CHAPTER 14

The Resilience of Indigenous Intelligence

Laura Rival

Abstract

This chapter examines some of the reasons why resilience has become such an important concept for scientists interested in developing sustainability science on a planetary scale. On the basis of two ethnographic projects, one documenting the resilience of Makushi manioc cultivation to weather extremes, the other exploring the built-in resilience of landscape restoration work, I show how local knowledge – or indigenous intelligence – fundamentally depends on learning how to learn in living environments. I conclude with a reflection on the contribution anthropology should aim at making to the development of the new science of integrated social-ecological systems. This task requires that we continue to document ethnographically and compare analytically cultures of resilience and sustainability all around the world. We also need to rethink a number of key concepts (in particular 'value,' 'human agency,' 'intentionality,' 'life' and 'materiality') in the light of practices and modes of living aimed at protecting the evolving maintenance of integrated social and ecological systems, as these practices both raise and attempt to answer questions which are profoundly anthropological.

Journalist Lisa Chase's piece "Do Worry, Be Happy" in a recent issue of *Elle Magazine*[1] is a good example of how the term 'resilience' is starting to capture popular imagination:

> What attracted me to Transition, as the movement is called, was the word *resilience*, with its implications of being skilled, being ready, being confident, and therefore being optimistic about The Day After Tomorrow. The word is all over Transition's literature, all over its YouTube clips. It seemed such a superior word to *green* and *sustainable* and *eco*—once hot, now almost clichés, and subject to corruption by the market. But resilience, you can't fake. A resilient person is who I want to be. And if I'm not inherently resilient, can I learn to be? […] Transition is about communities—in particular "relocalizing" them, and this you probably know something about: eating local and buying local, but also manufacturing local. It's also about "reskilling"—learning to do the things our great-grandparents knew how to do, such as growing food and building things. Most importantly, Transition is about resiliency, [that is] "a culture based on its ability to function indefinitely and to live within its limits, and to be able to thrive for having done so."

My goal in this chapter is to explore some of the reasons why resilience has become such a powerful word in the last few years, and why, despite the obvious problems linked to its popularity and its cooptation in the development discourse, resilience is a useful concept that helps us overcome dichotomous thinking when we attempt to theorize the intractable linkages between the natural world and the social world. I do so through two ethnographic accounts. The first one discusses the resilience of Makushi manioc cultivation to weather extremes, and the second presents the work of activists who consciously build resilience in their landscape restoration projects. I end with a discussion of how anthropology could contribute to the emerging sustainability science.

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1. http://www.elle.com/Beauty/Health-Fitness/Do-Worry.-Be-Happy Accessed on July 1, 2009

2. Recorded during the international conference held in April 2008 at the Stockholm Resilience Centre, available at http://www.stockholmresilience.org/research/whatisresilience.4.aeea4691ra3127427980004249.html.

The varied and changing meanings of resilience

Resilience has become an important concept for scientists interested in developing sustainability science on a planetary scale. These scientists stress the inseparability of social and ecological worlds, seen as forming integrated, complex, and adaptive systems "characterized by historical dependency, complex dynamics, inherent uncertainty, multiple scales, and multiple equilibria. Such complex systems do not divide along disciplinary lines; they are integrated social-ecological systems" (Holling 2001: 390).

Most authors currently writing on resilience note that the concept derives from ecology. In fact, the term resilience was coined by Holling (1973) in a seminal paper that radically broke away from mainstream ecology by addressing ecosystem dynamics and incorporating human actions as key components of ecosystems (Folke 2006: 262). Folke (2006) offers a fascinating account of the origin of the resilience perspective, including a history of how Holling progressively elaborated the concept as his research interests shifted from empirical studies of prey-predator interactions to the analysis of wider systemic processes and population models. Holling initially conceptualized resilience as the "capacity of a system to absorb or utilize or even benefit from the perturbations and changes that attain it, and so to persist without a qualitative change in the system's structure (Young et al 2006: 305)." More recently, he has coined a new term, *panarchy*, to characterize the resilience of coupled natural and human systems that interact dynamically across temporal and spatial scales (Gunderson and Holling 2002). While panarchy results from a two-way interaction between a hierarchy of adaptive cycles, social-ecological systems remain resilient through diversity, variability, modularity, and feedbacks. Events and processes, either small, big, fast, or slow can transform ecosystems and organisms through evolution, or humans and their societies through learning – or the chance to learn. For Holling, "change that is important is not gradual but sudden and transformative." Resilience is to biological evolution what sustainability is to societal development: both involve processes that simultaneously 'conserve' and 'create.'[2]

As the term resilience is increasingly used to refer to social and

socio-ecological – rather than purely ecological – processes, its meaning is shifting[3] towards related concepts such as vulnerability, robustness and adaptability. The need for epistemological clarity, therefore, is pressing (Gallopin 2006).

Discussions about resilience and the epistemological status of SES, as socio-ecological systems are increasingly referred to (Young et al 2006, Gallopin 2006), are akin to the old tradition of thinking about the cultural and the social in terms of the biological and the ecological, and it is this common characteristic above all that makes them so fascinating for the social anthropologist. If we are not very far, at times, from the naturalist sociology of Spencer, the values being expressed, however, are very different. Resilience becomes a way of talking about positive change. Hornborg (2009) is right to question resilience theorists for a lack of attention to power relations, politics, and culture,[4] but there are more ways of engaging the resilience perspective than his polemical and caricatural dismissal. This chapter hopes to engage critically, yet constructively, with some of the epistemological problems raised by the theory of resilience, and more generally, of sustainability.

The most intriguing fact for an anthropologist encountering the resilience literature is, arguably, the idea that resilience comes from ecology, for any quick survey of dictionary definitions reveals that the term's history is more complex and more interesting than the simple popularization of a scientific word. In fact, ecology borrowed the term resilience from physics. According to OED, the English word *resilient* comes from the Latin word *resiliens*, which derives from the verb *resilire* (to rebound or to recoil), a compound of *re-* (back) and *salire* (to jump, to leap). The word, first used in English by Bacon

3. See for instance the definition offered by Young and co-authors, for whom resilience refers to "the structural and other properties of a system that allow it to withstand the influence of disturbances without changing structure or dynamics" (Young et al 2006: 305).

4. The work of Tim Ingold, cited with praise by Hornborg (2009: 253) is a good example of how anthropologists engage with the intermingling of the social and the ecological without falling into the traps of systems. Ecology suffers, in my view, from an even worse lack of attention to issues of power and conflict than the resilience theorists under discussion.

in 1626, was formally defined in 1656 as meaning "a leaping or skipping back, a rebounding; a going from ones word."[5] From 1824 onwards, physicists used the word to refer to "the physical property of a material that can return to its original shape or position after deformation that does not exceed its elastic limit." Resilience (or resiliency) in this scientific context is a synonym of elasticity, that is, the "ability of matter to spring back quickly into shape after being bent, stretched or deformed" as well as "the energy per unit volume absorbed by a material when it is subjected to strain, or the maximum value of this when the elastic limit is not exceeded." The French borrowed the word *résilience* from the English in 1911, as part of their effort to develop the technical and scientific language of physics. At the time, the word was exclusively used to define "the relationship between the needed kinetic energy and the breaking up point of a metal.'[6] The French word *résilient* was borrowed a generation after (in 1932) to express the state of what "resists more or less to shocks."[7]

Although more etymological and historical research is needed on this intriguing issue, common French and English dictionary definitions never mention resilience in the context of ecology. Apart from physics (and the extension of its vocabulary to medicine, with, in the early part of the 19th century, phrases such as "the natural elasticity or resilience of the lungs"[8]), two other scientific disciplines seem to be concerned, namely psychology and economics. English dictionaries clearly separate definitions that apply to substances, such as metals and plastics,[9] from those that apply to persons, inclu-

5. The verb to resile (to retract, to draw back on one's word) was used almost a century earlier (1529) to describe Henry VIII's attempt to terminate legally his marriage to Catherine of Aragon (OED's quotations for resilience).

6. "Le rapport de l'énergie cinétique absorbée nécéssaire pour provoquer la rupture d'un metal, à la surface de la section brisée. La resilience, exprimée en kgm par cm2, caratérise la resilience au choc." Petit Robert.

7. "Qui résiste plus ou moins au choc, est caractérisé par une resilience plus ou moins grande." Petit Robert.

8. And other bodily organs such as in "the power of the heart […] materially reinforced by the resilient structure which composes the parietes of the aortic bulb," "the fibrils of the resilient part of the nerve," or "the skin giving a sensation of the loss of all elasticity or resilience."

ding their spirit, mind, conscience, and emotions. Human resilience is sometimes divided into 'physical' and 'mental' properties. Many synonyms (such as buoyancy, lightness, carefreeness, airiness, cheerfulness, liveliness, jauntiness, light-heartedness, breeziness, perkiness, and so forth) are associated with the capacity of buoyant persons to recover readily from shock or depression. When applied to economy, resilience refers to the faculty of taking up again (in French, *la faculté de reprise*). Further research would indicate whether resilience is really a scientific word in the vocabulary of economics, or whether it is a journalistic term widely used by politicians and news commentators.[10] Further work is also needed to establish whether Latin speakers, like their European descendents, applied the term *resiliens* indiscriminately to substances, matter and physical and mental properties of persons, and whether they used it to refer to the properties of landscapes.[11]

Finally, there is no work – as far as I know – on how the concept of resilience passed from physics to ecology. Such knowledge is however crucial if we are to disambiguate some of the epistemological issues evoked earlier. It would also help us understand why the inclusion of humans in ecosystem research was seen as so heterodox thirty years ago, and why it has become the dominant view in recent years. As the brief journey through the varied and changing meanings of resilience has shown, persons, their surroundings, the communities and institutions they create, and the systems of exchange they de-

9. The word resilient is now also used in the context of computer technology, and may be applied to hardware, software or data, to speak of the ability to recover from a failure. See http://www.wordinfo.info/words/index/info/view_unit/1883/2/?spage=1&letter=S Accessed on July 1, 2009.

10. Although bordering on the anecdotal, and may be more revealing of library acquisition policies than of the varied and changing meanings of resilience, the list of resilience books held in the Bodleian library at the University of Oxford reveals that there are 56 titles starting with the words 'resilience,' 'resilient' or 'resiliency,' of which 3 deal with physics and engineering; 7 with ecological systems; 12 with psychology; 19 with families, communities (including institutions such as churches and schools) and culture; and 14 with political and economic systems.

11. See Glacken (1967: 116-149) for a discussion of natural resources in the Greek, Egyptian and Roman worlds.

velop form webs of signification so intricate that they may defy rigorous SES modelling. SES research is developing as a systems science aimed to address the underlying forces driving contemporary environmental change at the global scale. Although resilience researchers aspire to link the physical, ecological, and social domains in effective ways, they may be neglecting dimensions of the human-environment interface that anthropologists are particularly well placed to examine. Ethnographic accounts, with their power to capture social action and evoke cultural renderings in all their creativity and openness to the world, have thus an important role to play in documenting, for instance, different cultural perspectives on human nature, the bio-physical world, society and individual rights, as well as how these may influence behaviour towards the environment.

Taming the weather in the northern savannahs of Guyana

I worked for some years with a multi-disciplinary research team that looked at agrobiodiversity and its relationship with genetic diversity from the perspective of a single plant, manioc (*Manihot esculenta*). This work has shown that human and natural selection jointly shape manioc diversity through (1) the overall cultivation system, which is highly adapted to environmental pressures; (2) the knowledge, categorization and valorization of phenotypically expressed varietal differences; and (3) the incorporation, in this clonally propagated crop, of sexually reproduced plants, which encourages intra-varietal diversity and occasionally leads to the creation of new varieties, i.e. new categories that are phenotypically distinct and receive a new name before being multiplied (Rival and McKey 2008). With its focus on the evolution of manioc under domestication, the research has thus contributed to scientific efforts aimed at documenting forms of environmental management, local knowledge systems and cultural practices that enhance genetic diversity. In this sense, it has provided "deeper understanding of the role of biological diversity in ecosystem dynamics" (Folke 2006: 257-258), and, as such, has contributed to the development of resilience theory. I outline here aspects of the research that are relevant to a discussion of the role of

indigenous knowledge systems in adaptation to climate variability and climate change.

In Guyana, where manioc fields are regularly flooded during the rainy season and parched under a scorching sun during the dry season, indigenous manioc cultivators such as the Makushi have long learnt to adapt to weather extremes. The weather may be getting more erratic because of climate change, but severe drought and flooding are recurring climatic conditions to which indigenous peoples of the Guiana shield have learnt to live with.

The rainy season usually starts in April and lasts until September, with torrential rains falling in July and August. The El Niño weather phenomenon causes dry conditions with subnormal, low rainfall levels, as well as the premature ending of the rainy season. My second field visit to the northern Rupununi took place in 1998,[12] a particularly bad El Niño year.[13] By April, drought and fires had already devastated many fields. I visited families who had lost their entire crops of manioc, pumpkin, watermelon, and fruit trees, and were suffering from food shortages. In the savannah community of Massara, for instance, almost every household was short of manioc tubers. Women had discontinued the preparation of *cassava* bread and *cassiri* drink – two Makushi favourites – and restricted the use of tubers to *farinha* making. The dried granules of pulped manioc tuber called *farinha* keep for months – if not years. *Farinha* is also easy to exchange or trade, and it can be taken on long treks. Scarce *cassava* bread was supplemented by rice, acquired through monetary exchanges or reciprocity. Fishing, facilitated by low water levels in rivers and creeks, was intensified, both for consumption (people were therefore eating

12. This study was part of a large research programme funded by the European Commission (DGVIII, Programme Avenir des Peuples des Forêts Tropicales). Institutional support was generously offered by the National Agronomic Research Institute in Georgetown, Guyana; the Ministry of Amerindian Affairs; the Environmental Protection Agency; the Amerindian Research Unit at the University of Guyana; the Conselho Indígena do Roraima; and Iwokrama Park. I will never forget the wonderful days and evenings spent with villagers in Rewa, Massara, Annai and Toka, to whom I am greatly indebted.

13. For a discussion of the impact of 1998 El Niño in Southeast Asia, see various contributions in Ellen (2007).

more fish than usual) and for sale (to obtain the cash necessary to buy rice). Whenever they could, families were leaving their savannah dwellings for less hot and smoky places, travelling to their *'high bush farms*' in forest areas on hilltops or along rivers, trekking to distant hunting territories, or visiting relatives living in more propitious and moister regions. When not fishing or visiting relatives, Makushi cultivators were busy preparing new '*farms*.'[14] What struck me most during these difficult weeks was that people, who did not seem too concerned about the loss of crops as a source of food, were putting all their energy in saving planting materials and preparing new areas for planting. This is what I wrote in my field diary:

> "Whenever there is a drought, the main concern of Makushi farmers is to prevent manioc stems from drying out. Their priority is not to save harvestable tubers, but to preserve cuttings as 'seed banks.' Cultivators prioritise the long-term reproductive cycle over the short-term productive one. For this, they look for swampy areas, which are, under normal circumstances, flooded, and transport their best stems —sometimes over great distances— from their farms to the swamps, to stock them in large bunches there, until the time when the rains make their replanting possible. The farmer's greatest problem in time of drought is, more than food shortage, the lack of manioc stems to replant and the sudden drop in varietial diversity."

Other members of our research team collected similar data in other field locations, and throughout the duration of El Niño. Had we not started our study of indigenous management of manioc varietal diversity during a period of bad drought, we might have taken longer to understand the general evolutionary ecological characteristics underpinning Amerindian traditional manioc cultivation, and, in particular, the crucial role played by seed bank dynamics (Elias, Rival and McKey 2000, Pujol et al 2007, Rival and McKey 2008).

In the following weeks, I learnt from Makushi villagers how to anticipate subtle changes in the weather by observing the flowering

14. Guyana is the only English-speaking country in South America, and this is what they call their manioc fields under slash-and-burn management.

and fruiting of certain plant species, the feeding and nesting behaviour of certain bird species, or changes in the behaviour of amphibious animals – in particular alligators. Although systematic research on this topic has yet to be carried out, there is little doubt that the Makushi use a complex system of ecological indicators to predict changes in weather patterns.

The oral histories collected during these weeks of intense drought also taught me that the Makushi, like so many other indigenous peoples, used to be more mobile in the past; their primary response to a severe drought was to leave the savannahs altogether. They would intern themselves in the forest and travel up river until the start of the rainy season. With no manioc products left to eat, they would live on fish, game and forest food, including numerous fruits, roots, young shoots, seeds, and honey. They would process the fruit and pith of certain palms, as well as other forest plants and seeds to produce a type of meal used to prepare ersatz manioc bread. Some of these forest foods are still known today, but no longer used. I was not able to visit the Rupununi during times of flooding, but conversations with villagers and research collaborators suggested that the Makushi are as well adapted to flooding as they are to drought, and moreover, that they know their environment in its – often dramatic – succession of more or less dry to more or less flooded state. I strongly suspect that further ethnographic research would show that, for the Makushi, the best way to deal with weather vagaries is not so different from the way one 'cultures' the land so that manioc can grow, or tames wild spirits, so that the ill can be cured (Rival 2001).

If Makushi manioc cultivation systems are so well adapted to environmental pressures and Makushi environmental knowledge so superbly tuned in with extreme weather conditions, why did the people suffer hardship during the 1998 El Niño? Part of the answer lies with the forces of "development and progress," to which indigenous peoples have had to adjust, and whose "pernicious effects" are far from easy to tame (Anchorage Declaration 2009, Kimberley Declaration 2002, Ginzburg 2005, Mander and Tauli-Corpuz 2005).

If Makushi contact with the forces of 'market' and 'progress' is several centuries old, it was, until the last thirty years or so, rather

intermittent and fairly unobtrusive. My older informants worked for large ranches or companies specializing in the extraction of balata latex, but the cash and trade goods they obtained through selling their labour did not impinge on the domestic economy or endanger its autonomous reproduction. For complex historical reasons linked to the consolidation of the international border between Guyana and Brazil, the formation of national political identities and allegiances away from the interior regions – in coastal areas – in both countries, and the political and economic consequences of the Rupununi Uprising in 1969 (Farage 1991, 1997, Santilli 1994), the Makushi of Guyana have been more economically isolated than other indigenous peoples of the Guiana shield. This has allowed them to maintain traditional hunting, fishing, and cultivation techniques to a degree I have not seen elsewhere in lowland South America.

Today, people live on the savannah, where they own houses and plots of land. As savannah soils are not propitious for cultivation, villagers farm miles away from where they live, on forested hills or in forest galleries along riverbanks, often on land to which they have no legal title, or in conservation forests in which it is actually illegal to cultivate. The schools to which they send their children are all located in savannah sedentary settlements, and operate according to a national calendar which cannot – will not – accommodate traditional seasonal migration. Like in so many parts of the world, ecological sense and the rationality of the state are not easily reconcilable (Rival 2002). Broader cultural, social, and political influences are further eroding people's confidence in traditional knowledge and people's valorisation of economic self-sufficiency, but their analysis is beyond the scope of this paper. Young couples who had given up fishing and manioc cultivation were particularly hit during the 1998 El Niño drought, and it is perhaps with such families in mind that the government designed its food aid programmes, which imagined Makushi villagers as environmental refugees in urgent need of food and water.

When a state of national emergency was declared at the end of March 1998, the Civil Defence Commission was asked to coordinate disaster relief efforts with UNDP, who drew up plans to procure and

distribute food (rice, flour, sugar, farine, oil) and water to Amerindian communities in Guyana's affected regions. A UNDP official was assigned the task of buying large quantities of cuttings of an improved sweet manioc variety from an agricultural research centre in Brazil. My interview with him clearly established that he had no knowledge of indigenous cultivation systems. He did not know that the Makushi mainly cultivate bitter – not sweet – manioc varieties, or that they regenerate germplasm from soil seed banks. UNDP short-term humanitarian relief policies seemed to be based on the same government ignorance of indigenous knowledge as the autarkic development policies promoted by the postcolonial regime in the early 1970s. These policies were aimed at boosting national self-sufficiency in basic foods by massively increasing the production of manioc flour throughout Guayana. The plan was abandoned after just a few years, however, because of the alarmingly high number of people who had been taken ill to hospital, some dying of poisoning. The intoxication was caused by the consumption of incompletely detoxified manioc flour. The 'coastlanders' (i.e. non-Amerindian Guayanese) involved in producing manioc flour industrially had never mastered the Amerindian art of manioc processing.[15]

Becoming hydroliterate through Brock's water tales and on Marsha's farm

> "The world is made of watersheds. Water is life. Without water, there is no life. Earth, like our body, is made of water. Water is the blood of the globe. On Planet Water, the average global rainfall is approximately 15 inches (40 cm) in a year. There is no activity on earth which is not lubricated, in one way or another, by the liquid of life. For me, the only true source of water is precipitation. The quantity of fresh water, like that of oil, is finite. But the difference between water and oil is that water is cyclic. The hydrological cycle is extraordinary. It's

15. This story was told to me in August 1997 by an academic of the University of Guyana. No manioc cultivar is completely devoid of cyanogenic glycosides. While bitter varieties, with high acid content, need to be detoxified prior to consumption, sweet varieties, with low acid content, can be readily eaten without processing.

linked to the sun, you see, to sunlight: solar distillation. With climate change, we are changing the hydrological cycle. Planet Water has had a 1° F (0.6° C) temperature in the last 100 years; it will soon rise to a 4 to 6° F fever. When you have a fever, you sweat. The glaciers are melting because Planet Water does what your body does when it's got a fever: it sweats."

"Rainwater is a source, not a supply. Rainfall is like an 'income' and storage like a 'saving's account.' Planet Water gives me an allowance during the winter months. I can let it run to the oceans, i.e. spend it all, or I can put it on my savings' account, naturally stored in soils and watersheds. Nature holds water in plants, air, and soil. Water is cleansed and recycled in wetlands, breathed into the air by trees, collected and channelled by landforms. If you work with nature, you can use your house and your garden to capture, hold and recycle water."

"Water exists in landscapes, and it moves. There is dead water, and there is living water. When water moves, it gets regenerated. In rivers, water moves, it's vitalized, livened up. As water spirals, it forms flows, which support oxygenation. Mineral salts are created. With the rhythm, toxic wastes are removed. Biological purification is part of life processes. This is why wherever I can I create channels filled with rocks and growing plants on which I run the water."

"The techniques I use are not different from those traditionally used in China, Mexico, Hawaii, and in many other parts of the world. All over the world, people have managed productive river and watershed systems. In some places, there were specialized plant systems to treat sewage water… There's something magical in creating these simple cycles, as if nature recognizes the services and showers us with her gifts in return. If we think of a garden as a living being, then a grey water system acts as one of its organs, a sort of liver and kidneys that process waste and liquid."

I have met many enthusiastic activists in Brazil in the last three-four years, but Brock is by far the most passionate when it comes to water, and the most knowledgeable as well. After a first degree in biology and many jobs down the line, including working as an engineer for oil companies in the Amazon region, Brock joined an ecology centre in California, where he established the Water Institute, also known

as the Institute for Watershed Advocacy, Training, Education and Research,[16] which he directs. One of the institute's achievements has been to help reintroduce the Coho salmon in one of the most polluted and intervened watersheds in the world. This was accomplished through observing the river to know it and experience it as a salmon would, and then convince decision makers that restoring the salmon run would be good for the Coho species, and also for the whole of society. If you go to the Institute's website and click his name, you'll see a picture of Brock in his shirt submerged in water, with a broad smile on his face. His smiling face reminds me of the drawing he gave me that day in Saõ Paulo, of the sad versus happy (magic) Mickey Mouse H_2O molecule. "H_{20} is a bipolar, in fact, a tripolar, molecule," he told me, "… it changes from gas to solid to liquid. Water as solid (ice) floats on its liquid self. This makes life possible." "Water drives the shape of life," he added, "the forms of life. Water follows the path of least resistance, which is not a straight line, but vortexes." He showed me a map of the Amazon River, the largest river on earth.

"Look, this is form following function… Look at these branching fractals. Water is the driver at every scale. Water goes from concentration to dispersion. Those who build canals (straight lines) are hydro-illiterates. I'm trying to promote hydro-literacy." Brock has perfected his teaching on water, over the months; it is instructive to listen to the various recorded talks available on the web, but none has the freshness and direct engagement of his one-to-one conversations.[17]

Listening to Brock has made me *think* about water, an element I was – like so many of us – simply taking for granted. In this sense, and as far as I am concerned, Brock has partly fulfilled his objective: he has made me more hydro-literate, even if just a little bit so. At

16. http://www.oaecwater.org/about/water-institute accessed on February 7, 2009.
17. You can hear a few of his talks on: http://www.ipcon.org/index.php?option=com_content&task=view&id=148&Itemid=1 and
http://www.sdnhm.org/webcasts/lectures/brockdolman.htmand accessed on February 7, 2009

least, I am now deeply aware of my ignorance. I still do not pay sufficient attention to water in my home; I often fail to attend to what I now know about water; and my surroundings are still shaped by the ignorance borne out of this taken-for-grantedness. However, Brock's water tales, with their mix of western science, esoteric knowledge, and poetic – almost religious – vision have awoken my anthropological imagination.

I met someone else in Brazil who knows about water in a similarly intelligent way. Marsha bought a piece of land in the *certaõ*, one of the poorest and driest regions of the northeast, a piece of land totally devoid of nutrients because of large-scale deforestation followed by eighty years of repeated bad management. The soil was as white as sand is on a tropical beach; no crop could grow, not even manioc. The *certaõ* has been made famous as a land of hunger, utter poverty, drought, desertification, and mass out-migration by writers such as Jorge Amado and anthropologists such as Nancy Scheper-Hughes. Rains are highly erratic, but there is good ground water, as indicated by the girth of the native cashew nut trees, which can reach ten metres, or more. Marsha's project to transform this bit of *certaõ* into a productive homestead involves restoring the land to its natural fertility, re-establishing the natural forest on part of the property, and creating dense networks of crops, animals, and people on and around the farm. It is there, in fact, that I received my first lesson in hydro-literacy. Marsha simply asked me to walk through the water-retaining landscape, and to execute very small, basic, low-skill tasks she knew I could perform without endangering the restoration work. She never explained much, and I did not dare disturb her with endless, naïve questions. But as I drunk the cool and fresh rainwater stored in the traditionally built earth tank; gathered small tomatoes covered in dew; and stumbled over big toads at night on my way to the bathing area, I learnt that water can be made abundant by working with the rain cycle, even in dryland areas.[18]

18. See the report *Rain: The neglected resource* for a policy-oriented discussion of rain as "the ultimate water resource" ("the supply is in the sky") at http://www.siwi.org Accessed on April 29, 2009.

Marsha moved to the *certaõ* with thirty-five years of experience in agroforestry and rural development. She is liked by the poor villagers who live around the farm. They get jobs on the farm (there's so much to do!) and, perhaps more importantly, feel part of the restoration project. Cultivation techniques are shared and tried out on various fields around the village. Notes are compared. The children come to Marsha's farm every day after school to play music and sing. As one of Marsha's friends told me, she does "repair work." "She rebuilds forests, water systems and communities," he added. There is absolutely no difference for people like Marsha between "caring for the earth," "caring for people," and "caring for the self." It's all part of the same ethics, all part of the same challenge.

Living well for Brock, Marsha, and like-minded people means thinking and acting in a world where built environments are not severed from wilderness, as all spaces need to be meshed within a web of relationships that unfolds into seamless socio-ecological spaces of dwelling. They see themselves as 'practical designers' who create value by applying ecological principles. "With the application of ecological principles, people are able to integrate themselves, their buildings and their landscape through beneficial association; these living systems are capable of supporting and regenerating themselves" says one of Brock's friends. "Our designs are applicable to any scale, from window box to region or to any system, from household through industry to economy. These principles are generic, they can be used in any climatic or cultural context" adds another. For Brock and Marsha, sustainability or resilience (they use the two words as synonyms) comes from understanding human physical presence on earth in terms of relative intensity. At one end of the continuum, we find the houses and buildings where people live, work, and make intensive use of resources; at the other, the spaces where people refrain from going or intervening, and where nature is left alone to organize things. All aspects of human life are linked. First, food, water, and shelter, including the flows of energy and waste that make a home a home; then, transport, education, and models of decision making, or the web of relations that link homes together over time and space; finally, spirit or soul, or what links home dwellers to other sentient beings. This is how people and nature are linked up

in a total socio-ecological fact, through actions aimed at regaining some control over the production and consumption of energy.

Through the socio-ecological worlds enacted in the integrated living landscapes designed by people like Brock and Marsha, development is envisioned as wellbeing, and sustainability valued in terms of a political economy which starts with the conscious, practical, and relational self, to then flow and radiate outward in concentric circles that embrace, through the awakening of awareness, imagination and empathy, the whole world. Landscape restorers and holders of local knowledge such as Brock and Marsha are living examples of the power and capacity of people to build resilience through collective action (Folke 2006: 262).

The resilience of indigenous intelligence

As theorizing the interface between society and the environment has always been a central concern of anthropology, anthropologists should be particularly interested in new concepts such as social-ecological systems, resilience and sustainability. However, the discipline has yet to reflect on sustainability as a newly emerging aspect of the co-evolving history of humans and environments (Rival ms). We currently lack a synthetic and integrated picture of anthropological thinking on nature, the environment, the economy, and development. One way of remedying the situation is by focusing on the anthropological questions raised by those who have gained or preserved some kind of indigenous intelligence.

Times of crisis are times when societies must choose between distinct historical directions. "The greatest resource that people have is their ability to innovate, and that ability is shared with all groups of humans who live or have lived on the Earth" (Kaua'i Declaration 2007: 1). Throughout the world, a new community of small holders is developing around people who use their rich knowledge of nature to increase food production sustainably and restore ecosystems. In the savannahs of the Guiana shield, in the Brazilian *certaõ* and in California, land is being restored through ecological practices. People like Marina, Brock and the communities in which they work are demonstrating in very concrete and physical ways how innova-

tion can revert environmental degradation, and restore the natural quality of the air we breathe; the water we drink; the topsoil upon which our agriculture depends; the diversity of biological life and cultural ways; and even climate stability.

As I have tried to show, the Makushi have been great innovators in their own ways, but they are suffering today from what some indigenous leaders have called the pernicious effects of development and progress (Kimberley Declaration 2002). The national society in which the Makushi live may now be more open to acknowledge their indigenous rights (a very recent recognition fraught with great tension), but they are still subjected to the symbolic violence exercised by those who cannot recognize the *value* (rather than just the right) of being different and living in a distinct human collectivity. Furthermore, dominant society has yet to accept that Makushi swidden horticulture is *wiser* than coastal agriculture, and that it could be used as a model to rethink Guyana's farming systems.

Whereas people like Brock and Marina *are becoming* indigenous, the Makushi *have been* indigenous. The indigenous intelligence deployed by the former is slowing being recognized, while that of the latter is rapidly being devalued and eroded. Weaker and smaller groups may internalize dominant values, and the hegemony of certain (non-sustainable) cultural modes of production and consumption may prevent creative forces to shape inter-community exchanges. 'Indigenous intelligence' fundamentally depends on learning how to learn in living environments. The extinction of experience is real enough (Atran and Medin 2008), but, as I have tried to show here, it can be reversed. The education of awareness can lead to change as (re-)discovery of what makes human life possible.

In his seminal *Problems in materialism and culture*, Raymond Williams (1980) said that we need different ideas of nature because we need different relationships. By ideas, I wish to claim, he really meant values. Anthropology may always have been troubled by the tension between knowledge and meaning, but there are today new twists to this tension. Science can tell us how the world is, but it cannot instruct us about meaning or values. Values will never be descriptive. Cultural values, as ideals, largely constitute standards against which people judge themselves and their neighbours. In keeping with Ray-

mond Williams' spirit, we need to ask: How do values shape the inter-relation between environmental change and development? Although often disparaged as an ambiguous, ideological and inoperable concept, 'Sustainable Development' has been remarkably enduring. Far from disappearing, as predicted, the oxymoron continues to inspire and mobilize energies. And despite its shameless exploitation by interest groups, a growing number of individuals, associations and communities all around the world have chosen not to reject, but to embrace sustainability as a core value, which they translate in a range of practices and modes of living that protect the evolving maintenance of integrated social and ecological systems. They usually use sustainability and resilience interchangeably.

I have started to document ethnographically the creation of spaces in Europe and in Latin America where the values of sustainability are being materialized and enacted, and have found that these practices both raise and attempt to answer questions which are profoundly anthropological. These anthropological questions and the concrete, material, and embodied answers they find in the projects I am researching can be used to engage with the politics of hope that such spaces embody, and to theorise sustainability from an anthropological perspective. By reflecting anthropologically on the anthropological projects of ethnographic collaborators, we will, I hope, be in a stronger disciplinary position to approach the issue of resilience.

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