

# “Post Normal Science – perspectives & prospects”

A reflective workshop: 26-27<sup>th</sup> June 2009: Oxford

## Abstracts & titles

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Version 0.61 JR  
12-06-09

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## ***Paul Barnes***

### **Threats, Uncertainty and Confusion: Risk Management as a Post-normal Science**

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## ***Ruth Beilin and Helena Bender***

### **'How PNS informs interdisciplinary curriculum design at tertiary level: disruption, interrogation and interaction as process'**

Dr. Ruth Beilin\* and Dr. Helena Bender\*

\*Department of Resource Management and Geography, Melbourne School of Land and Environment  
University of Melbourne, Parkville 3010, Australia.

In 2006 The University of Melbourne abolished the approximately 180 existing faculty based undergraduate degrees and initiated degree programs commonly associated with liberal arts and science degrees. The Bachelor of Environments is one of the six new Melbourne Model undergraduate offerings. It is intended to be an interdisciplinary, multi faculty based degree engaging students previously associated with architecture, civil (engineering) systems, construction, environmental geographies politics and cultures, environmental science, geomatics, landscape architecture, landscape management, physical (environmental engineering) systems, property, planning and urban design. Underpinning this plurality of potential second year majors is an 8 subject first year, with two core subjects. The focus of this paper is a reflection on how PNS assisted those involved in creating one of the new core subjects, Reshaping Environments, to understand what it is to strive for interdisciplinary teaching and learning.

Environmental issues tend to be messy rather than reductionist, and humanistic rather than specialist. They require a plethora of legitimate perspectives to acknowledge the complex and dynamic systems and values in play. Further, uncertainty and risk loom daily as often unspoken drivers of pedagogical and environmental decision making. In accepting that the *raison d'etre* of the new degree was to step outside of how our disciplines currently did things, and augment our practices with new 'ways of seeing and knowing', we entered the fuzzy world of interdisciplinary practice. Our aim as an academic team from five faculties was to write a new curriculum that would underpin the degree and connect with subsequent course content once students entered their major. We quickly found that the first step was in walking the talk ourselves.

This paper will focus on our decision to include PNS in the curriculum, how we came to understand its import, and how it helped us align our teaching across the discipline barriers. In particular, working with case studies, we used the idea of disrupting—or interrupting—established ways of reading the literature and ‘accepted stories’ of what occurred; of questioning interpretation and discipline assumptions to acknowledge through interrogation of ideas and sense making what was said; and of inviting each other and students to act as extended peer communities in considering the barriers and enablers that drove the changes in the case study narratives. Interruption was most often undertaken by invoking systems thinking—but even defining what each of the academics meant by ‘systems’ involved much discussion and negotiation.

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***Tom Børsen.***

### **University Science Education in the Post Normal Era.**

(I have used Jerry’s writings in my teaching of philosophy of science and ethics to science and engineering students).

And / or

NUSAP analyses of climate models’ projections. (I am currently setting up this project with Jerry).

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***David Brazier***

*Environment Agency for England & Wales*

**'Working with others - Building trust with communities'.**

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## ***Shirin Elahi***

*Scenario Architect: Complex Global Risks*

### **‘Here be Dragons’: Ignorance and Risk**

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## ***Kate Farrell***

### **The Politics of Science: Bjorn Lomborg, Herbert Marcuse and the characteristics of Post-normal Science in the 21st Century**

Proposed Theme: Session 3 / 11:30

*Theory – Methodology: what is it that is happening now, how and why; the Bjorn Lomborg Affair; IPCC and the repeating refrain with the IPBES, etc...*

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## ***Bev France***

### **How Post-Normal views of science have contributed to our model of communication about biotechnology**

The political GE debate in New Zealand during 2001-02 provided a focus for the development of our model for communication about biotechnology. Earlier Jerry Ravetz’s (1997) challenge to develop a pedagogy to explore a Post Normal view of science was taken up by this author when she developed strategies for biology teachers to examine biotechnological processes and products from a Post Normal science viewpoint. This view of system uncertainties strongly influenced the inclusion

of risk as an element that affected a person's 'view' of biotechnology within our communication model. Further development of this problem-solving spectrum of Post Normal science is possible if biotechnology is analysed from a technological epistemological perspective where a biotechnological outcome can be judged according to its fitness for purpose. If this occurs there are opportunities for biotechnology to be characterised as an example of Post Normal science from a scientific as well as an technological epistemology. Such analysis could provide opportunity for such an integrative perspective to be proposed and characterised.

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## **Mario Giampietro**

*ICREA Research Professor – ICTA Universitat Autònoma Barcelona*

### **The Lesson from Biofuel Madness: Post-Normal Science as a Vaccine against the Pandemic of Granfalloon**

The biofuel madness that rapidly contaminated the entire planet is a perfect example of corrupt use of science in the process of decision making. The formation of granfalloon - in this case, an uncontested belief that biofuel is the silver bullet for our salvation - is essential to stabilize the existing power structures in a situation of Ancient Regime Syndrome. Granfalloon are needed to reduce the stress that is typically associated to a perceived urgent need for change. Climate change is another good example where the granfalloon plays this role.

In the case of biofuel, one finds that behind the granfalloon all the ingredients and mechanisms are at work to prevent a fair and wise discussion about our future. If *we* would be serious about how to think about our future, *we* should put back reflexivity in the discussion. In turn, this would require the selection of *legitimate story-tellers*, *relevant narratives* and *pertinent analyses* about what *we* want to become. But if *we* would really do so, then *we* would soon discover that the real uncertainty is not about our perception and representation of the external world, but about the definition of who is *we* – *we* simply cannot define who *we* really are.

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## **Maria Hage**

### **Stakeholder participation in environmental knowledge production**

Maria Hage<sup>1,2,\*</sup>, Pieter Leroy<sup>1</sup> and Arthur C. Petersen<sup>2</sup>

<sup>1</sup> Political Sciences of the Environment, Radboud University Nijmegen, P.O. Box 9108, 6500 HK Nijmegen, The Netherlands.

<sup>2</sup> Netherlands Environmental Assessment Agency (PBL), P.O. Box 303, 3720 AH Bilthoven, The Netherlands.

Participatory approaches in environmental knowledge production are commonly propagated for their potential to enhance legitimacy and quality of decision-making processes, especially under conditions of uncertainty. This paper describes the development of the Stakeholder Participation Guidance for the Netherlands Environmental Assessment Agency as an attempt to put the rather theoretical ambitions of the participation literature into practice. The study includes an analysis of theories of ‘new production of knowledge’ and of the agency’s position as an intermediary organisation between science and policy, together with its participatory activities, to date. The Guidance is meant to suit different contexts, products and modes of assessments by the agency. Therefore, it cannot be a like a recipe book, but is intended to support and guide project leaders in their choices around stakeholder participation. The paper emphasizes the context-dependency of participatory knowledge production and stresses the importance of reflection and transparency regarding the role of scientific advisors in the science policy process.

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## **Colin Hannaford**

*Institute for Democracy from Mathematics*

### **Joining the Awkward Squad**

‘Young man, we are not arguing whether your idea is  
crazy:  
We are arguing whether it is crazy *enough*.’

Attributed to Niels Bohr.

I first met Jerry Ravetz at a seminar in Oxford of Professor Steve Rayner’s on the correlation between poverty and violence. Its conclusion was that the poor are both more likely to use violence and are more likely to use it on each other. The further implication is that they are more likely to believe that the larger society is not much concerned to either help or protect them.

I began to realise that nearly everyone else in the audience was a sociologist. Soon they began to discuss whether this violence could be reduced by more democracy - and then whether this democracy should better be more representative democracy or more participatory democracy.

Although somewhat intimidated by the authority in the room, I began to realise that there was something I should say. I indicated that I wanted to comment,

and at the limit of available time, Professor Rayner very courteously indicated that I might.

Being seated in the front, I had to turn around to speak, and this, added to my nervousness at having to correct what seemed to be an entirely general opinion, caused my comment to be scarcely polite: "*I think you ought to realise,*" I declared, "*that it really does not matter whether their increased democracy should be more representative or more participatory if their schools continue to persuade the majority of pupils that it is necessary to be dishonest in order to succeed. This destroys people's belief in society.*"

To my amazement, there was immediate loud applause. The seminar ended. Still surprised by this response, I stood up to find a tall, slim, distinguished-looking scholar standing beside me, who said: "*I have waited thirty years to hear someone say what you have just said.*"

This was my introduction to J.R. Ravetz. Since then his experience and wisdom have guided me through many academic traps and snares. I am honoured by Joseph Ravetz's invitation to contribute to this workshop.

Academically my background is a humble one. I taught mathematics in schools for twenty-eight years. For twenty-five I was a head of mathematics, teaching for the Baccalaureate exam in a major international school, one of a group twelve in Europe. My specialism, if I can be said to have any, was remedial mathematics.

There were several reasons why I stayed so long in one school. I was virtually autonomous. I was well paid. But, above all, I became fascinated by the discovery that nearly everything I had been taught about teaching was wrong.

That meant I had to discover how to get it right. This took some time.

It began one day that I was leaving a staff meeting with a primary school colleague. We had been discussing one boy. My colleague remembered him as a bright, cheerful, honest and eager ten-year-old. Now he was deceitful, bullying, and disruptive. He openly defied his teachers. He told everyone that he hated school. The meeting's conclusion was, effectively, he should be expelled. He was twelve.

Suddenly my colleague stopped, interrupting me in mid-sentence, and demanded angrily: "Just what is it that *you* do to *our* children in *your* school?" And then she left me standing there, with my mouth ajar.

At first I shrugged. I was only following the method of teaching I had been taught to use. How could *I* be responsible if some kids couldn't hack it?

But her anger made me think. The more I thought, the more I realised how much damage I was doing, simply by following orders uncritically, and also by uncritically accepting the result.

I had been taught to teach mainly by instruction and demonstration. The original aim of universal education was to provide millions of workers with the basic skills that industries required, and the willingness to follow further instruction. They were not expected to understand *why* they should obey, only *to* obey.

Nothing much had changed. Mathematics is still mainly taught by instruction.

But modern children, in the main, *do* expect to know why they should do one thing, and not another. And when most are obliged to obey, or fail, and when they are routinely humiliated if they dare to confess not to understand, the consequences are truly fearsome. As Jerry commented of an earlier text of mine: *children faced with such a corrosive situation have just three options: to beat the system; to survive it; or to reject it.* Their rejection ensures that many of the last will be permanently unemployable. This method of education *creates* the poor. It also creates dishonesty.



At first I thought this was only happening in my classroom. Then I discovered that the same was happening in my colleagues' classrooms. But then it must be happening in classrooms throughout all of Europe and America. It must be happening everywhere that Western practice has been adopted. The consequences are intellectually, socially, and also morally disastrous.

In my final fifteen years I learnt how not to damage my pupils in this way, then how to show them all how to learn most effectively together. To find the full analysis of the damage that instruction will inevitably do to children, go to my website and find SAPERE in 'Other Publications'. To give any child an advantage over most other children, go to 'Core Materials' and download a copy for them of the '*Socrates Workbook*' in the language of your choice. To share this understanding with other teachers or parents, download the '*Teachers' and Parents' Guide*'. All are free.

The following are included here to provide possible material for discussion:

- 'Giving Peace a Voice' is the report of a conference that I organised in January this year, with Jerry's help, at St George's House in Windsor Castle, on behalf of the Qatar Foundation. Appendix A is the list of participants; Appendix B is the original invitation. (A shorter report will be published in July this year in the journal '*Democracy and Education*', published by Lewis and Clark College, Oregon USA;
- A Briefing Paper prepared for Professor Mike Savage, Director of the HECFE project to improve the transition, especially in mathematics and the sciences, from schools to university;
- A letter of Jerry's nominating me for the 2009 John Humphrey Freedom prize of the Canadian Parliament's '*Rights and Democracy*' organisation.

Truly a prince amongst men!

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## ***Stephen Healy***

### **'Normality', PNS and the Future of Science**

*Stephen Healy, UNSW, Sydney*

Normality is like determinism, both timeless and dated, an idea that in some sense has been with us always, but which can in a moment adopt a completely new form of life (Hacking, 1990: 160).

Jerry and Silvio adopted the 'N' in PNS to make the point that when 'facts are uncertain, values in dispute, stakes high and decisions urgent' any sort of 'normal'

science, in a Kuhnian or other sense, isn't up to the job. PNS stresses, in particular, the requirement for 'extended peer communities' to generate 'extended facts' better equipped to deal with the exigencies of, the increasingly 'normal', post-normal character of contemporary technoscientific challenges. The effective resolution of post-normal challenges is, however, as much a matter of the societal implications of any proposed solution to them as it is of the technical inputs informing them. So while the contextualisation of these inputs via 'extended peer communities' will help temper the naïve technocratic character of traditional decision-making it may only go part way to addressing the imperative to ensure that the societal implications of any proposed solutions are widely accepted and endure.

This suggests a shift in focus away from normal science and toward 'normal' society, understood in a Foucauldian sense. For Foucault the content and character of contemporary life is moulded and shaped by structures of power constituted not only by politics, as generally understood, but also by the intimate interdependencies between governmental politics and other significant cultural formations, such as science. In particular, Foucault argued that from about the 18<sup>th</sup> C government became an increasingly technical exercise involving complex and sophisticated coercive techniques to ensure compliance with governmental imperatives. It's important to note the resonance between these ideas and both the retrogressive role of 'normal science' and the longstanding critique of technocracy underpinning the original PNS analysis. The turn to Foucault suggested here implying further attention to 'post-normal politics'.

'Post-normal politics' has been described as equating to:

...a thoroughly democratic polity in which state level political power acts as mediator for a complex web of decision making bodies, many analogous to extended peer communities, distributed throughout civil society...such that matters of technological innovation, scientific research, the environmental impacts of infrastructure development and also lifestyle and other singular personal and community level issues become properly the province of intense societal debate and consideration focused upon the construction of broad-based public knowledge (Healy, 1999: 666-667).

This paper will suggest that this focus 'upon the construction of broad-based public knowledge' should be extended to embrace the broader societal implications of such knowledge in a way adequately cognizant of the politics of which it is part. It will be proposed that this can be facilitated by framing the solutions proposed to post-normal problems in terms of an analysis of the 'forms of life' to which they may give rise. 'Forms of life' are well suited to societal oversight and evaluation because they encompass the complex interdependencies between culture, the specificities of everyday life, and the technoscientific achievements that result from (extended) factual claims. These arguments will be illustrated using the case of the emissions constrained 'forms of life' necessitated by climate change.

Hacking, I. (1990) *The Taming of Chance*, Cambridge University Press, Cambridge.

Healy S.A. (1999) 'Extended Peer Communities and the Ascendance of Post-Normal Politics', *Futures* 31(7): 655-699.

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## **Karen Kastenhofer**

### **Current challenges to Post-Normal Science: Assessing the risks and safety of emerging technologies**

*Karen Kastenhofer, Institute of Technology Assessment, Austrian Academy of Sciences, [kkast@oeaw.ac.at](mailto:kkast@oeaw.ac.at)  
Helge Torgersen, Institute of Technology Assessment, Austrian Academy of Sciences, [torg@oeaw.ac.at](mailto:torg@oeaw.ac.at)*

*Theme: Epistemology of PNS*

Post-Normal Science as a theory links epistemology and governance (Funtowicz and Ravetz 2003<sup>1</sup>). It comprises not only a focus on problem situations where facts are uncertain, values in dispute, stakes high and decisions urgent (Funtowicz and Ravetz 1993<sup>2</sup>), but also tries to develop epistemic approaches that allow for sound scientific answers. The planned paper aims at discussing major epistemological challenges within a typical ‘wicked problem situation’, i.e., risk assessment of emerging technologies. Such challenges include (a) epistemological problems intrinsic to the task of proving the absence of risk, (b) problems relating to trans-scientific translations, (c) the multidisciplinary of risk research and the multitude of epistemic cultures involved, (d) the incompatibility of scientific and trans-scientific goals, and (e) the complex actor constellations, that shape not only the way scientific knowledge is translated into action, but also which kind of knowledge is produced and which experts are listened to. To specify, illustrate and discuss these characteristics, the paper draws on results from an empirical study of risk research and risk evaluation in the fields of agro-biotechnology and telecommunication technology in Germany (Böschchen et al. 2006<sup>3</sup>, Kastenhofer 2007<sup>4</sup>). It concludes that some aspects of PNS are already part of current epistemic practices in this fields, while others are far from being implemented or pose unsolved epistemic problems.

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<sup>1</sup> Funtowicz, S. and Ravetz, J. (Lead Authors); International Society for Ecological Economics (Content Partner); Robert Costanza (Topic Editor). 2008. "Post-Normal Science." In: Encyclopedia of Earth. Eds. Cutler J. Cleveland (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment). [First published in the Encyclopedia of Earth September 18, 2006; Last revised August 22, 2008; Retrieved Oct 7, 2008]. <[http://www.eoearth.org/article/Post-Normal\\_Science](http://www.eoearth.org/article/Post-Normal_Science)>

<sup>2</sup> Funtowicz, S. O. and Ravetz, J. R., 1993, Science for the post-normal age, *Futures*, 739-755.

<sup>3</sup> Böschchen, S., Kastenhofer, K., Marschall, L., Rust, I., Soentgen, J. and Wehling, P., 2006, Scientific Cultures of Non-Knowledge in the Controversy over Genetically Modified Organisms (GMO). The Cases of Molecular Biology and Ecology, *GAIA* 15(4), 294-301.

<sup>4</sup> Kastenhofer, K., 2007. Converging epistemic cultures? A discussion drawing on empirical findings. *Innovation: The European Journal of Social Science Research*, 20(4): 359 - 373.

## **Dan McCarthy**

Assistant Professor

Social Innovation Generations / Department of Environment and Resources Studies  
University of Waterloo

### **Knowledge for Fostering Innovation in Planning and Decision-making in the Face of Complexity: Case Studies from Ontario, Canada**

This research represents an application of complexity-based thinking and post-normal science. It contributes a theoretically-based and empirically-grounded tool for fostering social learning to enhance the adaptive capacity (Armitage, 2005) and resilience (Walker and Salt, 2006) of social-ecological systems in the context of collaborative land use planning. The development and fostering of adaptive capacity is critical to resilience in social-ecological systems (Armitage, 2005) where adaptive capacity refers to the “aspect of resilience that reflects learning, flexibility to experiment and adopt novel solutions, and development of generalized response to broad classes of challenges” (Walker et al. 2002). Two of the key dimensions of adaptive capacity are “learning with uncertainty” and “combing different types of knowledge for learning” (Armitage, 2005).

A conceptual model of social learning within socio-ecological systems has emerged through this research that illustrates the epistemological context for environmental governance and the requirements of social learning as defined along three axes: Flyvberg’s (2001) three-part Aristotelian, typology of knowledge; three levels of critical reflection based on Flood and Romm’s (1996) triple-loop learning; and, a scale axis that highlights the importance of considering cross-scalar dynamics of complex systems. The heuristic was developed as a descriptive tool to conceptually map the evolution of an individual’s learning or an organization’s social learning through time.

Two case studies are used to demonstrate the conceptual tool’s descriptive and prescriptive utility. The first case is a multi-stakeholder, collaborative planning and advocacy process to protect a hydrologically and ecologically sensitive greenbelt (the Oak Ridges Moraine) in the most rapidly urbanizing are of Canada, the Greater Toronto Area. The second is in a community-based, collaborative land use planning process in a remote First Nation’s community on the western coast of James Bay, Ontario, Canada. The three axes of the model are each explored as tools to diagnose barriers to social learning to enhance both case study communities’ adaptive capacity and resilience.

## ***Martin O'Connor***

Professor of Economics, UVSQ, France

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**Réciprocity, Irréconciliation, Being and Dying, and Why Post-Normal Science Practice is a Pragmatic Asset for Our Time**

## ***Rafael Ramirez***

**PNS and scenarios – evolutions towards more effective future – mindedness**

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## ***Samuel Randalls***

**Climate change and health: postnormal and/or pathological?**

*(Broad Theme: Climate Change, or Environmental Risk)*

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## ***Joe Ravetz***

**Running with the Low Carbon Economy agenda - approaching cognitive diversity and dissonance through visual thinking**

The agenda for ‘Low Carbon Economy’ or ‘One Planet Economy’ is an example of the ‘post-normal’ – high levels of uncertainty, complexity, controversy, urgency, impacts, and strong probability of policy failure. To explore this we can identify some of the different kinds of knowledge involved, in terms of ‘cognitive agendas’:

- ‘Technical agendas’ – formal theoretical models, natural or social science, often quantitative and implemented in software;
- ‘Systems agendas’: more holistic systemic concepts, mind mapping or soft cognitive mapping;
- ‘Discourse agendas’ - underlying, fuzzy, qualitative issues, conflicts, cultural waves, ideologies etc.
- ‘Policy agendas’: real-time action-focused problems, issues, risks, opportunities, strategy and tactics;

Such ‘cognitive diversity’ is crucial in responding to the Low Carbon Economy agenda, and particularly the ideological ‘dissonance’ and conflict which suggests the probability of policy failure. To explore this we can look towards various kinds of heterodoxy – behavioural, institutional, or evolutionary economics: we can also look to these wider forms of knowledge.

This session will demonstrate a ‘visual thinking’ approach to such cognitive diversity. Using a variety of interactive techniques, the result aims towards a wider and deeper response to the Low Carbon Economy than is likely with rational text. Such visual thinking then points the way towards more holistic patterns of ‘ecological thinking’ which is suited to the global challenges of the 21<sup>st</sup> century.

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## ***James Risbey***

*CSIRO, Australia*

### **On the epistemology and robustness of climate projections**

The field of climatology is rife with meaningless and false research claims. Further, the three dimensional models of the climate system do not resolve the key energetic processes in the oceans, and these in turn degrade representation of weather systems and processes that make up the climate. The implications of these shortcomings for characterizing and projecting climate change are discussed.

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## ***John Robinson et al***

### **Envisioning sustainability pathways: Recent progress in the use of participatory backcasting approaches for sustainability research**

John Robinson\*, Sarah Burch\*, Sonia Talwar#, Meg O'Shea\*, and Mike Walsh~

*University of British Columbia / Envision Sustainability Tools*

This paper describes recent progress in the utilization of participatory scenario-based backcasting approaches to sustainability research that blend quantitative and qualitative analysis in order to explore alternative climate change futures, as undertaken in a range of academic, government, and private sector projects in the Lower Mainland of British Columbia, Canada. These projects involved second generation backcasting techniques, 3D visualization tools, criteria and indicators, and multi-stakeholder participation. We explore whether such techniques can help to build capacity, design integrated policy solutions, reveal values and attitudes, build awareness, promote dialogue, and enhance collaboration among various departments, disciplines, and stakeholders.

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## ***Hilary & Steven Rose***

### **On belonging to a shoulder generation**

*Professor Hilary Rose PhD FilD hc  
Emerita Professor of Social Policy, University of Bradford  
Visiting Professor of Sociology, London School of Economics*

*Professor Steven Rose, PhD  
Emeritus Professor of Life Science, Open University  
Visiting Professor of Life Science, University College London*

There are rather few people alive and active in the politics of science (maybe just Jerry, Steven and me) who personally knew members of the first wave of the radical

science movement. These, mostly natural scientists, gathered round J.D. Bernal following the publication of the Social Functions of Science (SFS). The very title of that pioneering wave - the social relations of science movement - makes clear its Marxist roots. Jerry and we were part of the shoulder generation - between the first and the second wave. This second wave beginning just forty years ago, came to call itself - the radical science movement. It began, in Britain at least under the banner of the British Society for Social Responsibility in Science (BSSRS). Perhaps the one common view (and about the only one) shared by everyone associated with BSSRS, was that this was an embarrassing name.

Retrospectively BSSRS was a catalyst for multiple practical activities, theoretical debates, the beginning of long friendships and alliances and significant differences.

Jerry's influential publication *Scientific Knowledge and its Social Problems* 1971 and our *Science and Society* 1969 faced a very different context from Bernal so replicating or extending SFS was not an option. Jerry as a historian of science was preoccupied with the loss of criticality in science and with the growing threat to the environment. He provided some sorely needed intellectual muscle to the in the UK nascent green movement. Perhaps the best thing that can be said about BSSRS was that it fostered many brilliant innovations many of which are now routine indeed seen as "good practice" to be funded by government and foundations to close the trust gap between science and society. Given today's professionalisation and depoliticisation, it is unlikely that few of those engaged today know (or would want to know) of their roots in BSSRS.

Nonetheless with the usual 20:20 clarity of hindsight perhaps the idea of "social responsibility in science" was actually a rather a good name for a social project which was and remains, fundamentally moral in purpose. Jerry, of course, made it clear from the beginning that this necessarily also entailed responsibility to the environment. He was of course right.



## **Philip J. Tattersall**

*Ph.D Candidate, University of Western Sydney, Australia*

### **Can Environmental Activism Benefit from Post Normal Science?**

Conflict over natural resource usage has been ongoing in Tasmania for many years. There is considerable community concern, disquiet and conflict over forestry management practices including impacts on water quality and yield. The interaction of socioeconomic, scientific and political factors leads to issues that are complex, messy and which are best described as ‘wicked problems’. The author has worked in this context as a scientist and activist for the past 36 years.

In the early to mid 1990’s there were questions in the author’s mind regarding the effectiveness of activism. While it was without doubt that effective activism would continue to perform a vital function in Tasmania there were concerns that conflicts were escalating and the Tasmanian community was at risk of becoming dangerously polarized. There also appeared to be a growing disconnection between the activists and the communities they were supposedly acting for. This was due in part to the immense workload experienced by so few activists.

During the late 1990’s an analysis of his numerous community support projects the author saw an opportunity to close this gap by more closely involving community members in decisions relating to natural resource management. His interest in action research led him to propose a form of activism that included ordinary citizens as active players as opposed to their normal role of spectator. This led in turn to the development of an approach based on the ideas of Post Normal Science.

The idea of the extended peer review aspect of Post Normal Science has been used in the development of a participative inquiry methodology known as Community Based Auditing (CBA). The methodology has slowly evolved since 1999 with some 16 projects supported by a team of facilitators who donate their time and resources, helping citizens with their inquiry from its inception through to outcome and outputs, including reporting.

The CBA approach encourages personal growth and transformation as citizens move through a process that deals initially with the immediate problem or concern through to a consideration of the ‘problem of the problems’. In this way CBA acknowledges and celebrates science as a Human Activity System with qualitative and quantitative sides and is thus the confluence of the objective and subjective, where creativity and insight thrive: the new science and the new activism. This was made possible through Post Normal Science.

This paper reports the key outcomes to date of Community Based Auditing 10 years on.

## ***John Turnpenny***

### **What is post-normal science? A critical review of its development, definitions and usages**

*( Special Issue Proposal: "Where now for post-normal science?" )*

#### **Proposers:**

John Turnpenny<sup>5</sup>, Mavis Jones<sup>2</sup>, and Irene Lorenzoni<sup>1</sup>

#### **Rationale:**

The concept of post-normal science (PNS) has been developed as a potential approach to addressing wicked issues (characterised by uncertainty, complexity, and high stakes). In its original formulation (by Jerry Ravetz, later in conjunction with Silvio Funtowicz and others), PNS should strive to cross disciplinary boundaries; become the product of a complex and recursive relationship between ‘experts’, policy-makers and others likely to have a stake in the policy outcome or its consequences and to provide additional evidence to support it. It is claimed such an approach will better respond to the wicked issue in question. As such, the ‘science’ in PNS is not limited to a conventional understanding of the word, but refers to the use of many different forms of evidence, knowledge and data.

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## ***Rene von Schomberg***

### **Post normal science or post something else?**

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<sup>5</sup> Tyndall Centre for Climate Change Research and School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, UK, Email: j.turnpenny@uea.ac.uk; i.lorenzoni@uea.ac.uk

<sup>2</sup> Department of Bioethics, Faculty of Medicine, Dalhousie University, Clinical Research Centre, Halifax B3H 4H7, Canada, Email: mavis.jones@dal.ca

## ***Hans von Storch***

Institute of Coastal Research, GKSS Research Center, Geesthacht, Germany

### **“Postnormal Science” as a guiding tool of embedding climate science in the public discourse**

The present paper is a call to cultural sciences for helping climate science to establish a sustainable practice of policy advice concerning man-made climate change. As a climate scientists engaged in communication with stakeholders and the media, mostly in Germany, the author has noticed a notable discrepancy between scientific knowledge about climate change, and the understanding in the public at large, specifically as fostered by the media and some publicly visible climate scientists. In this essay, this discrepancy is analysed to some extent and framed as the presence of two competing types of knowledge, namely a body of knowledge named “scientific construct” and another body of knowledge named “cultural construct” of man-made climate change. The relationship and the dynamics of these two knowledge claims are not well researched. In order to understand the dynamical interaction of the different knowledge claims significant efforts from cultural sciences are needed.

Using the concept of Postnormal Science, the Institute of Coastal Research has developed a strategy to address the needs and potential of stakeholder interaction in the field of climate change.

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## ***David Waltner-Toews***

Department of Population Medicine  
University of Guelph

<http://www.ovc.uoguelph.ca/personal/ecosys>

**"PNS as a novel approach to science and health" (with novel as a pun of course).**

## ***Angela Wilkinson and Esther Eidinow***

PNS and Scenarios – evolutions towards more effective future mindedness

### **Evolving practices in environmental scenarios: a new scenario typology**

*Angela Wilkinson and Esther Eidinow*

A new approach to scenarios focused on environmental concerns, changes and challenges, i.e. so-called ‘environmental scenarios’, is necessary if global environmental changes are to be more effectively appreciated and addressed through sustained and collaborative action.

On the basis of a comparison of previous approaches to global environmental scenarios and a review of existing scenario typologies, we propose a new scenario typology to help guide scenario-based interventions. This typology makes explicit the types of and/or the approaches to knowledge (‘the epistemologies’) which underpin a scenario approach. Drawing on previous environmental scenario projects, we distinguish and describe two main types in this new typology: ‘problem-focused’ and ‘actor-centric’. This leads in turn to our suggestion for a third type, which we call ‘RIMA’—‘reflexive interventionist or multi-agent based’. This approach to scenarios emphasizes the importance of the involvement of different epistemologies in a scenario-based process of action learning in the public interest. We suggest that, by combining the epistemologies apparent in the previous two types, this approach can create a more effective bridge between longer-term thinking and more immediate actions. Our description is aimed at scenario practitioners in general, as well as those who work with (environmental) scenarios that address global challenges.

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