. Her research interests include the use of ethnographic storytelling methods to explore the processes of trauma, grief, resilience and adaptation. Her current projects are focused on supporting communities in South-West Queensland to engage with cultural heritage and explore its connection with wellbeing. Jane has published in the areas of ethics, fieldwork methodologies, futures studies and climate change adaptation.

**Chris Riedy** is the Director of Higher Degree Research at the Institute for Sustainable Futures, University of Technology Sydney. Chris applies futures thinking, participatory processes and social theory to practical experiments in transformative change for sustainability. Between 2014 and 2016, he helped the Wintec Institute of Technology in New Zealand to establish a new Master of Transdisciplinary Research and Innovation. He runs workshops on cross-disciplinary supervision at the University of Technology Sydney and is currently developing a transdisciplinary learning lab to give research students a taste of transdisciplinary research. Chris is a Senior Research Fellow of the Earth System Governance project and a member of the editorial boards for *Futures* and the *Journal of Futures Studies*. He has published 35 peer-reviewed articles, one book and more than 50 research reports. He writes a blog on thriving within planetary boundaries called PlanetCentric (<http://chrisriedy.me>).

**Katie Ross** is curious about ways to create change. She wonders what types of strategies and approaches work best in certain situations, and what ‘palette’ of approaches leads to the most meaningful and well-directed change towards sustainable futures. Luckily, she is a Research Principal at the Institute for Sustainable Futures (ISF) at the University of Technology Sydney, where she can explore this interest daily. She specializes in transdisciplinary action research that agitates for change in social, technical and governance systems. Katie has more than 10 years’ experience working in sustainable development, resilient service systems and innovative capacity building. Since joining ISF in 2010, Katie has led and contributed to applied research in ISF’s renewable energy, climate change mitigation/adaptation, water/sanitation, international development and gender/equity research areas. Katie has qualifications in environmental science (Columbia University) and sustainable development (Victoria University / Macquarie University), and is pursuing her doctorate on the impact of tertiary transdisciplinary learning and service learning.

**Tanzi Smith’s** research interests include community engagement, natural resource management policy and practice and the application of systems approaches to achieve sustainable outcomes for people and the environment. She completed her transdisciplinary PhD at the Institute for Sustainable Futures in 2011 and undertook nine months of field-work in Vietnam as part of her doctorate. Currently she works in natural resource management in both practice and leadership roles. She is a current Director of the Burnett Mary Regional Group for Natural Resource Management and special projects officer at the Mary River Catchment Coordinating Committee. Tanzi holds an Honorary Associate position in the Institute for Sustainable Futures at the University of Technology Sydney. She is a Fellow of the Peter Cullen Water and Environment Trust, a past Wentworth Group of Concerned Scientists Scholar and a recipient of the Sir Edward “Weary” Dunlop Fellowship.

**Zoe Sofoulis** is an interdisciplinary cultural researcher with a long-term interest in the social, cultural and irrational dimensions of problems normally addressed through techno-scientific rationality. She has led projects on everyday water users and urban water industry managers, and co-designed the 'Water Diary' exercises subsequently adapted by other household water researchers. Expanding the scope of social and cultural research that informs urban water management was the goal of her 2010–11 National Water Commission Fellowship *Cross-connections: linking urban water managers with humanities, arts and social sciences researchers*. She has helped organise events for water researchers from different disciplines and sectors, and co-edited two collections of papers from the most recent of these (*Local Environment* 2015, 20(5); *ACME: The International Journal of Justice and Sustainability* 2015, 14(3)). Her ideas about knowledge ecologies were initially developed as part of the ICS-funded project Knowledge Ecologies Workshop (2012–14).

**Juliet Willetts** leads research to influence policy and practice in international development. For more than a decade she has led transdisciplinary research projects in this context, addressing the human right to water and sanitation and also making contributions to gender equality, sustainability, civil society role in development, and innovation in monitoring and evaluation approaches. She has supervised transdisciplinary doctoral researchers since 2002 and has contributed to intellectual leadership of the transdisciplinary higher degree research program at the Institute for Sustainable Futures, University of Technology Sydney over many years. Juliet serves as academic Co-Chair of the *Research for Development Impact Network* and is a founding member of the *Water, Sanitation and Hygiene Reference Group*, a policy reference group. She has received an international research award and multiple UTS awards for research excellence, human rights and social justice, and was a finalist in the 2014 National Australia Bank's Women's Leadership awards.

**Jennifer Williams** is an information designer, educator and researcher who has practised and taught for the past fifteen years in Australia and New Zealand. Her principal focus lies in expanding visual communication designers' roles within transdisciplinary design both theoretically and in the field, as well as advancing implications for design education. She was an Early Career Researcher (ECR) and co-leader of the Visual Communication strand in the two-year UTS Challenge Grant project, '*Transitioning to sustainable sanitation*', 2010–2012. As a design practitioner, Jennifer has worked most notably for the Museum of New Zealand (Te Papa Tongarewa) where, as a member of the initial transdisciplinary core design team, she designed a number of exhibitions, pan-museum signage and wayfinding systems.





# Preface

## Transdisciplinarity: a way of the future?

This book moves transdisciplinary inquiry into the academic and social mainstream. There is help here for diverse readers seeking a better understanding of what is happening to their society and their planet – the anxious individuals, disturbed communities, confused experts, frustrated organisations and hopeful agents of change. The increasing visibility of transdisciplinarity as a whole is demonstrated by the examples in the book's sections on change management, research practice, change agency and future directions. Together, the chapters flesh out the practice of transdisciplinary inquiry as a task for all comers, rather than a boutique enterprise. The question this book can help to answer is, have the hopes of those who originally invented the idea been realised?

The birth of transdisciplinary inquiry is attributed to transdisciplinary Jean Piaget of Switzerland and Erich Jantsch of Austria. In the early 1970s they began separate discussions that continue to this day. There was then no language to describe the phenomenon so they called their topic 'Interdisciplinary', a term as controversial then as transdisciplinarity is now. Both of them regarded the then current monopoly of the disciplines on constructing new knowledge as deeply unsatisfactory. Piaget (1973) called communication between two disciplines 'a dialogue of the deaf'. Jantsch (1972) deplored compartmentalised forms of knowledge as having 'a lack of individual meaning, lack of relevance and absence of a critical synthesis'. At the same time, they both held visions of a time when this new form of scholarship would become the leading way of thought.

They would both be pleased to find the breadth of practice and the depth of theory recorded in this volume. They would also find the two schools of thought which have existed from the beginning, and which are reflected and recombined there. Piaget places transdisciplinarity as operating within academia and Jantsch sees it as dispersed throughout the community. Piaget proposed structures that bring together the existing forms of disciplined inquiry; Jantsch argues for breaking new ground in thinking about complex issues.

Piaget followed the lead of the early quantum physicists in searching for the relationships within the existing system of inquiry. His stated goal was a synthesis that included the full range of academic disciplines. He wrote of the need for transdisciplinarity to bring together different sets of rules, values and meanings. On the other hand, Erik Jantsch expected transdisciplinarity to produce a more

complete and accurate vision of reality by integrating different ways of understanding. He wrote of human learning as a self-organising, self-renewing and self-maintaining system.

Recognising the need to combine a coordinating structure *and* open-mindedness, both thinkers point to a third possibility: the joining together of their own positions. Other divided traditions that they hoped would be brought together included diversity *and* unity, creativity *and* rationality, individuals *and* the collective. Both thinkers gave us a yardstick by which to measure progress towards establishing this third collective possibility. Jantsch hoped for the day when transdisciplinary thinking would value process over structure, uncertainty over equilibrium, evolution over permanency, and individual creativity over collective stabilization. Piaget writes of the need for a structure that recognizes a whole that is distinct from its elements, that achieves a fresh whole rather than continuing loyalties to existing divisions, and that has rules that permit re-organization from within. This is a powerful pair of prescriptions for a future transdisciplinarity.

From nearly half a century ago, these propositions reach out into the present. Taken together, they suggest criteria for a collective, inclusive, forward-looking transdisciplinarity. The four parts in *Transdisciplinary Research and Practice for Sustainability Outcomes*, namely, change management, research practice, change agency and future directions, mirror these projections. A summarizing lens helps us explore whether this book is helping create the future that early transdisciplinarity hoped for. In short, Piaget and Jantsch asked for:

- a unifying structure that allows for both the independence of the parts and their recognition as wholes;
- a value orientation for transdisciplinarity which requires changes that go beyond current social practices;
- a set of rules which permit, and even encourage, uncertainty and creativity in a self-organizing system of knowledge.

The important question to ask here is, do the 17 chapters that make up this book, taken together, reflect these three propositions for a future transdisciplinarity? Reading the book reveals that each of the chapters has a unifying framework, and all support the value of transdisciplinarity. The parts that make up each framework have a strong presence in their own right. Throughout the book uncertainty is expected and creativity encouraged. The hopes of both Piaget and Jantsch have been largely fulfilled, although not in the ways they might have expected. Competing schools of thought remain. There are still the differing directions taken by the compartmentalised academic and open community-based orientations, originally represented in the work of Piaget and Jantsch.

The choice of synthesising structures and their parts is a vital part of the current transdisciplinary story, a story that can be followed through the chapters of this book. In Part I, each of the chapters is based on a unifying structure, each structure having its own set of rules. One such unifying structure is the long-sought unity