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Science and citizenship in a global context

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Summary

Shifting science-society relationships are highly relevant both to contemporary practices of citizenship, their expressions, and to questions around the dynamics of "participation". Political and economic changes are altering the contexts, spaces and ways that people perceive and act on citizenship rights, as are scientific and technological changes and the new risks and opportunities they present. Today these issues are reflected perhaps most clearly in the extensive academic, policy and media debates which explore contemporary relations between risk, science and society. In this paper we begin to explore these issues in a globally-comparative frame, providing a review of some of the dominant lines of work in Science and Technology Studies (STS) and Development Studies (DS) which reflect on the relationships between science and citizenship. First we consider major emphases in how each has conceived of the relationships between "experts" and "lay knowledges", revealing some important contrasts in their approaches. We then go on to examine how different notions of citizenship have been incorporated into these debates, whether explicitly or implicitly. We show that approaches to participation and deliberation, now central to thinking and action in a scientific context in both north and south, are underlain by particular concepts of the citizen, which variously enable and constrain their transformative potential. Today these processes take place in a globalised context, and in a third section we reflect on how this context forces us to redefine further the relationships between science and citizenship. We show in this context why it is necessary to go beyond static, universalised and essentialised notions of citizenship and a singular notion of the state, to embrace a more fluid, de-centred, and experience-based notion of both citizenship and expertise, but without losing sight of the historical, political and institutional structures which shape often highly contrasting forms of engagement.

Contents

Preface

This paper was prepared for the Development Research Centre on Citizenship, Participation and Accountability (Citizenship DRC), and was presented at the conference on 'Science and Citizenship in a Global Context' held at IDS, 12–13 December 2002, an event co-sponsored by the Economic and Social Research Council (ESRC)'s Science in Society Programme and the Citizenship DRC.

The Citizenship DRC is an international research partnership dedicated to exploring the new forms of citizenship which are needed to make rights real for poor people. The Citizenship DRC's programme emphasises collaborative work across national, institutional and disciplinary boundaries, adopting an approach that combines research, capacity building, dissemination and policy influence. The Citizenship DRC brings together over 50 researchers from research institutions and civil society groups based in Bangladesh, Brazil, India, Mexico, Nigeria, South Africa and the UK. It is coordinated in the UK by the Institute of Development Studies (IDS); in Bangladesh by the Bangladesh Institute of Development Studies (BLDS); in Brazil by the Centro Brasileiro de Análise e Planejamento (CEBRAP); in India by the Society for Participatory Research in Asia (PRIA); in Mexico by the Instituto de Investigaciones Sociales of the Universidad Nacional Autónoma de México (IISUNAM); in Nigeria by the Theatre for Development Centre at Ahmadu Bello University (TFDC) and in South Africa by the Centre for Southern African Studies/School of Government of the University of the Western Cape (UWC).

For more information, please see the Citizenship DRC website: www.ids.ac.uk/drc-citizen/

1 Introduction

Shifting science-society relationships are highly relevant both to contemporary practices of citizenship and their expression, and to questions around the dynamics of "participation". Just as political and economic changes are altering the contexts, spaces and ways in which people perceive and act on citizenship rights, so too are scientific and technological changes and the new risks and opportunities they present. Scientific and technological issues present particular challenges and opportunities for participation: on the one hand they are associated with claims to highly specialised, professionalised knowledge and expertise which may serve to exclude, yet on the other hand, recent scientific controversies have also created new demands and opportunities for concerted citizen engagement in decision-making. At least in some contexts there is seen to be a new mood of public cynicism and critique of "expert" institutions and their knowledges, and demands for new sorts of dialogue and public empowerment in the scientific realm.

Today these issues are reflected perhaps most clearly in the extensive academic, policy and media debates which explore contemporary relations between risk, science and society. In this paper we begin to explore these issues in a globally-comparative frame. The justification for this approach is two-fold. First, these issues have to date been explored through distinct traditions of work associated with Science and Technology Studies (STS), focusing predominantly on "northern" contexts, and Development Studies (DS), focusing predominantly on the global "south". This suggests a need both to explore the cross-context "translateability" of theories and debates and the possibilities of cross-learning between them. Second, a comparative approach allows an exploration of how citizenship and knowledge claims are emerging around different issues – from biotechnologies and water development to biodiversity and health technologies, for instance – in different settings, according to particular histories and contemporary dynamics in the relationships between science, state, international political economy, and society.

In this paper we provide a review of some of the dominant lines of work in STS and DS which reflect on the relationships between science and citizenship. First we consider major emphases in how each has conceived of the relationships between "experts" and "lay knowledges", revealing some important contrasts in their approaches. We then go on to examine how different notions of citizenship have been incorporated into these debates, whether explicitly or implicitly. Through this discussion, we also address how diverse strands in the theoretical literature on citizenship (and the theories of democracy that link to these)[1] provide different lenses for thinking about science, knowledge and the engagement between different perspectives. As we show, approaches to participation and deliberation, now central to thinking and action in a scientific context in both north and south, are underlain by particular concepts of the citizen, which variously enable and constrain their transformative potential. Today these processes take place in a globalised context, and in a third section we reflect on how this context forces us to redefine further the relationships between science and citizenship. We show in this context why it is necessary to go beyond static, universalised and essentialised notions of citizenship and a singular notion

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[1] This paper cannot attempt to provide a full account of theories of democracy and their relationship to citizenship-knowledge debates. For recent reviews see, for example, Held (1987, 1995); Dryzek (1990, 2000); Mansbridge (1999); Phillips (1993).

of the state, to embrace a more fluid, de-centred, and experience-based notion of both citizenship and expertise, but without losing sight of the historical, political and institutional structures which shape often highly contrasting forms of engagement.

2 Perspectives on knowledge and expertise

In order to explore these issues we begin by considering the different analytical traditions for approaching knowledge and expertise relationships in STS and DS. While STS has relatively recently come to an interest in "lay knowledge" and experience-based expertise, DS by contrast draws on a much longer tradition of work examining local knowledge and practices and their conceptual and social underpinnings.

A recent review by Collins and Evans (2002) identifies two main waves in science studies to date. The first aimed at understanding, explaining and reinforcing the success of science, without questioning its basis. Science was held up to be authoritative, objective and universal, and an unquestionable basis for expert-led decisions. Despite critiques from the early 1970s by academics, this perspective continued to dominate in many policy contexts. Thus perceived crises of legitimacy in science among publics were deemed to be the result of public misunderstanding of science, a "deficit" in public knowledge which should be filled through science education.

A second wave of science studies, however, focused on challenging the assumptions and practices of science. In a variety of works sharing a social constructivist approach (e.g. Knorr-Cetina 1981; Haraway 1991; Barnes *et al.* 1996), science – its framing of questions, experimental methods, styles of investigation, modes of reaching closure, treatments of risk and uncertainty – was reconceptualised as a social and political activity. A strong line of work focused on the details of "laboratory life" (e.g. Latour and Woolgar 1979; Latour 1987) and examined the sets of practices that came to constitute science, and the ways these acquired authority in particular settings (Pickering 1992; Knorr-Cetina 1999). By emphasising the way scientific knowledge was like other forms of knowledge, this work challenged the distinctions made between scientific "experts" and other, non-experts. Yet in this work the emphasis was on demystifying the practices of science, and parallel research attention was not applied to other knowledges in the public realm.

Nevertheless an important strand of social science work did argue that public understandings of science were more sophisticated and nuanced than they had been given credit for, and that these understandings focused not just on the content and methods of science, but also on forms of its institutional embedding, patronage and control (Wynne 1992; Irwin and Wynne 1996). It also explored cases where lay people had explicitly engaged with and contested science and its advice by conducting their own research and experiments (for instance in "popular epidemiology" around issues of toxic waste pollution (Brown and Mikkelsen 1990). Drawing attention to what has become to be labelled "citizen science", this work demonstrated how publics now engage critically with the scientific perspectives of expert institutions, either through funding or orchestrating their own scientific investigations, or through lobbying to transform research questions (e.g. Irwin 1995; Fischer 2000).

Debates about citizenship and science in European settings have also been strongly influenced by Ulrich Beck's "Risk Society" thesis and its subsequent elaborations (e.g. Beck 1992, 1995). Beck and others have been arguing that contemporary public critiques of scientific expertise are symptomatic of a broader, more fundamental set of social transformations, requiring new forms of sociological theorising. The Risk Society thesis suggests that publics are increasingly concerned with risks that are no longer "external", but continually thrown up by systems of industrial technology and its governance themselves. The scientific and bureaucratic apparatus charged with knowing and managing risk continues to operate according to ideas of predictability, so there is a mismatch between the character of hazards and what Beck terms "relations of definition": the legal, epistemological and cultural power matrix in which discussions of science and technology are conducted (Beck 2000: 224). In the process, society has become "reflexive", compelled by this mismatch to question its foundational principles (including ideas of scientific rationality) in an automatic, boomerang-like reflex. Reflexivity can in turn lead to (but is distinct from) conscious public reflection, scrutiny and dissent, which draws attention to ways that public institutions with inadequate procedures more often legitimate than counter hazard.

For Beck, science not only creates the problems, but also the analytics required to recognise and overcome them: reflection is enwrapped in the terms of modern, expert science. Yet as a number of critics have pointed out, this obscures attention to alternative knowledges, sciences and forms of social order which may exist in the public realm (Wynne 1996; Caplan 2000). In a similar way, most work on citizen science has seen it as alternative *science*, conforming with its broad categories, paying less attention to the ways in which public's knowledges develop in embedded relationship with local social processes and differences, concepts and moralities (see Leach and Fairhead 2002).

Collins and Evans acknowledge in their 2002 review that by breaking down any theoretical distinctions between expert and public knowledges, seeing all as partial perspectives, the social constructivist view makes it difficult to define who should legitimately take part in decision-making over science and technology issues. They therefore propose a "third wave" of STS which focuses on expertise and allocates it a privileged role in decision-making. However such expertise is reconstructed to include not just certified specialists but a range of uncertified specialists with a variety of forms of "experience-based expertise". These could include members of the public who, they argue, can frequently bring valuable "contributory expertise" to a given decision-making process. However, they also argue that to be legitimate this expertise has to be continuous with western scientific rationality: they thus exclude, for example, astrology, theology and other "fringe" sciences, and discount attention to "folk knowledges" whose concepts and practices are discontinuous with those of western science.

In contrast, interest in "folk rationalities" and the socio-cultural embeddedness of public's knowledges has been central in debates about rural people's knowledge in the developing world.[2] This analytical tradition is rooted in social anthropological work from early in the twentieth century, which

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[2]   This discussion of the differing roots of work on indigenous knowledge as compared with citizen science draws on Leach and Fairhead (2002) and Fairhead and Leach (2003). See also Keeley and Scoones (2003).

detailed "knowledge systems" concerning issues such as health, agriculture and ecology in the context of broader ethnographies of society and culture (e.g. Richards 1939; Evans-Pritchard 1937). It thus emphasised how knowledge and beliefs about "technical" issues were largely inseparable from cosmology and local religion on the one hand, and questions of social order and prevailing relations of authority on the other. Central to this work has been exploration of local concepts, metaphors and idioms, examining how these make sense in relation to their particular social and cultural settings.

What came to be called "indigenous knowledge" (IK) from the early 1970s has been seen in ambiguous relationship with western science in its modernist guise. It has sometimes been depicted as a valuable and complementary resource to be repackaged in the terms of modernising, expert scientific institutions (Brokensha *et al.* 1980; Chambers *et al.* 1989), much in the same way as "third wave" STS seems to envisage. This perspective has stimulated numerous efforts to collect and collate stocks of valuable local technical knowledge around soils, plants, ecology and so on, sometimes assembling this in international "banks" and networks. It has also underlain an interest in local classification systems, and various approaches to valorise and incorporate the "complementary" or "contributory" expertise of rural people into technology development around agriculture and environment, such as through participatory technology development or farmer field schools (e.g. Farrington and Martin 1988). In these, local knowledge and western science are envisaged as complementary partners, filling gaps in each other's arenas of expertise.

At other times, indigenous knowledge and western science have been portrayed as rooted in incommensurable concepts and framings, necessitating a more comparative framework of analysis (Fairhead 1992; Scoones and Thompson 1994). This work has shown how rural people's knowledge frames technical problems and agendas, and defines what relevant data to include or exclude from consideration, in particular ways that reflect social and political circumstances. It has shown how dispute and debate over technical issues in local settings are interlocked with social difference (e.g. around gender, age, ethnicity) and with struggles over control of resources, and over socio-political authority, and how local knowledges develop through practice, experience and "performance" (Richards 1989; Nyerges 1997). In this respect, work on rural people's knowledge mirrors the tradition in STS of treating science as practice and performance (Pickering 1992). However, these practice-based analytical approaches have been pursued in parallel in DS and STS, applied to different actors in different settings by different academics, with very little engagement between them.[3]

Work in developing country settings also underlines that public dissent and lack of trust in expert institutions is not so new, and not uniquely a feature of late industrial modernity in the West (Latour 1993). For instance long-term anthropological/ecological/historical research in low income countries of Africa, Asia and the Caribbean, whether concerning pastoralism, forest management, soils or water, has frequently exposed major disjunctures between the knowledge and perspectives of land users, and those

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[3]   A few notable exceptions – studies which have treated rural people's and scientists' knowledges together within the same ethnographic, practice-oriented framework – include Wynne (1996); Murdoch and Clark (1994); Fairhead and Leach (forthcoming); and Keeley and Scoones (forthcoming).

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underlying and reproduced through national and internationalised science and policy (e.g. Scoones 1995; Fairhead and Leach 1996; Leach and Mearns 1996; Stott and Sullivan 2000; Brockington 2002; Homewood forthcoming). Local people have reflected on, responded to and resisted "inappropriate" technologies and development plans in a variety of ways (Peet and Watts 1996). Public experiences and critique of science and of risk-framing as being part of the legitimation of powerful institutions dates back to early colonial times, and now thrives for instance on concerns around forests in West Africa (Fairhead and Leach 2000), or water and dam development in India (Mehta 1998).

Perspectives from DS also suggest that works in the contemporary Risk Society tradition overstate the novelty of the risks faced by late industrial society, and the incapacity of "relations of definition" to recognise them. Risks, hazards and uncertainties have long been experienced in developing country settings in the constant interplay of ecological and bodily processes, capricious markets, government politics and international engagements (Mehta *et al.* 1999). Here too, they have long been inadequately appreciated by the sciences informing management of public health, rangelands, watersheds, soils and vegetation, which have frequently been premised on ideas of predictability and managerial control.

These strands of work in DS have grown out of a concern with rural people's basic needs in agriculture, natural resources and health. These have not been the sort of high-tech issues which have dominated debates in STS, which has been decidedly circumspect about the possibilities of lay publics contributing valid knowledge to technology development. Apart from those forms of lay expertise seen as continuous with formal science and seen as having a contributory role, other forms of public knowledge still tend to be seen as ignorance, misunderstanding or unfounded fears which need to be managed by science communication, education or political processes. Yet the DS literature suggests that publics may bring important perspectives to debates about science and technology, which may be more about the broader socio-political agendas it represents and the alternatives thus excluded, than about the technology per se. While the notion of valid "contributory expertise" differentiates between certain citizens who have the right to participate, and others who do not, taking lessons from DS work to embrace the broader notion of "contributory perspectives" suggests broadening – or indeed abandoning – this distinction. This in turn raises questions about the relationships between science, citizens and political participation which our next section works through from a different starting point, that of debates about citizenship.

3 Perspectives on citizenship and science

Contemporary debates about the changing relationships between science, public knowledge and different forms of expertise raise prospects for new forms of public engagement, whether in setting agendas for, conducting or applying the results of science and technology development. In recent years there has been an explosion of participatory, deliberative and inclusionary approaches to decision-making about scientific and technological issues in the context of risk, and many claims have been made about the need for, and ways to, "democratise science" and promote citizen involvement with it. But who are the "citizens" in these approaches, and what sort of participatory engagement is envisaged? Citizenship has been theorised

in many ways and according to diverse traditions of political philosophy.[4] Here we summarise how several dominant lines of thinking construct the notion of citizenship, indicate connections to particular theories of democracy, and consider how these are reflected – whether explicitly or, more often, implicitly – in debates about science and knowledge in STS and DS. We identify how these in turn suggest different approaches to, and justify different traditions of, participation.

3.1 Liberal perspectives

We begin with liberal perspectives. Put briefly, in liberal thought citizens are entitled to universal rights granted by the state. Citizens are seen as individuals who act rationally to advance their own interests, while the state's role is to protect and enforce their rights. Rights are deemed universal in the sense that every citizen has equal rights *vis à vis* the state, including rights to participation through electoral democracy. Exercising rights is seen as the choice of citizens, on the assumption that they have adequate resources for rights-claiming. Public participation is therefore seen as something to which all citizens have an equal right, and as conducted by individuals through engagement in democratic politics, overseen by a state whose benevolent motives are unquestioned.

This mode of theorising has been co-produced with the emergence of western liberal democracies. However, as other works have shown, different historical trajectories may strongly challenge the universality of rights in other contexts, given the particular experiences of colonialism and the way legal and political institutions define some as "citizens" and others as "subjects" or non-citizens (Mamdani 1996; see also Kabeer 2001).

From the liberal perspective the state is seen as a benevolent protector of individuals, including, as Marshall's classic work (1950) emphasised, protecting them against major risks. The state is given a role in reducing uncertainties emerging out of the processes of capitalism, requiring various forms of welfarism. In the contemporary era and from a liberal perspective, a similar role might be imagined for the state to intervene in risk amelioration, and for state-sponsored science to guarantee the safety of citizens, through food safety regulations, pollution risk management and so on. Liberal understandings of citizenship thus hold faith in the modern state's expertise, and science has become its core currency in the technology arena. Liberal theories of democracy connected with these defer decisions to elected elites who historically have been highly reliant on accredited scientific and technocratic expertise.

It is this kind of perspective on citizenship which underlies the "deficit" model in science studies and policy, established so authoritatively with the 1985 report of the Royal Society, which treats public scepticism about science as due to a deficit in people's knowledge and understanding of it. The assumption is that individual members of the public would come to respect and appreciate official scientific expertise if they could only be brought to understand this through education and the effective communication of science. In a European context, "science shops" (Irwin 1995), whereby members of the

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[4] In this paper we are not attempting a full review of concepts and theories of citizenship. For fuller reviews, see for example Jones and Gaventa (2002); Ellison (1997).

public can consult accredited experts on issues of their concern, reflect such a view, as well as a liberal emphasis on people's rights to access formal scientific knowledge. In DS a liberal perspective underlies much recent development thought, whereby citizens are conceived of as beneficiaries, customers and users of services provided by a developmental state or, following the Washington consensus, liberalised markets. As Cornwall and Gaventa (2001) have shown, much "participatory" development has been attempted within this framing, with participation seen in terms of individuals choosing among an array of options and services, but not playing a major role in setting agendas of policy or technology development.

3.2 Communitarian perspectives

In strong contrast to liberal notions of citizenship, communitarian thought centres on the notion of the socially embedded citizen and membership of a community (Sandal 1998; Smith 1998). Individual identity is therefore subsumed to that of a group and the common good is prioritised over the pursuit of individual interests. The emphasis is on the pursuit of local agendas, with the state appearing more distantly if at all.

A communitarian perspective in DS is evident – though usually implicitly – in many approaches to community development and locale-specific projects. In these, an external donor agency, non-governmental organisation or branch of the state may focus on a particular geographical area or group of people for the planning and delivery of development interventions. In such approaches "the community" is often constructed as if it were bounded and relatively homogenous, with people acting together for a common goal. This is particularly evident in approaches to community-based natural resource management, for example. It frequently follows that knowledge is assumed to be held by the "community", and that knowledge is seen as an important definer of group identity and cohesiveness. Drawing on a long tradition of highly localised, village-based anthropological studies, much work on indigenous technical knowledge and "ethnoscience" aims to document such knowledge as an input into community development processes. However, a communitarian perspective also allows for lay knowledges to be seen as culturally embedded and geographically specific, and to be associated with different precepts and problem framings from western science and its associated notions of modernisation and development.

A parallel, though distinct, set of ideas underlies communitarian movements in Europe and North America, such as those focused around anarchist or broadly "alternative" eco-lifestyles. Here again the focus is on community self-sufficiency in terms of governance, with knowledge seen as a community and local resource. In terms of science and technology it is this line of thinking that underlies advocacy of "radical" or "alternative" technology and a philosophy of "small is beautiful", supporting local economic development (Schumacher 1973).

In developing country contexts, participation has generally been constructed around and conducted within a community-level project frame, resting on the assumption that citizen participation emerges through being a community member. A large repertoire of techniques and methods have evolved since the 1980s in such contexts to facilitate the expression of community concerns and the elicitation of local

knowledge. Participatory Rural Appraisal, for example, has become the *sine qua non* of development practice the world over (Chambers 1983, 1997; PLA Notes 1988–). Only much more recently, and especially since the early 1990s in the wake of Agenda 21 initiatives (Selman and Parker 1997; Selman 1998), have such approaches and their associated constructions of the participating citizen become popular in the north.

3.3 Civic republican perspectives

Civic republican thought bridges aspects of the liberal and communitarian traditions, situating individuals as part of collectivities who press claims in the political realm. It recognises a diversity of interests within society and assumes that citizens will form factional groups around these. Citizenship is thus related to a common civic identity based on common public culture, and individual obligations to participate in communal affairs (e.g. Habermas 1984, 1996; Miller 1988). This participation is not confined to representative political systems as in liberal thought; rather civic republican thought promotes deliberative forms of democracy as a complement to or alternative to representative democracy (e.g. Dryzek 1990 2000; Bohman and Rehg 1997). A notion of the common good is seen to emerge out of a rational debate amongst free citizens in which different claims have their say and give way to collective agreement.

Much work around citizen science is underlain implicitly by a civic republican perspective. Such work draws attention to how claims and interests related to knowledge and experience emerge and are refracted through political dialogue. Factional groups, united by common experiences of science, technology and its risks, may press claims based on their experiential knowledge, as in the actions of HIV/AIDS activists, toxic waste campaigners, "NIMBY" protest groups or parents concerned about vaccine risks and side-effects.

The recent move towards deliberative and inclusionary processes explicitly invites such claims-making in new forums, whether citizens juries, consensus conferences, scenario panels and so on (e.g. NEF 1998; Bloomfield 2000; Holmes and Scoones 2000; IPPR various). In contexts of scientific uncertainty or where science and technology issues involve social and ethical judgements, plural perspectives and deliberative processes may be needed in order to reach socially legitimate and acceptable decisions (Munton 2003).

However many questions arise about how such dialogues are convened and framed. Civic republican thought generally assumes that nation states provide the organising frameworks for political dialogue, and by implication the epistemological basis for such interactions. Some commentators have pointed critically to the tendency for DIPs to remain very much within the orbit of mainstream scientific discourse, with their questions, problem-framings and modes of argumentation defined accordingly (e.g. Scoones and Thompson 2002). This tendency can perhaps be better understood by reflecting on its civic republican underpinnings, where the state is seen as coherent, rational and ordering, suggesting a reliance on scientific expertise as the basic framework within which judgements will be reached. Sometimes, of course, such encounters between citizens and accredited experts will result in the reframing of the debate, as when HIV/AIDS activists in the US succeeded in expanding the range of perspectives deemed credible within

scientific research about the issue (Epstein 1996). However, very often, deliberative fora remain couched within a particular framing, silencing other perspectives and agendas. The assumption of free debate and "ideal speech" contained within much civic republican thought (Habermas 1984) betrays naiveté about the politics and power relations of such encounters.

In the north, the turn to participation in decision-making around science and technology, as more broadly, has thus been bound up with an extensive debate about political interests and their expression in the public sphere through deliberative democracy. In contrast, and surprisingly, the much longer standing concern with participation in developing country settings has only late in its history come to reflect in any depth on the politics of participation, and on participation beyond the community and project level. Only recently are emerging from critiques of liberal "users and choosers" perspectives a range of arguments that citizens should be more active "makers and shapers" of development agendas (Cornwall and Gaventa 2001). Equally, emerging from a dissatisfaction with the communitarian emphasis on independent local settings is concerted reflection on how processes of local and national governance involving state and other institutions may be made more participatory (Cornwall 2002; Gaventa and Goetz 2002).

These emergent perspectives on participation in developing country settings resonate strongly with civic republicanism in their construction of citizenship, showing many similarities with perspectives on deliberative democracy in the north. Not surprisingly, they confront many of the same dilemmas. In relation to science and technology, recent attempts to invite citizen participation in policy processes – for example around national desertification or biodiversity conservation strategies – face similar problems of domination by powerful, mainstream problem-framings as do DIPs in northern settings (e.g. Fairhead and Leach 2003; Keeley and Scoones 2003).

3.4 Citizenship and identity

Although they do so in different ways, liberal and civic republican thought both promote citizenship as universal, distinguishing this from particularistic group identities. Such perspectives are critiqued by theories of difference and identity. Many feminists and others associate citizenship with group identities based on specific forms and experiences of difference – such as those linked to gender, race, disability, locality and so on (Young 1989, 1990) – creating a perspective which Dryzek (2000) terms "difference democracy". From such perspectives claims about universality and the rationality of dialogue are critiqued as promoting the biases of powerful groups. Standard approaches of deliberative democracy are extended and modified to attend counter processes of exclusion and recognise highly differentiated needs, such as through a "politics of presence" (Phillips 1993, 1995). These perspectives also stretch the definition of the public realm into the private sphere, in that personal, embodied experiences become central to the construction of identities and political positions.

Knowledge in such accounts is very much bound up with the constitution and expression of identity. For instance, certain strands of ecofeminist thought in both north and south link "women" with distinct experience-based forms of ecological knowledge derived from their everyday interactions with their local environments (e.g. Mies and Shiva 1993). Many discussions of indigenous peoples and their forms of self

representation similarly ground identity in particular forms of ecological knowledge. While drawing attention to knowledge differentiation, however, these perspectives tend also to depict knowledge as rather static and essentialised. Much work in a DS context has documented the struggles of such marginalised groups in relation to broader state and development processes and the science they are based on, which are seen as biased towards the interests of dominant groups (such as men, urban industrial elites, corporate capital and so on) over key resources such as water, genetic resources or forests (e.g. Blaikie and Brookfield 1987; Bryant 1992; Rocheleau *et al.* 1996).

This DS work bears strong parallels with work on environmental justice in European and North American settings. This similarly draws attention to the unequal effects of science and technology driven processes, and their contribution to the marginalisation of certain groups and places. The knowledge deployed in such struggles is seen to emerge from particular experiences of particular places, and to be derived from everyday lived experiences, for example of pollution, disease dynamics and so on (Schlosberg 1999; GECP 2001).

Certain forms of identity and difference – most notably gender, reflecting the important contributions of feminist thought – have received prominent treatment in both STS (e.g. Harding 1991, 1998) and DS (e.g. Kabeer 1994). In contrast, other dimensions – notably race – have been surprisingly downplayed in both, although perhaps for different reasons reflecting the respective histories of each (for STS see Skinner 2002).

While these perspectives on citizenship and identity bear parallels with civic republican thought in the emphasis on interests (linked to knowledge) and the mobilisation of these in claims on the state, the greater emphasis on difference, and the power structures within which these are embedded, leads to less optimism about reaching consensus through rational political dialogue. These perspectives draw attention to a political economy of knowledge which legitimates and privileges certain kinds of expertise over others, and in which people have differential access to material resources and political power through which to press their concerns. Thus, identity politics and engagement in scientific and policy processes are frequently pursued through social movements – such as the many evident in the environmental arena (Offe 1985; Yearley 1994; Wapner 1996). While movements may present their driving interests, knowledge and identity in essentialist terms, however (as indeed some analysts do), it is problematic to assume that actors cannot make demands on the basis of more than one identity, or indeed take part in more hybrid forms of political engagement. Such criticisms have in particular been forwarded by those taking post-structuralist approaches to the question of citizenship and identity.

3.5 Citizenship practice and subjectivities

A number of post-structuralist theorists have challenged essentialist ideas about collective identity. Instead they argue that people have a multiplicity of overlapping subject positions, as "female", "farmer", "Hindu" and so on, each more or less contingent, in which each dimension shapes the others. Subject positions both arise from and shape everyday practice, but may also be acquired through identification with broader discourses. Group political identity is produced through identification with others who hold

particular subject positions in common. Citizen action thus draws upon particular political identities at particular moments (Laclau and Mouffe 1985; Mouffe 1992, 1995). This gives rise to a fragmented and contingent notion of citizenship as realised in the enactment of political action. While citizenship also continues as an idea or principle to 'give a sense of inclusion . . . what it means to be included is now a highly contingent matter' (Ellison 1997: 709). Furthermore, rather than being directed at a singular notion of the state, such action may be directed towards more diverse and dispersed sites and spaces. This perspective thus becomes even more pertinent in the context of globalisation where terrains of governance are increasingly fractured, as we consider in the next section.

The emphasis on practice in these notions of citizenship has many strong resonances with the so-called turn to practice in constructivist STS from the 1980s onwards. This work emphasises how knowledge and its authority only come into being through particular practices, and the specific networks of actors and objects that they involve (cf. Haraway 1991; Latour 1987, 1993; Pickering 1992, 1995). More broadly the emphasis in STS on the social construction of scientific knowledge and the existence of plural, partial perspectives on any given problem is highly compatible with this way of conceiving of citizenship, even though, as we have seen, there has been rather little work on understanding citizen knowledge and perspectives in the STS field. In DS, by contrast, such analysis of knowledge-as-practice as there has been focuses on the domain of lay knowledges, rather than on accredited expertise. In actor-oriented approaches, particularly well developed around issues of agricultural technology (e.g. Long and Long 1994) and ecology (e.g. Nyerges 1997) a similar picture emerges of multiple and shifting subject positions which emerge through and enact particular forms of knowledge. Interactions between these – as for instance when farmers and agricultural extension workers interact, or in so-called participatory development encounters – may create new forms of knowledge and practice in an unpredictable and contingent way which thoroughly undermines aspirations to controlled, blueprint, planned development interventions (Long and van der Ploeg 1989). For this reason orchestrated attempts at public involvement often unravel, unleashing unanticipated outcomes and further processes of change.

For some commentators, this conception of the decentred, free floating subject tends – at its extreme – to dissolve into extreme relativism, nihilism and the politics of despair, failing to allow for the possibility of forms of solidarity, shared practices and meanings beyond those of a dissociated individual subject (Ellison 1997; Lash, Szerszynski and Wynne 1996). The extreme post-structuralist position thus threatens to eclipse the broader idea of citizenship as about inclusivity and political involvement. It is in attempting to rescue a notion of citizenship from this morass that Ellison comments:

> "Citizenship" no longer conveys a universalist sense of inclusion or participation in a stable political community; neither does it suggest the possibility of developing claims organised around a relatively stable set of differences; nor, for that matter, can the term be made to conform easily to the living out of a series of socially constructed identity positions on the decentred social subjects. Instead, we are left with a restless desire for social engagement, citizenship becoming a form of social and

political practice borne of the need to establish new solidarities across a range of putative "communities" as a defence against social changes which continually threaten to frustrate such ambitions.

<div align="right">(Ellison 1997: 712)</div>

Citizenship is thus redefined, in effect, as *practised engagement through emergent social solidarities*. Such solidarities frequently emerge in response to threats of various kinds. These forms of engagement, involving new processes of social and political interaction, are, as Ellison emphasises, likely to be 'increasingly messy and unstable' (1997: 712).

A politics of this kind is not dissimilar to the politics that Beck, Giddens and others (Giddens 1990; Beck 1992; Beck *et al.* 1994) have associated with the conditions of late modernity, and the emergence of the "Risk Society". As society responds reflexively to the emergence of new risks, it is argued, so new forms of sub-politics emerge. However, while Beck draws attention to the breakdown of traditional social forms in this context, and to the linking of reflexivity to an ongoing process of individualisation, the Risk Society thesis gives less attention to the building or regeneration of social solidarities (Ellison 1997). This may reflect the particular origins of the thesis in late twentieth century Europe, but it is not necessarily applicable elsewhere (Caplan 2000; Adam *et al.* 2000). Indeed a variety of experiences, many of them in developing country settings, reveal the creation and recreation of solidarities which are by no means stable, but which contribute substantially to social and political processes over particular periods in particular places: solidarities amongst people threatened or displaced by large dams or infrastructure development, for example. Emergent social solidarities may in turn connect up and link people and groups in different sites, albeit temporarily. For example, what is described as the "anti-globalisation movement" consists of a range of diverse solidarities around particular issues, expressed in practices of engagement with particular institutions in both local and global settings (Klein 2000; Held and McGrew 2002).

It is notable that such a perspective on citizenship potentially fractures the established social and democratic link between citizenship and social equality. Instead, as Ellison, paraphrasing Beck, suggests

. . . there may be "reflexivity winners and losers". Some groups may be more adept than others in adjusting to more fluid social and political forms, constructing and reconstructing solidarities which further a variety of claims across space and time according to the dictates of social change.

<div align="right">(1997: 212)</div>

Citizenship is then associated with those who are able to participate, and who do "practise engagement", which suggests in turn a category of contextual non-citizens who do not. This may be for a variety of reasons, whether through deliberate non-engagement, through political marginalisation, through lack of resources, or through a sense of distance and alienation from the debates being pursued in the public realm. Citizenship practice – and non-citizenship – thus need to be seen as historically constituted, their conditions of emergence shaped by particular social, material and political relations. For example, hunters

in Trinidad have brought their experience based expertise of wildlife dynamics into critical engagements with state and donor led biodiversity science through citizenship practice, whereas in Guinea, despite the prevalence of similar forms of local knowledge and state sponsored science, such citizenship practice has not emerged. The reasons for this can be traced to the ways in which social relations of science have developed, linked to the nature of colonial and postcolonial state-building and then to degrees of donor dependence, as embedded in each country's political, educational and media traditions (Leach and Fairhead 2002).

Such a perspective on citizenship as practised engagement links to a view of participatory democracy which emphasises the capacity of citizens to participate and engage in decisions which affect their lives (Pateman 1970). Some commentators distinguish such genuinely participatory democracy in which citizens bring their own perspectives and experiential expertise to bear from deliberative democracy which often constructs rational debate within dominant expert framings (Gaventa, pers. comm.). Participatory democratic theory also, as Sirianni and Friedland (2000: 23) note

> . . . stresses the educative function of participating in community and political affairs for creating the kinds of citizens capable of sustaining democracy. Through active participation, citizens become more knowledgeable about the political system, develop a greater sense of their own efficacy, and widen their horizons beyond their own narrow self interest to consider a broader public good.

In other words, practising citizenship is also a learning process which creates and enhances citizenship capabilities (Merrifield 2002).

Such a conception of citizenship as practised engagement through emergent social solidarities is helpful in conceptualising current public responses to science and technology and the risks these present. It is in these terms for instance that the forms of public response to GM crops in India can be best understood (Scoones forthcoming). Moreover, engagement with scientific controversies may now be a key context where citizenship practices are played out in new, important ways in an era when other issues have been depoliticised or given over to the play of liberal market forces.

However, there has been rather limited attention in most STS or DS commentaries to the implications of such reconfigured forms of citizenship for public action around issues of science and technology. As we have seen, much of the debate about participation and deliberation has drawn instead on, we would argue, overly static and essentialised notions of the "public", "community", "state", "interests" and "knowledge". These problems, and the need for a more historicised account of citizenship as practised engagement, becomes even more pertinent in the context of globalisation, a subject to which we now turn.

4 Globalised contexts for science and citizenship

While debates around participation in science frequently take place in particular locales, the world is now too connected, and science and policy too globalised, for citizenship practice to be confined to a local level. Equally, in the context of contemporary globalisation it is not appropriate to characterise "late industrial society" as specific to certain geographical locales, as the risk society thesis has tended to do. Rather, relations of definition around and responses to risk are quintessentially locked into globalised scientific and policy fields. This pervasive international context creates an important common arena for study which transcends north-south divides. Yet many comparative questions arise concerning the strikingly different capacities of different countries and groups to negotiate their interests in such internationalised contexts.

Despite the fact science and technology are commonly seen as central to processes of globalisation – for instance through the development of information and communication technologies – most debates on globalisation have been surprisingly silent on how science and knowledge relations are transforming in a contemporary globalised arena. Perhaps this relates to prevailing assumptions about the universality of science, dislocating it from context and place. Nevertheless a number of strands of contemporary theorising about globalisation in general offer important insights into how the globalised scientific field, and citizens' engagement with it, might be understood.

There are various dimensions to the globalisation of science. Rosenau (1990) describes the growing importance (alongside states) of a world of transnational sub-politics, with its dimensions including a prominence of transnational organisations, transnational problems dominating the political agenda, transnational events, the development of transnational communities, and transnational structures such as various forms of network. Many transnational actors relevant to science have emerged, whether corporations involved in scientific research and commerce (creating risks, defining what is risky and what is not), or international organisations with a scientific mandate, such as those regulating scientific and technology issues. International conventions, agreements and deliberations, such as those dealing with biodiversity conservation, biosafety and so on, co-evolving with scientific committees and with the politics of their operation, are conducted at least partly through the practices of science (Fairhead and Leach 2003).

Especially given the transformations wrought by information and communications technology, Castells (1996) argues further that dominant functions are increasingly organised through networks and flows which link them up around the world. Today scientists across the world are linked through e-mail based networks, as well as through the more traditional forms of professionally-based workshops, meetings and conferences. Such networks together can have a powerful influence on the framing of debates and the direction of scientific and technological research, through the creation of "epistemic communities" (Haas 1992) or advocacy (Sabatier *et al.* 1993) or discourse coalitions (Hajer 1995).

As a result of these increasingly prominent global actors and networks, there is evidence of a growing alignment of science and policy, which does not rely on orchestration by any particular international

organisation, state or located institution. The sense is more akin to Hardt and Negri's (2000) characterisation of an "Empire" dominating contemporary world politics, premised on an increasingly decentred, deterritorialised form of global governance. This is prescribing particular forms of harmonisation in the science-based regulation of science and technology. For example in debates about GMOs, globally-organised science is being used to justify harmonising standards to risk assessment and the removal of barriers to trade. Such moves also act to create a global field of epistemic relevance into which researchers find themselves drawn in order that their work has credibility and standing.

Even where the international political-economic interests appear more diffuse and harder to pin down, internationalised concepts can powerfully influence local debates, albeit mediated through complicated scientific and policy relationships and networks linking national research traditions, donors, NGOs, development projects, national and local media and so on. Sometimes the effect can be to silence local discourses, or rather for their evidence, concepts and categories to be co-opted into terms which more or less fit internationalised ones. This is the case, for example, in Guinea where the internationally-salient concept of "biodiversity" has been operationalised in a variety of national and local scientific and policy discourses. All of these share the notion of "managing biodiversity" as something separate from and threatened by people, thus writing-out or reinterpreting farmer's perspectives on the ways they live with and manipulate plant variety in everyday life and landscapes (Fairhead and Leach 2003).

However, while international concepts sometimes serve to over-simplify debates, they can also sustain local debates in powerful ways. As anthropological work on globalisation has pointed out, rather than opposing local knowledges to a homogenising movement of cultural globalisation, there is a need to look at how precepts which appear as universal are in fact represented and interpreted in quite different ways in different locales (Robertson 1992). Thus, while appearing to have a common meaning, international concepts can mean different things to actors in different local contexts, and be appropriated creatively as vehicles for localised movements, as been the case, for example, with the use of "sustainability" ideas by activist groups in India (Visvanathan, pers. comm.).

These conceptual appropriations suggest one set of ways in which globalisation is now shaping apparently localised movements around science, technology and risk. Others include the linking of local knowledge claims and movements through international networks and organisations, with "indigenous peoples" perhaps representing the case par excellence.

However these linkages take place in a context of increasing deterritorialisation due to mass migrations and trans-national flows of products, images and ideas, creating what Appadurai (1991) has termed a "global cultural ecumene" or what Hannerz (1990) terms a "world in creolisation". In this despatialised world, claims around the territorial or local basis of knowledge or practice are no longer taken for granted. And where such claims are made they need to be interrogated for their social and political meanings (Gupta and Ferguson 1992). This casts a new, more critical light on what is meant by "local" or "indigenous" knowledge.

Globalisation, then, renders theories of citizenship situated solely within the context of the nation state (whether of liberal or civic republican persuasion) as highly limited. One response to this has been

the construction of the notion of a "global citizen", responding to global problems and linked with others across national borders through citizen action (Edwards and Gaventa 2001). The sense of inclusivity which undergirds the idea of citizenship emerges here through inclusion in the idea of an integrated world community. There is also a sense, as in Beck's (2000) construction of "World Risk Society", of citizen reflexivity emerging in response to global, trans-national risks and threats, such as those linked to global warming, for example.

A perspective on citizenship as practised engagement of social solidarities – as developed earlier – allows for the possibility of global citizen action, but in ways that are often contingent, fragmented and diffuse, emerging through the expression of aspects of people's global and local identities. Rather than recourse to the establishment of global institutions to guarantee global citizenship rights, these are claimed and might be institutionally supported through more diverse actions linked across different sites (Robins 2002).

Moreover, as Robertson (1992) argues, globalisation may be generating new forms of reflexivity as through the mass media and other forms of interaction people come to pay more conscious attention to the world as single place. For example in a project to translate global environmental problems into a set of meaningful indicators for Lancashire County Council (McNaghten *et al.* 1995), it became clear against all preconceptions that people felt a sense of solidarity with Bangladeshi farmers who would be affected by rising sea levels as a result of global warming. This thoroughly contradicted the idea that people will only be persuaded to do anything about global climate change when negative impacts on them, personally, can be demonstrated. In this case, more transnational expressions of citizenship challenged prevailing constructions of the citizen as an individual, self-interested consumer within the context of a nation state.

Bauman (1998) argues that globalisation and localisation are not only two aspects of the same thing, but also driving forces of and active expressions of a new polarisation and stratification of the world's population, a new socio-cultural hierarchy dividing those who are free to move from those who are "chained to the spot" – or forced into (globally shaped) localities against their will. In effect this is an argument about those who can assume global citizenship – through taking advantage of new networks, movement and communication forms and compressions of space and time (Giddens 1990; Harvey 1989) – and those who cannot. Nevertheless it is important not to write off these so-called "localised poor" as non-citizens in a global context. Even those apparently excluded from global citizenship are still subject to the effects of global processes, possibly leading them to form different sorts of social solidarities at different scales and in different ways. There is evidence of these emerging, for example, in cases where disenfranchised valley farmers face flooding by large dam construction, or where marginalised smallholders are subject to policies promoting industrialised, biotech-based farming.

Contemporary discussions of participation in a global setting often emphasise mechanisms such as the representation of local or special interest groups (e.g. indigenous people, women, pastoralists, small farmers and so on) in international convention meetings. They also emphasise global consultations with people as "consumers" of development, as in the 'Voices of the Poor' exercise of the World Bank (Narayan 2000). In such approaches, people are supposed to participate and express their knowledge and

perspectives in internationally convened fora. They rest either on a liberal conception of citizenship, replacing the usual emphasis on the nation state with the globe, represented in turn by supposedly impartial international governance institutions such as the World Bank, IMF, CBD or WTO, or accept a form of identity or interest-based citizenship in the global arena.

The limited literature that has reflected critically on these approaches highlights how the power dynamics at play replicate and exacerbate those evident in participatory approaches in local settings (e.g. Brock *et al.* 2001). Taking a different perspective on science and citizenship suggests that sites of engagement may be far more diffuse and transient, but nevertheless contain potential for the development of multiple and interacting solidarities in a global context. For example in the opposition to GM foods, groups working on themes from property rights to sustainable agriculture to health and food safety in settings as diverse as rural India and Europe are finding areas of common – or at least overlapping – ground, facilitated by a huge array of email networks, meetings and other fora, to raise and reframe the debate about food and agriculture futures. In this way 'everyday sites of social resistance' (Lefebvre 1991) may become linked in new, often unpredictable, ways, recasting the rather mechanistic, instrumental view of participation into one which is more decentred, less orchestrated, and, with this, more political. In turn, such engagements may create, through repeated practice, experiential learning and the building of solidarities, new forms of citizenship engagement which provide – at least for those who become involved – the possibilities for envisaging alternative science and technology agendas.

5 Knowledge rights, science and citizenship

The demands of many citizens' movements, whether or not orchestrated through international connections, are for what might be termed "cognitive justice" (Visvanathan, pers. comm.) in the scientific field. Such demands do not represent an anti-science or anti-technology agenda; nor are they necessarily against the particular high-tech scientific developments, such as biotechnology, which have caused such public controversy over possible risks. Rather, the demand is for the right for different forms of knowledge to co-exist, and to carry weight in the decisions that affect people's lives. It is in this respect that an emergent notion of "knowledge rights" might be a candidate for inclusion together with the political, social and economic rights that currently dominate discussions of citizenship, and which comprise the rights-based agenda in development.

Knowledge rights would not be confined to rights to possess or access knowledge as if it were a commodity linked to individuals, as a liberal conception of citizenship – and many "rights to information" campaigns – would suggest. Nor would it simply be the right to bring "contributory expertise", continuous with dominant scientific perspectives, to a given decision. Nor would it be only about the rights of citizens to press claims based on their experiential knowledge, as a civic republican perspective would suggest. Nor would it be confined to a right to express essentialised knowledges associated with particular local, community, or identity-based groups. Rather it would encompass rights to pursue particular ways of life, knowledge, perspectives and practice; rights to use these as ways of building

solidarities with others, and rights of cognitive representation in processes of scientific experimentation and decision-making around science and technology issues. While such rights would be formally granted through institutional and legal processes, they would only be made real through the practices of citizens claiming and using them (Nyamu 2002). This may, in turn, rely on the realisation of other rights, such as those in the economic or political realm; although in other circumstances knowledge rights may be a means to extend other forms of rights claiming. Such a perspective on knowledge rights, grounded in a conception of citizenship as practised engagement, could serve to enrich innovation-oriented science and the setting of science and technology agendas, as well to render protection-oriented, precautionary science and risk assessment more socially inclusive and legitimate.

The issues and examples discussed here, albeit very briefly, underline that the "north-south" distinctions which have pervaded so many debates on science, risk and participation do not hold up in practice. Experiences of extreme vulnerability and marginalisation from science/policy processes are common to groups of people in Europe and the US as much as in Asia and Africa, while the latter, too, have their groups of "scientific citizens" contesting official perspectives in Euro-American, reflective, "risk society" style. Other distinctions – between issues, prevailing scientific cultures and histories, and positions in international political economy, for example – may be of greater significance in shaping the evidently highly diverse patterns of public engagement (and disengagement) with science appearing across the world. In this respect it is unfortunate that STS and DS debates have proceeded in parallel, with so little communication between each other to date – although as we have tried in this paper, each body of work has been "ahead" on certain issues at certain times, while lagging in others. In this respect there is much to be gained from a more integrated perspective which draws the insights of each together. This paper has been a first step in this direction.

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