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Extended peer communities and the ascendance of post-normal politics

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Abstract

This paper describes an approach to the operationalisation of extended peer communities that deploys uncertainty, ignorance and indeterminacy, and examines the crucial role of trust. Trust underwrites both the dialogue central to extended peer communities and the functional utility of the knowledge so created, because when “facts are uncertain, values in dispute, stakes high ... and the framing of the problem involves politics and values as much as science” (Ravetz J. Knowledge in an uncertain world. *New Scientist* 1990;127:2) the taken-for-granted trust in ‘normal’ science is no longer assured, necessitating the cultivation of trust by other means. It is argued that extended peer communities provide a focus for the ascendant politics of the post-normal realm, in resonance with recently articulated insights into broader social theory.

“... we continue to believe in the sciences, but instead of taking in their objectivity, their truth, their coldness, their extraterritoriality ... we retain what has always been most interesting about them: their daring, their experimentation, their uncertainty, their warmth, their incongruous blend of hybrids, their crazy ability to reconstitute the social bond. We take away from them only the mystery of their birth and the danger their clandestineness posed to democracy” (Latour B. *We have never been modern*. Hemel Hempstead (UK): Harvester Wheatsheaf, 1993:142). © 1999 Published by Elsevier Science Ltd. All rights reserved.

1. Introduction

Post-normal science was conceptualised as a means of confronting increasingly prevalent post-normal situations in which conventional distinctions between the

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spheres of facts, values and politics no longer hold sway and which without urgent remedy threaten calamitous outcomes. While exemplified by global environmental issues a diversity of matters currently qualify as post-normal, particularly in the area of environmental management. Here in Sydney at the time of writing our drinking water has again been declared safe after a series of boiled water alerts over recent months although the causes remain inexplicable. This saga—which encompasses microbiological concerns focused upon the *Cryptosporidium parvum* and *Giardia lamblia* parasites; related epidemiological issues; the efficacy of water purity monitoring techniques; matters surrounding the design, operation and contracting out of water purification plant and distribution infrastructure; catchment management practices; utility corporatisation; associated government-inspired financial pressures; and issues of corporate mismanagement—typifies such matters. I have written in a similar vein on the UK BSE issue [1] and there is no shortage of analogous issues (e.g. AIDs, endocrine system disrupters in the ‘natural’ environment, precipitous declines in fish stocks). In other words the post-normal is increasingly normal and the challenge that post-normal science was conceived for is both pervasive and of great immediacy. This paper argues that the ‘normalisation’ of post-normal science that this necessitates requires the institutionalisation of extended peer communities and that the politics of knowledge so manifested will be a crucial feature of future political landscapes.

Central to the efficacy of post-normal science is the notion that “an extension of peer communities, with the corresponding extension of facts, is necessary for the effectiveness of science in meeting the new challenges of global environmental problems” ([2], pp. 754–755). Extended peer communities not only extend the traditional quality assurance role of conventional peer communities to all legitimate stakeholders and enable their participation in related policy debates but also “positively enrich[es] the processes of scientific investigation” by enabling the use of ‘extended facts’ involving local and anecdotal knowledge ([2], p. 753). Others have made similar observations. Wynne, for example, argues for institutional reform “involve[ing], inter alia, recognition of new socially extended peer groups legitimated to offer criticism ... from beyond the confines of the immediate exclusive specialist science peer group” ([3], p. 39).

If we are to clarify how extended peer communities may be institutionalised we must first understand how they might be configured and extended facts enrolled. A particular opportunity to achieve both these aims is granted by uncertainty—not the narrow typically stochastic measure of traditional scientific practice that details merely a simple unitary measure of imprecision but extended multidimensional conceptions that embrace both ignorance, where we don’t know what we don’t know, and indeterminacy (see, in particular, Funtowicz and Ravetz [4], Smithson [5] and Wynne [13]). By embracing uncertainty, rather than futilely attempting to banish it, an arena is revealed in which the limitations and weaknesses of both scientific and lay knowledge may be opened up and examined side by side, so facilitating a dialogue that can be used to effect their reconciliation. This process of dialogue and negotiation, focused upon the reconciliation of lay and expert party perspectives and insights, is precisely that required by the mandate of extended peer communities for

‘extended facts’ and equates with how contextual uncertainties are engaged in other areas, such as that of the law with its ‘burden of proof’ concept. The following sections clarify the operationalisation of extended peer communities by explaining how uncertainty, ignorance and indeterminacy may expedite both the inclusion of all stakeholders and the enrolment of extended facts, and then by examining the crucial role of trust. The ensuing sections discuss firstly the broader sociopolitical role of the politics of knowledge embodied by extended peer communities and secondly the implications that follow for the shape of future politics.

2. Enabling extended peer communities

Traditional scientific peer communities evaluate core and applied science by established, although implicit, criteria that centre on notions of detachment, objectivity, originality and repeatability. Fundamental to their operation, and to the practice of science and Western conceptions of rationality more generally, is a posited distinction between notions of objectivity and subjectivity that derives from the western scientific tradition.¹ This postulated difference, while a key to the instrumental power of core and applied science [1], becomes an impediment once we enter the post-normal realm in which clear distinctions between fact and value cannot be upheld and knowledge is ‘soft’ and irredeemably indeterminate. Extended peer communities therefore operate within a realm in which the legitimacy of a variety of established notions break down, denoting a discontinuity with aspects of the enlightenment tradition whose implications cannot be underestimated.² Correlating experience to date³ indicates that, in the first instance at least, the operation of extended peer communities will have to rely upon widely accepted fundamental principles such as the norms of rational discourse, although over time more formalised criteria can be expected to develop.⁴ Other matters of practical interest such as the membership of extended peer communities have been discussed elsewhere [9] and will not be further dealt with here.

Means of developing shared meaning will be critical to the success of extended peer communities. The facilitation of mutual intersubjective sensitivity to the perceptions and understandings of others is necessary for the development of mutual understanding and so requires processes that focus upon the development of shared meaning. Different normative criteria and value frameworks among participants necessitate mutual trust (see discussion below) and a respect for the knowledge claims of others as an initial condition for dialogue. The approach outlined below

¹ Emergent tensions over this distinction are manifest in a major current debate in the risk field between ‘objectivist’ and ‘subjectivist’ conceptions of risk. See Royal Society Study Group [6] and, for its influence in environmental risk policy debates, Finkel and Golding [7].

² In that these implications are ultimately not merely epistemological but ontological. See Latour [8] for one particular explanation of these implications.

³ Such as with consensus conferences. For a relevant recent discussion see Fixdal [9].

⁴ For an attempt to develop formal discursive criteria from critical theory see Renn et al. [10].

utilises frameworks of broader uncertainty that encompass both technoscientific and broader contextual parameters and concerns and therefore grant a particular opportunity to translate between these positions and viewpoints. By enabling a mutual exploration of the assumptions underlying different participants' positions and the interrelationships between them these frameworks facilitate constructive dialogue focused upon the development of a shared position based on mutual understandings. Developing shared meaning then revolves around the resolution, by negotiation, of uncertainty in the context of conflicting values and agendas. The aim of this process is the development of a shared meaning of uncertainty, and the knowledge to which it attaches, rather than the imposition of one particular view. This negotiated approach thus enables a shared agreement or understanding conducive to effective and resilient outcomes resulting from the input and support of a broad range of stakeholders. Such outcomes may correlate with those optimal from a rigidly technical perspective, although will likely modify them in various ways if not replace them altogether.

The failings and limitations of orthodox scientific approaches to uncertainty have been detailed elsewhere (see Healy [1] and, in particular, Funtowicz and Ravetz [11], Smithson [12] and Wynne [13]). A conventional, although misleading, analysis of these might subsume them by two categories: the omission and/or misrepresentation of firstly technical uncertainties, and secondly broader contextual considerations. The former can be regarded as less problematical in that a thorough application of existing methods, including recent innovations such as the NUSAP notational scheme [11] described below, may improve their resolution significantly. The latter, while more problematical, provide the key to opening up a shared cognitive space in which the intersection of technical and lay interests may be clarified and the enrolment of extended facts empowered. Cognisance of this intersection involves an acknowledgement that the divide between technical and contextual uncertainties is artificial and that, contrary to accepted notions, technical uncertainties embody, and yet also exclude, contextual factors that shape the associated technical knowledge (see, particularly, Wynne [13]). An illuminating recently published study [14], for example, shows how the generally accepted temperature range for the sensitivity of climate to a doubling of CO₂ of 1.5–4.5°C has remained static since 1979 not because of any 'hard', determinate technical considerations but because of contextual factors (underlining in this case the post-normal nature of the greenhouse debate).

The frameworks of broader uncertainty that this work draws upon have been described elsewhere [11–13] and will be illustrated here simply by reference to the NUSAP notational scheme of Funtowicz and Ravetz [11], developed specifically as a means to manage uncertainty in the post-normal realm, and Wynne's four-part taxonomy of uncertainty [13]. Of particular relevance to this exercise is the work of Smithson [12,15], whose taxonomy of ignorance represents the most sophisticated transdisciplinary analysis of the multidimensional nature of uncertainty to date, and who also usefully expands upon many of the dilemmas and trade-offs involved in exercises of this nature.

3. Elaborating uncertainty

Funtowicz and Ravetz developed the NUSAP (Numeral, Unit, Spread, Assessment, Pedigree) notational scheme as a means to specifically manage uncertainty in the post-normal realm. By flexibly accounting for both conventional first-order uncertainty—Spread—and second-order uncertainty—Assessment—this scheme optimises the use of conventional arrangements for minimising technical uncertainty but its particularly innovative element is the pedigree matrix. Pedigree matrices, which are tailored for specific applications, provide a partially formalised evaluative account of the production process of the associated knowledge ranking, for example, data inputs in terms of their source, methods of data collection and analysis, peer consensus, and institutional culture. In the words of Funtowicz and Ravetz they represent “the epistemological sort of uncertainty, border with ignorance” ([11], p. 29) and usefully clarify many contextual uncertainties obscured or omitted by conventional approaches. The Pedigree approach provides a template that might be elaborated to, for example, express additional uncertainties such as those described by Wynne (see below) and Smithson, and provide a basis for future attempts to represent and communicate such uncertainties.

RISK: system behaviour is known, and outcomes can be assigned probabilistic values.

UNCERTAINTY: important system parameters are known, but not the probability distributions.

IGNORANCE: what is not known is not known.

INDETERMINACY: causal chains, networks or processes are open, and thus defy prediction

Wynne’s taxonomy of uncertainty [13]

Wynne’s simple taxonomy usefully highlights many key features of concern, helping illuminate both weaknesses in traditional scientific approaches and the relevance of lay contextual insights. For example, uncertainty where major parameters are known but not their probability distributions is often conflated in technical practice with risk where all parameters and their probability distributions are known. This taxonomy might thus usefully facilitate effective recognition of the practical ramifications of the merging of these two categories. This could, for example, involve explicit acknowledgement of the analysis, judgments and assumptions brought to bear in applying the methods of risk to a problem of uncertainty, and might be achieved by formal means, such as those encapsulated by NUSAP (see above), or by less elaborate discursive methods, dependent on context.

Although ignorance cannot, by definition, be catered for in the orthodox sense of a specific acknowledgement or representation, consideration of it should clarify a variety of matters of concern at the intersection of lay and technical perspectives, and in which lay knowledge and insights may be crucial. For example, what are the applicable domains of the scientific models that are being applied and how or where may they fail or lose potency? What assumptions have been made in the application of existing approaches and which potential areas of ignorance do they flag? While

irresolvable in conventional terms, consideration of such matters will help ensure that sufficient resilience is built into whatever approach is finally agreed upon. Similar considerations apply to indeterminacy where local knowledge and insights are also likely to be particularly applicable to identifying shortcomings in the determinate assumptions underpinning conventional technical approaches. For example, how might local conditions differ from those assumed by the generators of technical knowledge and therefore effect its application?⁵

This exercise in which broader uncertainty is embraced rather than banished will expose participants to the fundamentally political nature of the final decisions at which they arrive. The trade-offs and choices made in the face of continuing uncertainty, ignorance and indeterminacy must clarify, or be clarified by, the expected or hoped for balance of benefits and losses, opening up what were once narrowly technical decisions to the broader sociopolitical commitments that they embody.

4. Trust

Trust is both a rationale and a key requirement for extended peer communities. The taken-for-granted bond of trust that decision makers still regularly assume between science and the general community can no longer be relied upon. While recognition of and respect for the instrumental power of science and its foundational role in industrial lifestyles are ubiquitous they are tempered by an equally universal awareness of the involvement of science in many of the most threatening concerns of our time. Similarly, the long-accepted claim of science to a superior, and in some cases global, rationality holds a severely diminished influence with a public long exposed to expert discord over everything from whether or not, for example, British beef is safe to eat, Sydney's water safe to drink or whether the global climate is changing. A crucial dimension in ensuring the effective application of science in this post-normal realm is therefore the cultivation of trust by other means. The role of extended peer communities in fulfilling this vital role is examined in the sections that follow. The no less critical matter of inter-personal trust between the members of extended peer communities is examined below.

The literature underlines how lay trust in science is often conditional and marked by ambivalence. Wynne describes the 'private ambivalence' of Cumbrian sheep farmers in their interactions with British government scientists over Chernobyl fallout on their land, detailing a deep-seated mutual scepticism [3,16]. McDonnell [17] goes somewhat further, characterising a condition of 'suspended doubt' as more typical of lay attitudes to many areas of public policy than trust. This condition is more provisional than trust and involves a continued monitoring and review of knowledge claims indicating a level of insecurity that would be obviated by the existence of

⁵ Wynne elaborates on examples of all the failings outlined in this paragraph in his case study of UK government scientists' attempts to deal with Chernobyl fallout on upland Cumbrian sheep farms—most notably in Wynne [13] but also in Wynne [3,16].

trust. Giddens describes people as making a “bargain with modernity ... governed by specific admixtures of deference and skepticism, comfort and fear” ([18], p. 90) in his discussion of trust and expertise, and describes a number of ‘adaptive reactions’ to the risk profile of modernity including ‘pragmatic acceptance’ and ‘cynical pessimism’ ([18], pp. 135–136). While these authors all depict a pervasive and deep-seated alienation, Giddens’ portrayal of its dual residence with more traditional regard is perhaps closest the mark, indicating that the cultivation of lay trust in science and scientists is not beyond practical remedy.

Direct, particularly personal, factors will likely play an important role in this. Fixdal reports that lay members of the Norwegian consensus conference demonstrated scepticism toward some technical experts on personal grounds alone, disregarding their technical expertise, with expert arrogance noted as a particular factor in this regard [9]. Similarly Wynne, in his Cumbrian sheep farming case study, notes “farmers felt that their whole identity was under threat from outside interventions based upon what they saw as ignorant but arrogant experts” ([3], p. 36), referring to the expert disregard for specialist local knowledge of hill sheep-farming methods. Clearly technical members of extended peer communities will need an open-ended approach disavowing any such preconceptions. Ensuring lay trust will require not only transparency, as facilitated by a focus on broader uncertainty, but also a concern with ensuring effective personal relationships. Openness and a willingness to find language and explanations assessable to all will be central to cementing this trust.

Ensuring expert trust in lay people and their knowledge will likely be more problematical. Sceptical attitudes towards lay tacit knowledge are inherent to contemporary science and widely documented [3,19] such as by Wynne in his Cumbrian case study described above [3,13,16]. Cementing personal trust between expert and lay parties will be an essential first step toward developing broader expert trust in lay knowledge but requires as an initial condition that expert parties place, at least potential, value in the knowledge and insights of lay parties. The value of lay knowledge has only recently been widely acknowledged in these regards with the technocratic ethos that discounts it still generally pervasive. The extent of this influence is underlined by its reflection, as others have indicated [16], in the work of the social theorists Beck and Giddens discussed below, reflecting also the currently marginal status of alternatives to this dominant paradigm. Emergent changes in this regard are evident in a number of areas, including: technology assessment where participatory approaches such as consensus conferences are gaining a following [9,20]; and in both environmental management [21] and in discussions of sustainability [22,23] more generally where lay insights and knowledge are increasingly recognised to be of pivotal consequence. Success in cultivating expert trust in lay insights and knowledge will be aided by, and probably require, a broader awareness of case studies demonstrating the utility of lay knowledge, particularly in the context of technoscientific applications.

5. The politics of knowledge

The concerns that inspired post-normal science have been elaborated in a variety of contexts and this section highlights how recent social theory has similarly grappled with the pathologies of late-industrial society. While this literature displays some limitations in its grasp of science and its interdependence with broader society, it delivers a depth of insight into broader sociopolitical matters rarely found in discussions of post-normal science. Of particular interest to this discussion are the analyses of the dynamics of society's pathologies and the proposals put forward for their resolution, from which the idea of post-normal politics is elaborated. This idea centres on the notion that future political landscapes will involve a complex web of decision-making institutions with many analogous to extended peer communities. This literature shares with post-normal science the belief that, contrary to post-modernist conceptions of the 'powerlessness' of the contemporary condition, progressive change is feasible and necessary but requires radical but constructive engagement with many of the most fundamental assumptions upon which modernity is based.⁶

Primary issues of concern to post-normal science such as those of risk and the credibility of expertise are central features in the work of Ulrich Beck and Anthony Giddens.⁷ They both engage with the saliency of risk in contemporary societies, the associated politics of expertise and the reflexive dynamic enjoining them via the contingency and ontological insecurity they engender. They identify risk as a central organising principle of contemporary societies, bound to an emergent awareness of the limits of expertise, particularly its inability to deliver certainty and control, as key features in the erosion of the authority of dominant institutions whose legitimation traditionally involved the now discredited claims of expertise.⁸ They both regard current institutional approaches as not only redundant but a key to modernity's afflictions, primarily because of their centralised application of a discredited technocratic logic that compounds rather than cures these afflictions.⁹ The alternatives they describe, discussed in the ensuing section, involve forms of decentralised democracy in which decision making around technoscience and its implementation is a key element.

For Beck risk has now become the organising principle of late-industrial societies, the underpinning rationale now that of the distribution of 'bads' in the form of risks, resulting from industrial production, rather than that of the distribution of material 'goods' that had hitherto been taken to define industrial society [24]. In this risk

⁶ For an illuminating summary of this position see Giddens ([18], p. 150).

⁷ This paper draws upon Beck [24,25] and Giddens [26,27]. For a useful commentary, particularly of Beck, see Goldblatt [28].

⁸ This commentary on the work of Beck and Giddens is partial and concentrates on those elements of importance to the development of the notion of post-normal politics. A thorough appreciation of the power of their analyses requires coverage of the full range of matters they address, including structural economic change, detraditionalisation in areas such as work and the family, and the implications for issues such as intimacy and gender.

⁹ This is, however, made more explicit in the work of Beck than that of Giddens.

society the knowledge and expertise necessary to define, understand, ameliorate and control risk become a highly charged political commodity and “the natural and engineering sciences ... become a branch office of politics, ethics, business and judicial practice in the garb of numbers” ([24], p. 82, his italics). Beck sees science as an unwitting accomplice to the proliferation of modernity’s risks because of how “sciences’ monopoly on rationality is broken” ([24], p. 29, his italics), detailing a variety of ways in which the traditional claim of science to a monopoly on hard determinate knowledge enabling prediction and control no longer holds. He identifies a break between ‘social and scientific rationality’, noting that “scientific rationality without social rationality remains *empty*, but social rationality without scientific rationality remains *blind*” ([24], p. 30, his italics), correlating with arguments for extended peer communities. He extends these arguments into the institutional sphere by contending that current institutional arrangements rely on outmoded ‘relations of definition’, a ‘legal, epistemological and cultural matrix’ ([28], p. 166) appropriate for the nineteenth century but redundant in the late-twentieth. He points, for example, to how current systems of liability and attribution are predicated on causally identifiable risks emanating from unitary sources, something that rarely obtains in a world where risks and pollution are generally pervasive, diffuse and often of indeterminate origin. He convincingly elaborates these arguments to show how current institutional arrangements act, against their own claims, to nurture the proliferation of modernity’s risks rather than vice versa.

Much of Beck’s risk society rationale reflects that of post-normal science.¹⁰ While Beck delivers a depth of insight into how the unanticipated negative consequences of industrial civilisation are structured into present sociopolitical and socioscientific arrangements and therefore necessitate their reform, he is on weaker ground when he engages with the practice of science itself. He argues for an ‘*alternative science*’ ([24], p. 179, his italics) in which science changes itself, primarily via a process of ‘reflexive scientisation’ ([24], chapter 7) in which science turns its ‘organised scepticism’¹¹ on itself so as to foreclose on the unanticipated consequences of its application that are central to the risks of concern. This process, however, privileges internal critique of science by science rather than the combination of such critique with external critique as is central to extended peer communities. While Beck makes a point of indicating a need for broader societal involvement, he perceives expert critique of expertise to be the key to the reform of science. This effective cordoning off of science from broader society is perhaps surprising in light of how science is pivotal to his risk society analysis, and even counter to how he effectively integrates science with broader social factors such as in his notion of the ‘relations of definition’ (see above). This flaw in his argument, which may simply reflect an ignorance of science and critical science studies, appears, rather ironically, to have predisposed

¹⁰ See, for example, the Ch–Ch (Chernobyl–Challenger) Syndrome described in Funtowicz and Ravetz ([11], p. 1).

¹¹ One of the four ‘norms’ described by the American functionalist sociologist Robert Merton (universalism, communality, organised scepticism and disinterestedness) widely taken to confirm the objective and value-free status of scientific knowledge.

him towards the positivist myth so beloved of expertise that the complexity of science precludes lay involvement. Wynne, in a vigorous constructivist critique of both Beck and Giddens,¹² points to how this failure thwarts an effective engagement with lay knowledge of the form necessary for the fabrication of ‘extended facts’.

The insights of Giddens are consistent with those of Beck, although he is much less concerned with technoscience and its role and more specifically focused upon the personal and psychological implications of the risk and trust profiles of late-modernity. Giddens makes a particular contribution in highlighting the crucial role of trust in sociopolitical arrangements, underlining how “*the nature of modern institutions is deeply bound up with the mechanisms of trust in abstract systems, especially trust in expert systems*” ([18], p. 83, his italics), the latter of which encompass sociotechnical systems. He is particularly concerned with the ‘ontological insecurity’ resulting from modernity’s risk profile and its consequences, characterising these in terms of the ‘adaptive reactions’ briefly described in the discussion of trust above. The most positive of these ‘adaptive reactions’ is that of ‘radical engagement’ ([18], p. 137), which is bound up with contestatory action and exemplified by social movements. From this and as a vehicle for envisaging positive future developments Giddens develops a model of ‘utopian realism’ ([19], pp. 154–158), linking together normative and immanent considerations of the future, and which is elaborated into the ‘post-modern order’ described in the following section. While Giddens is at pains to emphasise the difficulties of establishing trust in modern contexts, his work indicates that the establishment of such bonds will be crucial to the success of any future polity, a point taken up below.

Central to the work of both Beck and Giddens is the notion of reflexivity. Late-modernity, for them, is inherently reflexive in the sense that all aspects of contemporary life are contingent and subject to continual change as a result of an ongoing and dynamic flux of new knowledge and information. For Beck the paradoxical role of science as both cause and potential antidote to modernity’s risks is a crucial reflection of this reflexivity that he believes may be harnessed by cultivating a critical awareness of the underlying assumptions that are brought to bear in the application of science and by creating institutional mechanisms for this. While not specific about how this is to be achieved he details the process of ‘reflexive scientisation’, described above, and calls for “*controversial and alternative discussions on the risks of certain steps and plans in advance, and not only in intradisciplinary circles but also in interdisciplinary partial public spheres that would need to be created institutionally*” ([24], p. 235, his italics), a call that might be compared to that for extended peer communities. Giddens is concerned with not only how modernity’s reflexivity is a source of risk but also particularly with how it shapes social life and systematic self-knowledge, presenting both opportunities and threats. He alludes to how discussions such as those of the ensuing section reflect a reflexive relationship between the

¹² Wynne [16] ascribes this failure to them being insufficiently ‘constructivist’ and beholden to ‘realist’ insights, highlighting a key tension underlying sociological attempts to engage with environmental matters [29]. Unlocking these tensions will require a transcendence of the cognitive rigidities associated with these traditional dualisms, skilfully depicted by Latour [8] as undesirable ‘works of purification’.

present and the future in the sense that “Anticipations of the future become part of the present, thereby rebounding upon how the future actually develops” ([18], pp. 177–178). Not explored here (see footnote 8) but central to both their work is a concern with the effects of modernity’s reflexivity on the individual, on personal life and on conceptions of self.

The correlations between the analyses of Beck and Giddens and what I have identified as the post-normal realm revolve around: the centrality of risk; the limitations of science and expertise as conventionally envisaged; the politicisation of knowledge; and the resultant requirement for a democratisation of technical decision making. Both Beck and Giddens, however, neglect the crucial role of lay interests and knowledge in tempering science and its application that are integral to extended peer communities and the associated notion of extended facts (see discussion of ‘reflexive scientisation’ above). While post-normal science is more explicit about this democratisation, its role and how it is to be effected, the work of Beck and Giddens illuminates its broader, particularly political, relevance and implications that form the focus of the following section.

6. Post-normal politics

Beck believes that without effective remedy the dynamics of the risk society will ensure the reinforcement of centralised state power around existing ‘relations of definition’, denying the post-normal realm, and resulting in what he calls an ‘authoritarian technocracy’. Beck’s response centres on a thoroughgoing democratisation centring on matters of techno-economic development. He elaborates this in terms of a ‘Differential Politics’ ([24], p. 231) in which centralised state-level politics takes on a mediative role within a broader democratic process encompassing decentralised politics in the public sphere, the latter of which he terms ‘sub-politics’ ([24], pp. 192–194). Beck’s concept of ‘sub-politics’ is much broader than that of social movements encompassing how life across the public sphere, including in business, the professions, culture, personal life and of course science, is increasingly politicised. He believes that there must be “*the extension and legal protection of certain possibilities for sub-politics to exert influence*” ([24], p. 234, his italics) and that this requires strong and independent courts and media and institutionally protected “opportunities for self-criticism” [24]. This latter point is specifically addressed to science and his idea of ‘reflexive scientisation’. In addition to the call detailed above for “interdisciplinary partial public spheres” he also mentions the potential for the “inclusion of citizens’ groups in technological planning and the decision-making processes in research policy” ([24], p. 229). In this scheme state-level mainstream politics is primarily conceived of as having an arbitrative role with “*the preserving, settling, discursive functions ... become[ing] the core of its tasks*” ([24], p. 235, his italics), and with much decision making of importance, such as that around science, occurring at the level of ‘sub-politics’.

Giddens’ proposal for the resolution of modernity’s dilemmas, inspired by his notion of ‘utopian realism’, centres on the four dimensions of an ‘institutionally

complex' 'post-modern order' ([18], p. 164) that he sees as immanent in present trends. These four dimensions encompass: a 'post-scarcity system' that moves beyond capitalism by way of a globally coordinated system of 'socialised economic organisation'; 'multilayered democratic participation'; 'demilitarisation', which is beyond the concerns of this present paper; and 'the humanisation of technology'. The arguments of this paper correlate with two of these four dimensions, that of 'multilayered democratic participation' and 'the humanisation of technology', yet in ways that expand and refine Giddens' vision. For Giddens 'the humanisation of technology' is concerned primarily with curtailing the instrumental impulse behind modern technological innovation and scientific development, although little detail is given on what he means by this. While Wynne argues that this lack of clarity results from an unduly positivist perspective (see footnote 12), a more mundane explanation may be that, as with Beck (see previous section), it relates to an ignorance of science and critical science studies. The effective 'humanisation of technology' will, as Wynne underlines, have to involve lay interests alongside those of expertise in the manner of extended peer communities. Such processes are inherently democratic and map naturally into the dimension of 'multilayered democratic participation'. In other words, once Giddens' omission of an effective democratic dimension to 'the humanisation of technology' is made good we arrive at a vision similar to that described by Beck.

Giddens sees 'multilayered democratic participation' as resulting from trends toward polyarchy at both the local and international levels.¹³ He describes "democratic participation in the workplace, in local associations, in media organisations, and in transnational groupings of various types" ([18], p. 168). His analysis of the four dimensions of a 'post-modern order' draws upon a prior analysis of social movements with 'multilayered democratic participation' correlating with free speech/democratic movements and the 'humanisation of technology' with ecological movements.¹⁴ By mapping 'multilayered democratic participation' into 'the humanisation of technology' a more distinct resemblance to Beck's notion of differential politics results. Giddens' notion of 'the humanisation of technology' can then be likened to the democratisation of techno-economic development at the core of Beck's vision with 'multilayered democratic participation', equating to Beck's notion of 'sub-politics' bound up with a mediative role for state-level politics. So central to this shared vision is a democratically facilitated politics of knowledge, predicated on extensive mediation and negotiation between expert and lay interests, as an element in a democratic process that encompasses the public sphere.

This shared vision of the politics of a post-modern order provides the general outline of post-normal politics. Post-normal politics thus equates 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, dis-

¹³ For the relevance of the more local slant to democratisation given in this paper to that at the global level see Joss [20].

¹⁴ The Post-Scarcity System correlates to Labour movements and Peace movements to demilitarisation.

tributed throughout civil society. These are 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. Such a politics would be very different from the representative forms of democracy with which we are familiar. Decision making by proxy would be replaced by a dynamic and extensive process extending throughout the community. While this may remain an ideal from the viewpoint of the present, it is latent in a number of contemporary occurrences and endeavours. To name just two, the Brent Spar episode¹⁵ illustrated how broad, in this case international, community pressure can be effectively brought to bear on the most powerful of vested interests, while the increasing popularity of consensus conferences [9,20] may auger more fundamental change. A key to such change will be a recognition that central to community trust in science is not trust in science as ‘truth-machine’ per se but trust in the institutions and procedures that certify its practical efficacy [17,18]. As the shadows of doubt resulting from late-modernity’s afflictions continue to gather, the pressures to provide the ‘broad epistemic and fiduciary warrants’ [17] required to underpin science’s practical efficacy will continue to multiply. Post-normal politics can generate the dimensions of trust necessary to fulfil this vital requirement whilst extending the functional utility of science to the post-normal realm.

These ideas reverberate with those articulated across a range of areas. They equate, for example, to the discursive approaches to green democracy articulated by Dryzek [30] and Barry [31], amongst others. Dryzek’s call for ‘autonomous public spheres’ (p. 78) and Barry’s for a democracy in which citizens engage in all decision making and which brings “expert and lay citizens together in a (hopefully) mutually enriching context” ([31], p. 126) echo many of the themes of post-normal politics. These also, for example, resonate with Turnbull’s “third space ... in which local knowledge traditions can be reframed, decentred and the social organisation of trust can be negotiated” [32], and in which the performative, as against representational, content of knowledge is critical. What is clear is that in order to shake off the redundant and retrogressive shackles of technocracy, and yet underwrite the future functional utility of science and technology, we must embrace the need to certify techno-economic development via broad-based participatory processes to which all have access, and that moreover such changes can be discerned in both current thought and practice.

7. Conclusions

Extended peer communities facilitate decision making in the face of the erosion of traditional distinctions between fact and value by enabling a mediation of technical

¹⁵ See: <http://www.shellexpro.brentspar.com/> for a view from the Shell oil company; <http://www.greenpeace.org/~odumping/oilinstall/monitorbs/index.html> for a view from the other the major protagonist—Greenpeace; and <http://www.greenchannel.com/tec/bspar/index.htm> for a description of the public dialogue process initiated since by Shell.

and lay interests so as to produce a body of knowledge that integrates technical and contextual matters and is legitimated by all relevant stakeholders. Frameworks of broader uncertainty, bridging contextual and technoscientific considerations, can empower the negotiation of these bodies of public knowledge by enabling a mutual exploration of the assumptions underlying different participants' positions so as to facilitate the development of a shared meaning of uncertainty, and the knowledge to which it attaches, rather than the imposition of one particular perspective. This negotiated approach is amenable to the transparent formulation of policy and conducive to resilient outcomes because of the input and support of a broad range of stakeholders. The realisation of this approach requires mutual trust between all concerned, with current widespread public ambivalence to science and scientific scepticism of lay perspectives necessitating particular initial attention to the development of interpersonal trust. While adequate levels of interpersonal trust will be a key to their success, extended peer communities offer the potential to generate the trust, between science and the broader community, required to assure the future functional utility of science.

This broader role is necessitated by the ongoing proliferation of public ambivalence to science and expert scepticism of lay perspectives that are symptomatic of broader contemporary institutional failings. A fundamental means by which these are articulated are sociopolitical and socioscientific arrangements that deny the post-normal realm, primarily by adhering to the traditional view of science as the province of objective, determinate knowledge. These matters are a focus of recent social theory that articulates alternative arrangements that centre upon a decentralised politics in which a politics of knowledge of the form embodied by extended peer communities is a key element. This post-normal politics involves power sharing between conventional political institutions and a proliferation of newly legitimated bodies across the public sphere which focus upon decision making within their area of concern. Extended peer communities will be pre-eminent among these in the resolution of matters of techno-economic development and as the forums in which new forms of public knowledge, amalgamating technical expertise with lay insights and knowledge, are articulated. The democratic and discursive means by which this knowledge is realised exemplifies the basis of a new political order in which traditional power relationships are usurped by others resting upon the dimensions of trust generated by these new political arrangements. These insights suggest that attempts to buttress present arrangements can only be achieved at the cost of increasing levels of coercion, and ultimately in the failure to meet our common challenges.

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