

years, Al-Kabeer has killed 920,000 buffaloes and 2,850,000 sheep to earn only Rs200 million a year, according to the company's own projections. It has provided just 300 jobs. See Gandhi (1995).

24 Tis Hazari Court, judgment passed on 23 March 1992, Case No. 267/90, Delhi.

25 Renato Ruggiero, speech given at 'Policing the World Economy' Conference held at Geneva, 23–25 March 1998.

26 World Trade Organization, GATT Agreement, Geneva, 1994.

27 Haraway (1997: 80).

28 Mander (1995).

29 Some go so far as to suggest that gene transfer could 'cure' racist attitudes in society. But, on the contrary, 'gene enhancement' therapy is being requested for changing skin colour (see Rick Weiss, 'Gene Enhancements' Thorny Ethical Traits,' *Washington Post*, 11 October 1997). Genetic engineering is showing every sign of becoming the basis of a new racism, in which the blue-eyed, blonde-haired, white-skinned race becomes the measure for all.

30 Goethe (1988: 121).

31 Haraway (1985: 65–108).

32 *Ibid.*

10

Global Circulations Nature, Culture and the Possibility of Sustainable Development

Banu Subramaniam, James Bever
and Peggy Schultz

How do you live and think together beneath a light that warms our bodies and models our ideas, but which remains indifferent to their existence? We contemporary philosophers cannot ask this question while ignoring the sciences, which, in their very separation, converge to ask it, even to exacerbate its terms. And when 'the world' means purely and simply the planet Earth ... when humanity is finally in solidarity and global in its political existence and in the exercise of science, it discovers that it inhabits a global Earth that is the concern of our global science, global technology, and our global and local behaviours. This is the reason for the necessary synthesis....

Michel Serres

*Conversations on Science, Culture and Time*¹

In his book, *We Have Never Been Modern*,² Bruno Latour argues for the inextricable interconnectedness of nature and culture, science and society, humanities and the sciences. He marks the impulse to be modern as involving two sets of practices. First, the 'work of purification', whereby we create two entirely distinct ontological zones: that of the non-human/natural world on one hand, and that of the human/cultural world on the other. Thus, the natural and physical sciences can be said to 'discipline' us into the study of non-human 'nature' and its processes, and the social sciences and the humanities into the study of human 'culture' and its processes. However, alongside this work of purification, Latour argues a second set of practices, namely the 'work of translation'. This work of translation, he suggests, creates mixtures between the worlds of nature and culture, or hybrids of nature and culture. Such is the paradox of the moderns – 'the more we forbid ourselves to conceive hybrids, the

more possible their interbreeding becomes'. He argues that although we may try to separate (or, perhaps, *because* we try to) the natural and cultural worlds into their discrete categories, hybrids will proliferate. Despite disciplinary impulses to separate the natural and cultural worlds, they are inextricably interconnected. As he puts it, 'In the eyes of our critics the ozone hole above our heads, the moral law in our hearts, the autonomous text, may each be of interest, but only separately. That a delicate shuttle should have woven together the heavens, industry, texts, souls and moral law – that remains uncanny, unthinkable, unseemly.' Such is our legacy of academic disciplinaryity, which much interdisciplinary work seeks to overcome and undo.

One field that has grounded its interdisciplinarity in the links between the non-human/natural world and the human/cultural world is feminist science studies.³ A central focus of much of the social studies of science, especially the feminist studies of science, technology and development, has been about the illumination and elucidation of the interconnections between nature(s) and culture(s). Nature and culture, scholars have argued, are co-constituted, simultaneously semiotic as well as material.⁴ Through tracing the networks of power, knowledge, resources and politics, the feminist studies of science and development underscore the centrality of gender, race, class, sexuality and nationality in our understandings of nature and culture.⁵ Furthermore, these interconnections and networks are never static, but always dynamic and changing. These dynamic global circulations of power and politics have a profound impact on our study of nature, culture, science, technology and development. As Donna Haraway argues, we must move beyond our binary understandings of nature and culture as separate, non-interacting, non-intersecting realms. Nature is simultaneously material and semiotic and we must find ways to study and understand our world as simultaneously both material and semiotic.⁶

Development is one arena where the natural and cultural worlds implore. Science and technology have been crucial agents in modern development as well as contemporary globalization. Indeed, science is deeply implicated in modernity and the modern state. Among the developed nations and increasingly so in the so-called developing/Third World nations, science is often 'the reason of state'.⁷ Therefore, any discussion of development and post-development must necessarily reconcile and grapple with the role of science in such visions. Much of the literature on development, including critiques of development, has focused on the so-called 'underdeveloped' or 'Third' World. The literature has highlighted and documented the ecological, economic, environmental, cultural and political costs of development in 'Third World' countries as well as the increasing reliance and dependence on the 'First World'. While critiques of development in the 'Third World' are essential, our focus in this essay is on the question of 'development' itself. We want to focus on the ideology of

development that is at the heart of the modern state, and the central rationale of capitalism, globalization and the rhetoric of 'growth'. This ideology of development has taken hold and continues to sustain economies and public policies in the First World. Our title aims to highlight the global circulations of science in the rhetoric of development. Even within the so-called developed countries, growing inequalities sustain arguments for the need for 'development'. Others suggest that the very ideology of development and growth is at the heart of the growing inequality within and between countries. Recent anti-globalization movements from Seattle to Genoa have begun to highlight, among other issues, the cost of globalization, development and unfettered growth to the environment. It is clear from the reception the protesters received that political and economic power interests continue to nurture and sustain the rhetoric of globalization and development. The globalization of the rhetoric and the ideology of development have pervaded most spaces of political and cultural life. The ideology of development has been so naturalized that it is often difficult to extricate its influences from the larger political, economic and cultural processes.

Often ignoring social studies of science, scientific institutions continue to embrace the notion of objectivity and the possibility of producing unbiased knowledge about the world. In this chapter we explore our growing understanding of how research on the natural world is influenced and shaped by larger political and social issues. In particular, exploring the role of development, we use the case study of 'invasion biology' to illustrate this point. Invasion biology has developed as a field concerned with the increasing presence of exotic and alien plants and animals. We suggest that the problems of development are central to the growing concern about alien plants and animals entering the United States. We argue that critiques of development and the discourse of post-development to which this anthology is a contribution must pay attention to the naturalized ideology of development in addition to the very material consequences of development in the Third World. Invasion biology is also a good case study of the tensions between the global and the local. The global movements of humans, plants and animals as well as consumer products have profound consequences at the local level – of culture, economies and labour as well as nature and its management. As development scholars have already shown, hierarchies such as those based on gender, race, class, nation or sexuality are imbricated in development narratives and ideology, and central to the case of invasion biology as well. These intersections are crucial in any discussion of development.

Locations: scientists and the politics of science

We enter these discussions as three scholars studying questions of ecology, evolution and conservation. The three of us met during graduate school in the

biological sciences. While our intellectual and disciplinary academic journeys have varied, we have all been deeply aware of the political nature of science. As fellow graduate students, we initiated and were part of a discussion group on the politics of biology. Early on, we began to recognize that there were deeper questions to be asked beyond the traditional focus on the diversity of the scientific workforce, although we believe this continues to be an extremely important topic. We saw (as well as experienced) that science was not a meritocracy, and that the differing career paths of individuals were embedded in a history of science that was entrenched in certain gender, race, class and national norms and cultures. Our readings and discussions took us deeper as we explored the social and political nature of scientific knowledge production. Science was committed, we came to realize, to certain political economies, geographies, philosophies and histories. While the questions we asked, the methodologies we employed, and the conclusions we drew in our biological research seemed 'obvious' from our disciplinary trainings, we recognized those naturalized impulses as historically and politically embedded. However, these interdisciplinary insights and understandings are not so easy to sustain in the purified world of any discipline. In the sciences, culture and politics are considered irrelevant to scientific pursuits. Within the world of basic scientific research, 'nature' is ontologically real, and separate from the messy world of human entanglements. The scientific researcher is an abstract node, a replaceable investigator in knowledge production, whose personal politics and ideologies are irrelevant to the production of knowledge. Finally, the scientific method is seen as epistemologically pure and the scientist as able to pursue the abstract and intricate workings of the natural world. Biological research can thus produce generalizable and verifiable results separate from the often subjective constructs of the social and cultural worlds. It is virtually impossible to investigate or theorize the interconnections of nature and culture in 'pure' science journals and departments. These are relegated to the applied and social sciences.

Given these realities, developing an interdisciplinary natural science/humanities/social science project, especially one that engages the ideological and political nature of science, is a difficult academic endeavour, yet one to which we are committed. These are interdisciplinary terrains that we are still discovering and negotiating. To us, each of the disciplines brings something uniquely valuable. We must say at the outset that, from our location as scientists, we are committed to scientific practice and the possibility of understanding and elucidating the mechanisms that sustain biological populations and processes. For us scientific knowledge is crucial in our engagement with the natural world and the possibility of a sustainable planet.

We have read with interest and sympathy many of the critiques of modern science, including those that have called for a total rejection of science, together

with its inherently reductionist and violent epistemology and methodology.⁸ While we take some of these critiques to heart, we find that many ignore the heterogeneity within science and reduce science to a monolithic caricature with uniform ideology, methodology and epistemology. Scientific practitioners are likewise presented as naive, apolitical pawns, unaware of or unmoved by their collusion with and in modern capitalism and neocolonialism. Colonialism, similarly, is presented as entirely hegemonic and totalizing in its impact.⁹ However, over the last few decades, postcolonial scholars, especially those in Subaltern Studies, have argued and documented the heterogeneity in colonialism's impact as well as local resistances and insurgencies among those colonized. Similarly, scholars in Science Studies have showed the heterogeneity within science and the history of science – not only in its methods but also in its practitioners and their ideologies.

Science has a long history of critics and dissenters; we are inspired and empowered by that history. Like the critics we are often dismayed by the rise of the science/industry/military complex, the patenting of genetic organisms, the prevalence of biological determinism, the uncritical support of the human genome project, the proliferation of genetically modified food and organisms, etcetera. These issues energize and impassion many scientists (as they do us) who have vociferously opposed and have spoken against the scientific merits and ideological commitments of such projects. While the sciences have been used to secure patriarchal, capitalist interests and have been historically linked to them, we do not want to relinquish science to these interests. We embrace science, as others have, for its progressive possibilities that will enable us to build a sustainable world. Furthermore, some critics of science who reject science have postulated the embrace of local 'knowledges' and practices. While we believe local knowledges and practices are crucial to a sustainable world, we do not believe they need be in competition with science as an either/or choice.

While we embrace science and technology, we are always aware of their ethical, political, economic, cultural and ideological connections, often beyond our individual control. While we take issue with those critics who reject science entirely, those who advocate an unquestioned support of science and scientific objectivity equally trouble us. To us the history of science and the current privatization and commodification of science are a testament to the deeply political and ideological nature of science. We are deeply aware of the problematic history of science – of eugenics, Nazi science, Tuskegee syphilis experiments, the atomic bomb – and its role in colonialism and modern capitalist expansions. Science, like any institution, is always embedded in politics and should never be beyond critique. Whether science is advocated by globalists, nationalists or fundamentalists, it should not blind us to the systematic marginalization of certain groups and knowledges in the name of science or development.

Even though we embrace science and scientific practice, 'global' science is not inherently superior to local knowledges and practices.

Vandana Shiva and Meera Nanda are both important and influential voices in the debates around science and local knowledges. Their work and critiques have deeply influenced our own thinking on the subject, although we do not agree with all their positions. We are deeply moved by Vandana Shiva's essay in this collection and share her vision of agricultural practices that pay attention to the complexities of ecological processes. We agree with her vision that we must develop sustainable practices that utilize the vast and complex resources of a diverse array of organisms. However, we would argue that this is not alien to the world of science. Many progressive scientists work with farmers in developing sustainable ways of farming. Such sustainable practices, in our vision of science, are not contradictory.

Second, while Shiva's vision of nature is wonderful, as ecologists we must point out that this 'nature' also includes pathogens, parasites and processes that do not always lead to such an idyllic vision. There are natural toxins in nature, and 'natural' processes by themselves do not necessarily lead to a more sustainable world. For example, Jim Bever's work¹⁰ on the relationship of soil communities and plants shows that ecological interactions are complex. While plants can develop mutualistic and symbiotic relationships with their soil communities, plants also attract pathogens and parasites. These complex ecological processes can result in negative feedback cycles – so that plant communities can contribute to a decrease in the productivity of a plant over time instead of increasing it. Nature is not always harmonious or comforting. We find ourselves between two contrasting visions on the nature of nature – the exploitation of nature by science and capitalism and the idyllic vision of a harmonious and benign nature by ecofeminists. As ecologists, we feel we can embrace neither. The material body of nature is complex and should not be reduced discursively to be either a monster or a friend.

Similarly, Meera Nanda's critiques of the limits of indigenous knowledges are very persuasive. Academic discourse that silence the subaltern only to speak for them are indeed dangerous. We agree with her that local indigenous practices are not always pure and should not necessarily be exalted in the name of pluralism. As she points out, patriarchal and feudal practices are deeply embedded in local practices and should be interrogated and condemned as such.

However, we believe we must extend such critiques to science as well. While post-development should not be top-down, neither should science. The institution of science as it is practised today is deeply hierarchical and top-down. While we cannot accord local knowledges epistemic purity, neither can we do the same for science. We should treat neither as grand theories – both are problematic, embedded in different histories, geographies and politics. While

we embrace the possibilities of a progressive science, there is nothing in the history of science *per se* that encourages the hope that science will 'enable the subaltern to see through the mystification of their inherited dialogues'. Western science has been hegemonic and we need to understand the ways in which it has appropriated, dismissed or supplanted other forms of inquiry and practices. Conversely, as Nanda suggests, we need to understand the limitations of local knowledges as well. It seems that such discussions cannot be productive while we continue exalting either science or local knowledges, the primacy of the global or the local; instead, we need to pay more attention to the vast negotiable spaces in between these polarities.

We locate ourselves squarely, rejecting what we see as two unproductive and artificially created binaries – pro-science/anti-science, pro-global/anti-global, pro-local/anti-local. We embrace a contextual combination of both, committed to a reflexive and situated practice of science,¹¹ one that involves local communities while it embraces the progressive possibilities of a global and local science. Further, while the context in which science is done, and its ethical, historical and political ramifications are all crucial to us, so equally is an understanding of 'nature'. Nature is not entirely semiotic and in the realm of discourse; it is simultaneously deeply material, with its own agency and regulatory practices.

We cannot build dreams or visions of a sustainable world from our armchairs. Science and technology are important. 'Nature' in all its aspects – the flora and fauna that share our planet, the environments, principles and variables that govern their and our lives – are necessary ingredients of any such dreams or visions. We recognize the social embeddedness of such practice and the need and possibility of a reflexive scientific practice that painstakingly examines the context, rhetoric, and conditions under which scientific experimentation takes place. While truth and scientific knowledge may always be partial and situated, the knowledge that science can bring about natural processes is vital.

In this chapter we use a project on invasion biology that we have embarked on collaboratively as a case study to show how we can develop an interdisciplinary research agenda in the sciences – to develop an account of natural and biological processes embedded and enmeshed in cultural and political contexts. To us, such interdisciplinary practices are crucial to any vision of 'post-development' or progressive political action. We begin by elaborating on our conception of 'global circulations', followed by an analysis of our case study of invasion biology. Here, we describe current scientific theories and research on plant invasions followed by an analysis of how deeply cultural the rhetoric of 'nature' is. We conclude with our vision for interdisciplinary work across the humanities, natural and social sciences. At the core of this vision is the imperative that we simultaneously study nature(s) and culture(s).

Global circulations

We entitle our chapter 'Global Circulations' to call attention to the circulations of science, technology and development. None of these are static fields; they are made up of theories, ideas and practices that circulate across time, space and regions. In the contemporary globalized world, these circulations reach the far corners of the globe: decisions in the World Bank in Washington DC, for example, impact on tiny villages across the globe. The title of the chapter is also intended to underscore the profound contemporary impact of globalization, *the* emergent phenomenon of our times, on nations and nationalisms, on the global and the local, and on notions of hybridity and purity. The tensions between globalization and localization, and who is empowered to determine these, are central to the contradictions of our times. On one hand, national boundaries have been transgressed by a world consumerist culture – popular music, McDonalds, Pizza Hut, designer clothes, cosmetics, World Wrestling Federation – that the upper/middle classes across the globe share. Yet, simultaneously, cultural and religious nationalism – the call for the promotion of national and local cultures and values – is also growing. Medical sciences and drugs have dramatically increased life expectancy and the quality of life, yet classes of people in virtually all countries, including the industrial West, do not enjoy these benefits and have virtually no access to these breakthroughs. The World Wide Web connects people from remote corners of the world in common chat rooms and news groups, while others have not heard of a computer. Corporations, free marketers, and the governments of certain countries are developing international treaties and organizations such as NAFTA and WTO to make national boundaries permeable to the free flow of money, goods, people, plants and animals. In response, environmentalists, some farmers, labour unions and activists have lobbied against these stressing the exploitation of workers, the needs of local employment, environmental standards and regulations.

Proponents and opponents of globalization signal the tensions of living in an unequal world with a history of colonialism. 'Development' is one area in which issues of globalization and localization are central. We use the case of invasion biology because we believe issues of development and globalization are central to the story of native and exotic plants. While the panic over exotic species occurs in many countries, our study focuses on the US to highlight the local-global connections, development and environmentalism, globalization and localization.

Invasion biology: a case study

Charles S. Elton's classic book *The Ecology of Invasions* (1958) has led to much interest in studying and cataloguing the establishment and spread of exotic and

non-native species in native plant communities and in the landscape in general.¹² Over the last twenty years, ecologists and conservation biologists have chronicled the impact of alien/foreign species on native plants and animals, studying various aspects of the biology of native and exotic plants.¹³ While many 'immigrant' species enter new habitats, few survive and only a fraction become naturalized. Some naturalized species, however, become invasive. The field focuses on developing a typology of those species and the conditions that result in invasions in order to develop some predictive power on future invasions. Introduced exotic plant species are believed to impact negatively on managed and unmanaged ecosystems by competing with 'desirable' native species and degrading important ecosystem properties. Invaded ecosystems have been shown to experience dramatic changes in many ecological characteristics such as soil chemistry,¹⁴ fire regimes¹⁵ and local hydrology.¹⁶ These changes in the ecosystem function can then further accelerate the future invasion of these communities. It is believed that virtually all communities can be or have been invaded; communities clearly differ in their susceptibility to invasion by exotic plant species. Several censuses document the increase of exotic and alien plants and the corresponding decrease in native species, often to alarming degrees. Overall, the research in the field characterizes the current status as a national crisis, with the geographic scope and impact alarming. We have seen the development of local and national projects across the country focusing on biological invasions, and the creation of conferences and forums at national meetings devoted to the issue. Local and national restoration projects have also developed, while national and local societies eradicate exotic species and promote the use and establishment of local species.

The rhetoric of invasion

We began this project wanting to explore some of the larger questions the biological literature raised, and in particular to focus on the impact of native and exotic plants on their soils. As we got into the project, we were struck by the rhetoric surrounding plant and animal migrations and the striking parallels with the rhetoric of human immigration. The very term 'invasion' suggests alarm, the influx of a larger volume of undesirable aliens. The terminology of plant and animal migrants – alien, resident and naturalized species – closely parallels that applied to human immigrants. The very terminological distinction between 'native' and 'exotic' species is deeply problematic given the history of migrations over the past centuries. The biological literature, and reports in the popular press in particular, describe the presence of exotics as an 'onslaught'.¹⁷ One article summarizes it as, 'They Came, They Bred, They Conquered'.¹⁸ The rhetoric seems unmistakable and transfers common concerns about alien peoples to alien

plants and animals: for example, questions such as hygiene and disease (aliens spreading disease and threatening drinking water); looking different or 'other'; changing familiar landscapes; silently growing in strength and number; surviving under the most extreme conditions with little resources; aggressive predators and pests; hypersexed females and prolific reproducers; parasites on the economy; aliens that consume a lot but contribute little.¹⁹ Nancy Tomes's work on germ panics in the twentieth century suggests that anxieties about immigrants often spill over into our conceptions of nature. She documents how the panic about immigrants spilled over into a panic about germs. The current panic around biological invasions suggests that our anxieties about foreigners are spilling over into a panic about foreign plants and animals.²⁰

We find this argument particularly compelling given what gets left out in much of the popular rhetoric surrounding exotic and alien species. For example, the fact that nearly all the US crops are exotic plants, while most of the insects that cause crop damage are native.²¹ There is little mention of the tremendous benefits from alien plants and animals (just as in the case of humans). There is virtually no mention of the problematic term 'native'. (Who is native? Who gets to define it?) Finally, and most pertinent to this chapter is that the changing landscape is blamed on aliens and foreigners. There is little focus on the continual degradation of land in the name of development. Rather than focus on the degradation of the quality of land which helps the establishment of weedy species (not just aliens/exotics), current management focuses on policing borders to prevent entry of foreign plants and animals, and on crude efforts to exterminate a few introduced species. For example, President Clinton's 1999 executive order creating the National Invasive Species Management Plan is entirely directed at federal agencies to 'mobilize the federal government to defend against these aggressive predators and pests'. So, rather than rethink growth, which causes the continual deforestation and development of land, we focus instead on policing our borders and boundaries. A study of contemporary discourse suggests that the language of exotic/alien plant and animal invasions reflects a pervasive nativism in conservation biology; a nativism that blames the alien and the foreign for the changing US landscape.²²

What is striking to us is that rarely is there similar panic around other issues that may contribute to the rise of exotic species and the loss of native biodiversity. Unchecked development, weak environmental controls, and the free flow of agricultural plants and animals across national borders in the name of globalization remain invisible and unproblematic. By identifying the exotic species as the problem, other potential agents of biodiversity loss, such as habitat destruction, are ignored, free of responsibility. The shift of focus onto foreign plants and animals depoliticizes a political problem.

Plants that originate in Eurasia, for example, dominate much of the landscape

of Southern California. Many of these plant species were purposely introduced either as crops or as forage for cattle. The preservation and re-establishment of the native flora is the focus of an active movement. While this movement is diverse, a major effort of this movement, and the component of the movement that is endorsed by local, state and federal governments, focuses on the problem of introduced species. However, ecological research has identified that the success of exotic plant species in Southern California is tied to two factors. First, many exotic plant species are more resistant to overgrazing and therefore reached dominance during the long history of profit-driven exploitation of often privately owned land by always privately owned cattle. Second, our own research has identified that many exotic plant species are more successful in disturbed soil, and have therefore increased in response to land use during recent 'development', including the massive disturbances of land for modern agriculture, suburbanization, military exercises and off-road vehicle recreation. Viewed in this way, the dominance of exotic plants in Southern California is a symptom or consequence of past and current development, rather than the cause of the loss of native biodiversity. Problematic unsustainable land-use practices would quickly focus attention on who made and benefited from these practices – a very political issue of differences in power that government agencies would not endorse. But displacement of blame to 'foreign' plants frees the human agents, the political and economic drivers behind such a problem, from responsibility. Displacement of blame to foreigners, however, does not solve the problem of the extinction of species and the degradation of habitats; indeed, it dilutes our efforts to reverse these trends.

The consequences of unchecked development and growth in the name of globalization remain invisible and unproblematic. What is striking to us about this case study is the global circulation of science and the interconnections between science and politics in contemporary globalization. The inequality of global wealth and opportunities leads to human global migrations; these in turn shape local contexts and issues; and ultimately these local contexts transfer human politics to plants and animals, which in turn demonizes human migrations. What gets little interrogation in the current case are those inequities of wealth and opportunities, and their connections to global capital, globalization and permeable borders.

Intervening in the politics of knowledge

What this project has taught us is the inextricable connection between science and politics. The project leads us into more fundamental questions of the field of ecology. Who/what is native? Who gets to define it? What is considered natural? What models or frameworks surround the use of nature and the

natural? What practices and ideas are mobilized in the name of nature? Historically, for example, racism (and in contemporary discourse, heterosexism) and other forms of oppression have been explicitly defended in the name of the 'natural'. These questions are also particularly salient in ecology, where descriptive models of the processes of 'nature' are central to the field. In invasion biology today, foreign plants are eradicated in the name of the natural. How have we evolved around a common rhetoric of the foreign/alien? How have we come to address questions of diversity and difference? It is apparent that ecological research can benefit immensely from such reflexivity – or tracing the interconnecting histories of our theories of plants and animals and those of humans. Language is not the irrelevant, transparent piece of communication that is still taught in graduate programmes in the sciences. It is, instead, potent, central and consequential to the enterprise of science. The reflexivity that an attention to language, history and politics gives us in the present case of invasion biology will help enact better public policy and environmental regulations. It forces us to interrogate the nexus of power in contemporary globalization instead of powerless and poor immigrants.

We realize that our vision of interdisciplinarity does not create an explicit counter-model; that rejecting two binaries does not articulate a new alternative. However, we believe that grand theories have been precisely the problem of development. Our focus is not a new grand practice but rather a call for new processes of negotiations. The grand theories of science must be put to local tests, but not in exporting global practices into local contexts, as in the high-input agriculture that recreate unsustainable practices of agriculture. Instead it is in a contextual science that takes local ecologies, cultures, histories, economics and geographies into consideration. Clearly the nature of the negotiations and solutions will differ in different places. Such negotiated practices must be negotiations of the material and the discursive. Our vision of new processes is one of creating new conditions that will allow certain kinds of knowledge to emerge and flourish.

To us the possibility of such interdisciplinary work is exciting. It brings together the very things modernity divided – the body and the mind; the rational and the emotional; objectivity and subjectivity; ethics, morality and aesthetics with costs and benefits. It allows the possibility of understanding the natural world we live in as participants and co-creators of the same world. The tensions and divisions that emerge in the world are precisely because modernity allows us to separate and reduce what was once whole. Any vision of post-development must bring these parts together again.

Notes

- 1 Serres and Latour (1995).
- 2 Latour (1993).
- 3 We use the term 'feminist science studies' in this essay to include feminist work on technology and development studies. While these fields are in many ways separate, they are interrelated in the inextricable interconnections between science, technology and development. Furthermore, all the fields share a common critique of modernity and its claims.
- 4 See Haraway (1997) and Goodeve (1999).
- 5 See for example the works of Ruth Bleier, Evelyn Hammonds, Donna Haraway, Ruth Hubbard, Evelyn Fox Keller, Helen Longino, Anne Fausto Sterling.
- 6 Haraway (1997).
- 7 Nandy (1988).
- 8 See, for example, the works of Vandana Shiva, Ashis Nandy, Claude Alvares.
- 9 Guha (1997).
- 10 Bever, Westover and Antonovics (1997: 561–73); Bever (1994: 1965–77).
- 11 Haraway (1988: 575–99).
- 12 Elton (1959).
- 13 For example, see Burke and Grime (1996: 776–90); Groves and Burdon (1986); Mooney and Drake (1986).
- 14 Vitousek and Walker (1989: 247–65).
- 15 Mack (1981: 145–65).
- 16 Walker and Smith (1997: 69–86).
- 17 Mack *et al.* (2000: 1).
- 18 Bright (1999: 51).
- 19 For a discussion on the rhetoric of biological invasions, see Subramaniam (2001: 26–40).
- 20 Tomes (2000: 191–9).
- 21 Sagoff (2000, B7).
- 22 Paretti (1998: 183–92).