Foucault and the Water Temples

A Reply to Helmreich

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In a recent article in *Critique of Anthropology*, Stefan Helmreich deconstructs my research on the water temple networks of Bali, as published in *Priests and Programmers* (1991) and various articles:

> [Lansing] is hardly at the helm of a giant anti-politics machine, ideologically or financially, even if he has garnered some monetary support from international agencies, most notably the United Nations Food and Agriculture Organization. His activities might rather be understood as small moments in the production of a dispersed and distributed network of practices that reinstall in more complicated ways some of the patterns of dependency and relations of inequality that have characterized neocolonialism. (1999: 256)

Helmreich is concerned that my use of simulation models to analyse water temple networks 'oversimplifies history and power relations', since 'the simulation encodes an objectivist God's eye view, that view most familiar to administrators charged with counting and correcting'. Moreover, my presentation of model results in print and on video reinforces the 'colonial gaze'; for these reasons 'the use and abuse of computer simulations bears watching – especially in situations where there is a notable power differential between those putting together the simulation and those whose lives are the subjects and objects of these simulations'. Thus Helmreich sees my work as not merely conceptually flawed, but morally deplorable. His views of my work are new to me, but evidently have been in circulation since 1993, at such distinguished venues as the 13th International Congress of Anthropological and Ethnological Sciences and the Center for Critical Analysis of Contemporary Culture at Rutgers. So far I have not been invited to contribute a response, but here I claim the privilege of offering one. My comments will be directed first towards his discussion of my use of simulation models, and then his assessment of their political implications.

Helmreich begins with a brief summary of my research on Balinese water temples. Perhaps to save time, he quotes from an unpublished manuscript by A.J. Michael, who purports to summarize my findings: 'This complex system of irrigation and water management, which has been a functioning ecological system for over one thousand years, is controlled by

members of the Brahman priestly caste' (Helmreich, 1999: 251). Helmreich comments that 'Many priests are on record as disagreeing with Green Revolution innovations, but where Lansing sees this as a function of their wisdom, we might also see it as a response to a sense that their authority and position as Brahmans is being jeopardized' (1999: 257).

I can think of no clearer way to characterize my argument in *Priests and Programmers*, than to say that it is about the implications of the fact that Brahman priests have *no authority or role whatsoever* in irrigation management on Bali. Helmreich worries that access to my simulation models may inadvertently strengthen the power of the Brahman priests. This is ironic, since the purpose of the computer models was to explore how a bottom-up system of irrigation management can function in the absence of hierarchical control. Thus if our nonexistent Brahman water priests were to study the simulation, they would only discover an explanation for their own failure to exist.[1]

But Helmreich did not invent these fictional Brahmans; they came into existence as characters in the minds of Dutch colonial administrators and engineers in the aftermath of the Dutch conquest of south Bali (1906–8). Since then, they have lived on in the imaginations of planners and social scientists who have tried to modernize Balinese irrigation systems. Thus from my perspective, Helmreich's critique is another chapter in the long history of failures to understand an institutional system – Balinese water temples – that is remote from our experience of social life in the West. Indeed his article furnishes fresh evidence for the Foucauldian argument I made in the introduction to *Priests and Programmers*, that to recognize the existence of water temple networks as a social institution challenges the Eurocentric focus of Western social theory (1991: 8). Like the Dutch engineers (and for that matter the planners of the Green Revolution), Helmreich imagines an hierarchical system of irrigation control, and even chastises me for failing to 'actively seek out ways to articulate his project with local resistances that may already be under way' (1999: 256). For surely, where there are powerful Brahmans, there must be resistance?

In *Priests and Programmers* I describe the efforts of colonial authorities in Bali to impose a centralized, hierarchical system of irrigation control on the Balinese:

> Nineteenth century Dutch officials found little evidence for centralized royal control over irrigation. But in the twentieth century, for reasons of its own the colonial administration did its best to create an hydraulic bureaucracy, and argued that in so doing they were merely restoring an ancient system which had fallen into decay during the nineteenth century ... The 'restoration' of a powerful irrigation bureaucracy would not only increase tax revenues, it would provide an attractive justification for colonial rule. When it became obvious that no centralized royal system of irrigation management existed in any of the conquered principalities, the Dutch did their best to invent one. (Lansing, 1991: 35)

My argument, in brief, is that the water temples of Bali were largely ignored by the Dutch, for two reasons. First, because the 'restoration' of an imaginary hierarchical system of irrigation management was a congenial project for colonial officials embarrassed by other aspects of their rule, such as the slaughter of Balinese courts and the imposition of a profitable government monopoly on the sale of opium. Second, because the water temples are so unlike the kinds of institutions familiar to classical social theory that they were nearly invisible. Thus, paradoxically the restoration of an imaginary hierarchical system became the cornerstone of colonial policy with respect to irrigation, while the actual system of bottom-up control by water temple networks continued to function:

> . . . there is evidence that the Dutch were aware of the existence – and even some of the practical functions – of the temples associated with farming and water control. But it appears that once the temples had been pigeonholed as religious institutions, their practical functions became invisible. Although the colonial archives provide useful observations of the workings of the water temple system, the system itself was not detected because it rested on a system of power relations so ephemeral, from the point of view of a colonial adminis-tration, as to be imperceptible – 'an external whisper, a beating of wings that one has difficulty in hearing in the serious matter of history' (Lansing, 1991: 36)

The lesson I drew from an examination of the colonial archives is not that the Dutch deliberately suppressed the water temple networks, but rather that they failed to recognize these networks as social institutions: 'Because the Dutch model of irrigation vastly underestimated the com-plexity of the sociobiophysical systems involved in rice production, water temples and bureaucracies coexisted without creating technical problems in irrigation control' (1991: 127).

But while the Dutch were mostly content to contemplate their historic role as the successors to Bali's last great kings, benefiting from a 'restored' 'royal irrigation tax' while leaving the actual management of water to the Balinese, the 'Green Revolution' of the 1970s brought the water temples into direct conflict with the goals of foreign engineers and planners. 'If the powers of the water temples were rather hazy for the Dutch, they were entirely invisible to the planners involved in promoting the Green Revol-ution, who regarded agriculture as a purely technical process' (1991: 111). By then, the Dutch were gone, but the institutional systems they had created persisted:

> The failures of the Green Revolution revealed for the first time that this bureau-cratic model of irrigation control was hopelessly oversimplified. The state's claims to control irrigation – or at any rate, to manage terrace ecology – were hollow. In reality, subaks were not autonomous units, terrace ecology could not be sustained by continuous rice cropping; and water temples played a major role in hydrological and biological management. (1991: 127)

This brings us to the chief topic of Helmreich's critique: the work I've

done with James Kremer, a systems ecologist, using simulation models to understand water temple networks. In *Priests and Programmers* I explain how our collaboration began:

> My investigations had convinced me that the primary role of water temples was in the maintenance of social relationships between productive groups. The question that Kremer and I wished to address was, Did these systems of social coordination have measureable effects on rice production? The Green Revolution approach assumed that agriculture was a purely technical process and that production would be optimized if everyone planted high-yielding varieties of rice as often as they could. In contrast, Balinese temple priests and farmers argued that the water temples were necessary to coordinate cropping patterns so that there would be enough rice for everyone and to reduce pests by co-ordinating fallow periods. (1991: 117)

But why involve the mathematical apparatus of systems ecology and simulation modelling in an anthropological study of a social institution, the Balinese water temples? First, to make sense of the problem. Consider: the Oos and Petanu rivers of southern Bali provide irrigation water for nearly 200 subaks. Subaks are egalitarian, cooperative farmer's associations that manage the flow of irrigation water into rice terraces, and also coordinate agricultural rituals. But the average size of each subak is less than 50 hectares and 100 members. When a single subak decides on its planting schedule for the next year (what to plant, and when), it sets in motion an irrigation schedule for itself, which will also affect its neighbors. In other words, how much water one gets depends in part on the irrigation schedules of one's neighbors upstream. Moreover, as Balinese farmers recognize, the irrigation schedules chosen by subaks also affect the life cycles of rice pests, like rats, insects and diseases. My colleague Gusti Nyoman Aryawan, a Balinese ecologist, has shown that synchronizing irrigation schedules over a sufficiently large area of rice terraces can control rice pests, since 'if all of the fields in a sufficiently large area are harvested at the same time, and subsequently flooded, rice pests are deprived of their habitat. If no alternative hosts are available, the pest population will drop' (Lansing, 1991: 121, cf. Aryawan et al., 1993).

So why did we bother with computer simulations, since the ecological point seems straightforward? Because 'with hundreds of subaks distributed in many branches along a typical river, there are an enormous number of possible cropping schedules':

> Imagine a jigsaw puzzle of a watershed with 100 subaks, where each color signifies a cropping pattern for the year: yellow might mean 'plant a particular rice variety the week of February 15, and a different rice variety the week of July 20'. Groups of subaks up and down the river choose this plan, while others choose different plans, symbolized by different colors. The result, for the whole watershed,is a patchwork of colors. An almost infinite number of different-sized and different-colored patches is possible, but nearly all of them would lead to acute water shortages and pest outbreaks. (Lansing, 1999: 211)
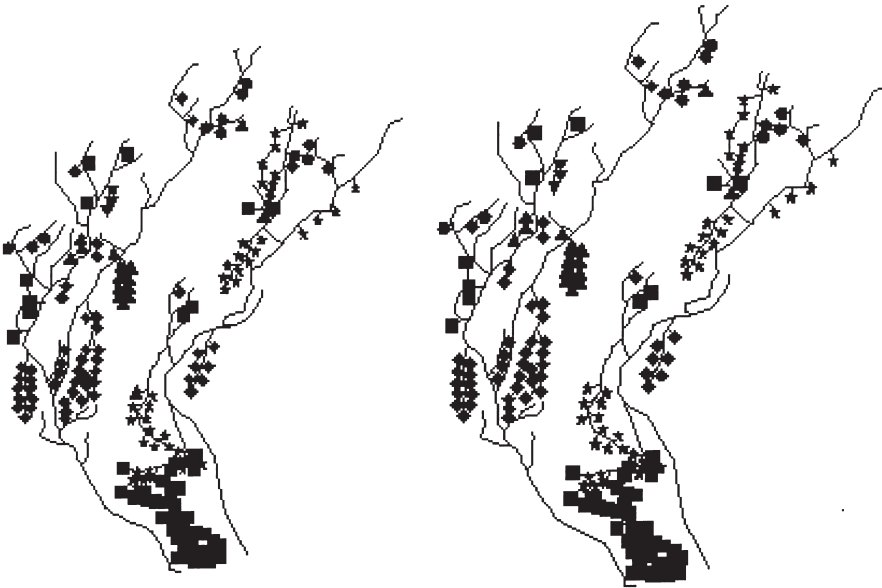
Figure 1 Cropping schedules for 172 subaks along the Oos and Petanu rivers of Bali (not to scale). Symbols represent annual cropping patterns for each subak. The diagram on the left shows a computer simulation of self-organization; on the right observed cropping patterns in 1988

The subaks do not consciously attempt to create an optimal pattern of staggered cropping schedules for entire watersheds. Yet the actual patterns my colleagues and I have observed in the field bear a very close resemblance to computer simulations of optimal solutions (Figure 1).

Helmreich objects that our simulations leave out many tragic facts about Balinese history: 'Missing from Lansing's model of a religio-ecological system that has worked for the last "one thousand years" is any acknowledgement of the introduction of Indian religion into Bali, of 17th and 18th-century slavery in the archipelago, of Dutch imperialism, or of Indonesia's struggle for independence. The massacre of more than 80,000 people on the island in 1965 and 1966, in the wake of Suharto's rise to power, is also disappeared [sic] . . .' (1999: 260). I have addressed all of these topics in my publications, but they are indeed absent from the ecological model (which also omits to 'acknowledge' global warming, the Second World War or the role of missionaries). The computer model was not a substitute for historical analysis, but a specialized tool for investigating the ecological effects of water temple networks. We used it to ask two questions: first, whether there was an ecological basis for the farmer's belief that water temples improve harvests for everyone. The simulation results

supported this view. Second, whether a full-fledged watershed-scale water temple network could easily come into existence, or whether it required careful planning or sheer good luck. Our results indicate that such networks will self-organize easily in about a dozen years, and are robust in the face of environmental perturbations.

In light of Helmreich's critique, several points need to be emphasized about our simulation models. First, they don't provide tools for the powerful to control the weak; instead they illustrate why a bottom-up system of control produces better harvests for everyone than centralized management. Second, they don't attempt to capture historical reality. All of the model's assumptions are deliberately crude: simple models of rice and pest biology, rainfall and irrigation flows, and the simplest possible model of decisions by the subaks. We are not interested in trying to simulate exactly what happened to Subak X in 1988; rather we're interested in the behavior of many subaks across a wide range of conditions, where the fate of each depends to some extent on the behavior of the others. We want to know what water temple networks do. The complexity of the calculations required to understand these patterns explains the need for computers. Third, the uses of the model are severely limited. It won't tell us a thing about why water temples exist in Bali, or their ritual functions, or indeed how to 'control' them. All it can do is to help us explore the relationship between water temple networks and the ecology of Balinese rice terraces. The model's simplicity is its chief virtue: it provides a way to investigate the processes by which local interactions can generate large-scale patterns of cooperation, without the need for either planning or enforcement.

Helmreich's critique of our model consists of two points: that it doesn't include many tragic historical events and processes, such as slavery and colonialism; and that it is a potential weapon in the hands of the powerful Brahmans who control the irrigation systems in Bali. It seems that he has missed the point on both counts. Lest there be any further misunderstanding, allow me to emphasize: the Brahmans don't control irrigation in Bali, and the model helps to explain why. This leaves us with a new puzzle: if I am correct, then what would account for Helmreich's failure to grasp these points? The answer, I think, is that he fails to give any account at all of the water temple networks as an institutional system. Helmreich's comments on our computer simulations are confined to the graphical interface ('. . . representations that can indeed be used rhetorically to persuade us that the model captures something of "reality"', 1999: 259). His focus is on the appearance of the simulations, not on their content.

I can imagine a critique that would go something like this: the cooperation and egalitarianism Lansing reports in water temple congregations probably conceal a hidden struggle for power, where caste and class rivalries must surely exist. But of course I agree with this view. The ecological analysis achieved by the simulation modelling provides only a single dimension to our understanding of the water temples. It shows that ecological feedback

provides a strong motive for cooperation. But that doesn't imply that Balinese farmers always cooperate, or that other forces are not at play. Since 1995, I have worked with several Balinese colleagues in a study of conflict and cooperation in 15 subaks. We would like to gain a better understanding of the interplay of forces, from status rivalries to ecological feedback, that influence the historical patterns of conflict and cooperation in subaks. But this has no relevance to Helmreich's critique, which is confined to his worries about our computer models falling into the wrong hands.

I have one further bone to pick with Helmreich with respect to his critique of my ethnography. He writes: 'Lansing's computer model still depends on and implements a romantic vision of the cyclical time of the other, and brings stereotypes of "oriental", indigenous and peasant societies into the silicon age' (1999: 254). In fact, the vision of time implemented in our model is nothing more romantic than the passage of months. Helmreich goes on to say that my account of Balinese calendars belongs to a group of 'orientalist (and primitivist) portraits of non-western societies [as] ordered by circular conceptions of time' (1999: 253). Here I really must object: the idea that systems of time reckoning must either be linear (Western, modern) or circular (Oriental, primitive) is a naive stereotype, patently false but still oft repeated. In my work I have been at pains to emphasize the intricate details of the three Balinese calendrical systems; partly in the hope of subverting this simplistic dichotomy. Balinese ideas about conjoint permutational cycles are an important tool for farmers in the water temple networks, which I discuss at length in *Priests and Programmers*. My work on this topic is greatly indebted to Clifford Geertz's analyses of Balinese agricultural rituals.

Mention of Geertz brings me to the subject of Helmreich's warnings about my work in the context of agricultural policies in Indonesia. If Helmreich is critical of me, he stretches innuendo perilously close to libel in a remark about Geertz:

> If Clifford Geertz's early work on Indonesian agriculture, *Agricultural Involution* (1963), had agendas in common with the national security apparatus (John Gledhill, personal communication) (using a cultural ecological approach to demonstrate to policy makers how traditional beliefs and histories might be interfering with top-down projects of development), Lansing's work is meant to be advocacy work for indigenous Indonesians. (1999: 256)

As for me, despite his many criticisms Helmreich seems comforted by my failure to achieve very much: 'Lansing's project is quite small, and Lansing, while articulated to a large university, is an individual with relatively little power to effect far-reaching transformations in Balinese life' (1999: 255). Here again I must beg to differ. It is true that I am affiliated to a large university and that my projects are quite small and poorly funded. But their effect has hardly been to comfort the powerful. I offer two examples.

First, the Bali Irrigation Project (BIP) was a development project carried out by the Indonesian government with $55 million borrowed from the Asian Development Bank from 1977 to 1989. In meetings with the foreign consultants managing the project, and in letters to the Bank, I criticized the project as dangerous to both the sociocultural system of the water temples, and the ecology of the island. Project officials were not pleased. The Japanese head of the Irrigation and Rural Development Department wrote in response to my objections 'Everybody can criticize and damage a project, but only few people can overcome those difficult problems and make the project viable'.[2] Subsequently the American manager of the BIP wrote to the head of the anthropology department at USC, requesting that I stop all correspondence with the Bank. But it was too late: the Acting US Director of the Bank wrote on 17 October 1984 that I had 'triggered a full-scale review of the Bank's environmental policies'.

In response to my criticisms, BIP staff expressed skepticism that water temples had any practical role in irrigation. Since they were not persuaded by my written evidence, I began to film examples, and sent a copy of the footage to the Bank (this footage eventually became *The Goddess and the Computer*). I also began my collaboration with systems ecologist James Kremer, which led to the simulation models of water temple networks. These proved to be more persuasive tools than my letters. The final evaluation report for the BIP concluded that 'the substitution of the '"high technology and bureaucratic" solution in the event proved counter-productive, and was the major factor behind the yield and cropped areas declines experienced between 1982 and 1985 . . . The cost of the lack of appreciation of the merits of the traditional regime has been high.' (Lansing, 1991: 124–5). Subsequently, direct opposition to irrigation management by water temple networks ceased.

Second, more recently my colleagues and I have studied the continuing effects of BIMAS ('Massive Guidance'), the top-down government programs for Green Revolution agriculture described in chapter four of *Priests and Programmers*. The cornerstone of 'Massive Guidance' is the provision of loans to farmers to encourage heavy use of fertilizers. We found that:

> Since the advent of high yielding 'Green Revolution' rice agriculture in the 1970's, Balinese farmers have been advised to supply all the potassium and phosphate needed by rice plants via chemical fertilizers. This policy neglects the contribution of minerals leached from the volcanic soil and transported via irrigation systems. We measured potassium and phosphate levels in unfertilized Balinese rice paddies, and found them to be indistinguishable from those in fertilized paddies, and sufficient for high grain yields. Field experiments indicate that most of the added phosphate flows out of the paddies and into the river systems, accumulating very high levels before reaching the coast. (Lansing et al., in press)

Thus for the past 30 years, the 'Massive Guidance' program has instructed Balinese farmers to purchase superfluous fertilizers, which flow

out of the paddies and into the rivers and ground water. Since Balinese rivers are fast and short, a great deal of fertilizer reaches the coastal zone, threatening the coral reefs (coral death and red tides have already been observed). How could such a mistake have occured, since every gardener knows the danger of adding too much fertilizer? Part of the answer has to do with a genuine issue of neocolonial power: until recently, fertilizer production in Indonesia was a monopoly controlled by President Suharto's circle. If we had done this research before Suharto's fall from power, the publication of our findings would have entailed risks for my Indonesian co-authors. But it would be simplistic to view 'Massive Guidance' as mere fraud. The real question is why these programs were implemented and sustained by technocrats for decades with so little regard for local conditions. In *Priests and Programmers* I described a 'contest of rationalities' between Balinese and 'modern' institutions, which began in the colonial era. As the two examples just described show, the contest is not yet over, and recently our simulation models have been useful in the defence of Balinese 'traditional' farming practices. For example, we were able to make a convincing argument against the continued use of chemical pesticides, by modelling the effects of synchronized fallow periods on rice pests. Without the use of mathematical tools, this analysis could not have been done, and Balinese farmers would still be told to spray organochloride pesticides on their fields in the interests of national development.

But while the use of simulations has been vital in our efforts to prevent further needless environmental damage to Bali from the imposition of Western hierarchical management systems, it has been less well received by anthropologists. The explanation for this seems straight-forward: many anthropologists continue to associate any use of mathematics with a simplistic positivism. I hope that I have shown here that this characterization of my work falls somewhat wide of the mark. While I might wish that Helmreich had read my work more closely before attempting to discredit it, I am indebted to him for this reminder that a Western reader can be so distracted by our use of computer models, as to miss the larger points.

Notes

1   All Balinese temples are cared for by local priests (*pemangku*), who are seldom Brahmins and have little or no authority over members of the temple's congregation. This is true for water temples. The highest-ranking water temple, Pura Ulun Danu Batur, has a priesthood whose members are chosen by a trance medium, and have greater sacred authority than ordinary temple priests. They cannot be Brahmins. Brahmin priests (*pedanda*) do exist in Bali; they have high status and considerable authority, and very little to do with water temples.
2   Letter to the Vice President (Projects) from Director, IRDD, 2 October 1984, Asian Development Bank.

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