

The Genealogy and Utility of the 'Hydrosocial Cycle'

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The hydrologic cycle produces perhaps the most picturesque diagram an introductory science textbook can offer. Often presented simply as *the* 'water cycle,' a standard illustration will include snow-capped mountains, green fields, a winding blue ribbon of a river, and a deep blue sea all tied together with gently curving, cyclical arrows evoking the pleasant, now-ubiquitous recycling logo of the 1970s environmental movement. Cities, industry, dams, irrigation, even farms, rarely make the cut. Humans are nowhere in sight. This idyllic picture of water perpetually cycling in 'nature,' separate from and unaffected by human activity has been muddled over the past century. A growing hydro-centric strand of social science has helped trace how humans have profoundly altered the flow of water in an endless attempt to manipulate and monopolize its fundamental role in sustaining organic life. Yet water has a material stubbornness all its own and scholarship has increasingly turned to the ways in which water directs, restricts, and confounds human activity. This relational dialectic of making and remaking is at the heart of the 'hydrosocial cycle,' a recent reformulation of the hydrologic cycle that seeks to better incorporate the broader socio-natural contexts which interact with water.

Although the hydrosocial is not without its critics, it has gained considerable interdisciplinary traction as it attempts to synthesize a number of broad trends in water theory, including an emphasis on materiality and the co-constitution of water and power. As such, the hydrosocial cycle provides a convenient framework through which to consider current directions and questions facing the field. Starting in the 1950s, the following survey will trace the historiographic conversation which led to the formulation of the hydrosocial synthesis before turning to recent scholarship on irrigation networks in Southeast Asia as a test-case for exploring the efficacy and limits of such an approach.

Water and Social Power

Although long-percolating in Marx's characterization of 'Asiatic' state appropriation of agrarian surplus, Wittfogel's aqua-centric rendition of Oriental Despotism was perhaps the first to center control of water as a possible basis for state formation and monopolization of power. First formulated in 1957, his oft-cited "hydraulic hypothesis" pinpoints control over water distribution as the source of the despotic power of the 'Asiatic states'.¹ In Wittfogel's model, the organizational work of constructing and managing large-scale irrigation and flood-control systems is seen as spurring political integration and state formation. By investing heavily in hydraulic management, certain states historically produced societies both dependent on, and largely content with, autocratic rule. Whoever controlled the water also controlled the people who needed it.

¹ Karl August Wittfogel, *Oriental Despotism: A Comparative Study of Total Power*. New Haven: Yale University Press, 1957.

Wittfogel's analysis was in some ways more nuanced and forward-thinking than its Orientalist packaging would suggest. For one, contrary to many later perfunctory summaries of his hypothesis, Wittfogel did not see water as a universal enabler of despotism. In fact, one could argue—as, indeed, we shall see Worster do—that he was perhaps too confined in delineating settings where the state could consolidate power via water control. Wittfogel insisted:

It is only above the level of an extractive subsistence economy, beyond the influence of strong centers of rainfall agriculture, and below the level of a property-based industrial civilization that man, reacting specifically to the water-deficient landscape, moves toward a specific hydraulic order of life.²

While the requirements of being 'above' extractive and 'below' property regimes now read as perhaps overly Eurocentric and teleological, Wittfogel's focus on aridity as a condition contributing to totalitarianism prefigured a broader historiographical turn, particularly in the United States, towards environmentally-grounded histories of the state. The post-1950s wave of studies on Dust Bowl America and the apparatus of the New Deal, for example, in many ways took up the focus on state power and "water-deficient landscapes" initially highlighted by Wittfogel.

A further example of the foresight buried underneath Wittfogel's Orientalism is the fact his analysis contained a surprising emphasis on what we might now call the materiality of water. He argued water possessed a "distinctive quality"—what he referred to as "its tendency to gather in bulk."³ The ability to pool makes water "institutionally decisive" in Wittfogel's mind. It justifies large-scale state-managed construction projects and enables a volume of hoarding unmatched by other natural resources. By centering a behavioral property of water as the 'decisive' factor in his broader hypothesis regarding authoritarian state formation, Wittfogel foreshadowed—although in a manner many would now consider heavy-handed and deterministic—more recent attempts to better incorporate water as a material agent that contributes to socio-historical processes.

A work with conclusions as sweeping as Wittfogel's was bound to attract an equally broad range of criticism. The most consistent category of initial critique centered on the environmental determinism apparent in Wittfogel's emphasis on the requisite arid or semi-arid setting for hydraulic authoritarianism. Analyses driven by environmental determinism are often characterized as overly simplistic, lacking contingency, and, in the context of Orientalist historiography, morally evaluative.⁴ Wittfogel's mechanistic and moralistic tie between water-deficient settings and despotic state formation is certainly open to critique on these grounds.

² Wittfogel, 12.

³ Wittfogel, 18.

⁴ David N. Livingstone, "Environmental Determinism." In *The SAGE Handbook of Geographical Knowledge*, edited by John A. Agnew and David N. Livingstone, 368–80. SAGE Publications, 2011.

A second significant cluster of criticism has questioned the inevitable authoritarian trajectory in Wittfogel's hydraulic model. In this regard, Wittfogel's personal political experiences and anxieties appeared to increasingly color his argumentation. Writing in the aftermath of his own internment in a Nazi concentration camp and a bitter disillusionment with the totalitarian form of communism emerging eastwards in post-war Russia and China, Wittfogel's historical analysis reads as perhaps an anachronistic and simplistic overemphasis on the total power and social control water can provide.⁵ Life in premodern China or India, according to Wittfogel, was one of "total terror—total submission—total loneliness."⁶ Many scholars have argued an empirical analysis of settings beyond Wittfogel's chosen historical examples reveals irrigation construction did indeed often coincide with political upheaval, but the result was not inevitably a top-heavy state. "What [Wittfogel] got wrong," in the words of archaeologist Matthew Davies, "was not that the requirements of irrigation management lead to new forms of authority... Rather, what he misunderstood was that these forms of authority should be, in any way, hierarchical or, to use his own term, 'despotic'."⁷

Despite the ahistorical anti-communist rhetoric that increasingly colored his McCarthy-era output, Wittfogel's unique turn to the political aspects of irrigation and water control has had considerable staying power. Led by the likes of Julian Steward, an emerging school of 'ecological anthropology' soon developed a considerable amount of scholarship on the historical role of irrigation in political and social organization. Perhaps most famously, three decades after *Oriental Despotism*, Donald Worster took up Wittfogel's hydraulic model as a framework to analyze the federal and corporate interest in large-scale water management projects west of the Mississippi.⁸ In Worster's estimation, Wittfogel and the ecological anthropologists' biggest failing was not an essentialization of Asian totalitarianism, but a reluctance to extend their analysis of irrigation and state power to modernity:

Nowhere do the ecological anthropologists—nor does Wittfogel, for that matter—seem to realize that the link between water control and social power might occur in places other than the archaic cradles of civilization nor that the past hundred years have seen more irrigation development than all of previous history.⁹

For Worster, this hesitance to extend the hydraulic hypothesis to modernity was tied to Wittfogel's own compromised position as a recent post-war immigrant to the United States. Any examination of the modern state's monopolization of power via water

⁵ Paul Robbins, *Political Ecology: A Critical Introduction*, (Malden, MA: Blackwell Pub, 2004), 47-48.

⁶ Wittfogel, 137.

⁷ Matthew I. J. Davies, "Wittfogel's Dilemma: Heterarchy and Ethnographic Approaches to Irrigation Management in Eastern Africa and Mesopotamia." *World Archaeology* 41, no. 1 (March 1, 2009): 31.

⁸ Worster, Donald. *Rivers of Empire: Water, Aridity, and the Growth of the American West*. 1st ed. New York: Pantheon Books, 1986.

⁹ Worster, 30.

control would have to contend with the nature of the United States' own western expansion. Worster held no such political reservations and duly took up the task of tracing the role of water control in the consolidation of American state and corporate power. In his magisterial *Rivers of Empire*, he argued the monopolization of water resources by federal and corporate entities was a defining feature of western growth from the outset. Settlement patterns, economic structures, political institutions all developed around—and depended on—large-scale water projects dominated by a small core of wealthy or technically-skilled elites. Worster particularly singled out the Bureau of Reclamation and a small, recurrent set of corporate interests as the drivers behind the increasingly frenzied construction of large-scale dams, canals, and reservoirs across the West. These hydraulic projects provided images and narratives of progress while serving to concentrate capital and socio-political control into the hands of a few. Structures such as the Hoover Dam should then be analyzed—just as Wittfogel's ancient Chinese waterworks—as embodiments of a deeply acquisitive, if not 'despotic,' modern capitalist state.

Thus where Wittfogel was content to displace the "terror" of hydraulic states in an othered, Asian past, Worster locates a water-enabled tyranny at the heart of a thoroughly modern, western state. "It may not be only the Russians or the Asians we must worry about," Worster quipped, "but also ourselves."¹⁰ Worster's conclusions on the contemporary West are as bleak as Wittfogel's abstract musings on life under an Asian despot. The American West of the 1980s, according to Worster, was an oppressive, techno-bureaucratic empire with cracks throughout its cement foundations. Just like Han China, the modern West faces issues with extreme social stratification, migrant labor exploitation, state-induced environmental damage, and a lack of effective democratic mechanisms.

Hybridity: Blurring the Society-Nature Divide

While Worster's conclusions have been critiqued by some as hyperbolic, his creative extension of Wittfogel drew renewed attention to the analytical potential of water-focused social and political histories. Published a decade after *Rivers of Empire*, Richard White's *Organic Machine* took-up Worster's renewed riparian frame yet altered the basic terms of the conversation in a number of significant ways. Where Wittfogel ranged across multiple civilizations and Worster took on the American West as a whole, White instead focused on a single river—the Columbia of the American northwest. His conclusions, however, were no less far-reaching. White's history of human and animal interactions with the Columbia River suggested the line between nature and society is both impossible to draw and a hindrance to historical analysis. This stood in stark contrast with Worster and Wittfogel's binary frameworks that spoke of the state and society as discrete entities interacting with, yet ontologically separable from, their environmental context. Rather than enabling the construction of an authoritarian state,

¹⁰ Worster, 30.

large-scale hydro-projects should be seen as part of a more haphazard process of human entanglement with changing, broader contexts. Along these lines, White proposed the metaphor of an integrated 'organic machine' in place of the Wittfogelian nature-society binary. In White's narrative, the Columbia was not conquered by a totalitarian power; instead a wide range of actors—including the river, society, and radioactive isotopes—have reconfigured the basin into a Franken-system only partially controlled by humans.

The ramifications of White's emphasis on both haphazardness and the need for more holistic frameworks is perhaps best seen in his innovative use of what he terms 'energy maps'. White uses energy as a controlling concept linking a wide-ranging analysis of water, fish, hydroelectric, atomic, and disease 'geographies' within the basin over the past two centuries. Each of these geographies of energy cut across conventional human-nature divides, revealing far more extensive, entangled systems. Salmon, for example, historically worked a particularly transgressive energy map. Fattened by their long-distance venture into the solar-enriched food system of the Pacific, adult salmon fed a string of seasonally large human settlements built along key bottlenecks in the fishes' return migration route. Their foundational role in the diet and migratory rhythms of human populations consequently gave salmon a central place in indigenous ritual and social geographies. Even as the material basis of this geography dried up with the damming of the salmon's migration route, the symbolic power of the fish persisted with salmon taking on a renewed second life as a defining regional emblem. White's salmon 'energy map' thus reveals a web connecting fish fat to the sun, gender roles, and regional identity. Where exactly, he asks, is the line between nature and society in this picture?¹¹

To be fair, neither Wittfogel nor Worster conceived of society and nature as entities entirely separate from each other. "Both continue to make and remake each other," Worster argued, "in an ongoing spiral of challenge-response-challenge."¹² Yet White's history of the Columbia suggested a far more heterogenous dynamic than the binary dialectic implied by either Worster or Wittfogel. Paul Sutter has characterized White's shift as an "embrace of hybridity" marking a broader historiographical turn to the study of hybrid natures:

Where the first generation of American environmental historians might have seen a dam thrown across a river in the western United States as an act of domination, of human artifice destroying a natural system, the second generation has been more likely to characterize such an intervention as creating a 'second nature' of the river, or, to use Richard White's phrase, an 'organic machine'.¹³

The decade after *The Organic Machine* featured waves of scholarship intended to better theorize the hybrid turn implicit in White's narrative. Erik Swyngedouw led the

¹¹ Richard White, *The Organic Machine* (Critical Issue. New York: Hill and Wang 1995).

¹² Worster, 22.

¹³ Paul S. Sutter, "The World with Us: The State of American Environmental History." *Journal of American History* 100, no. 1 (June 1, 2013): 96.

change with a series of increasingly complex formulations of what he termed the "socio-natural waterscape."¹⁴ Swyngedouw insisted earlier nature-society dialectics such as Worster's still suffered from the classical Marxist relegation of nature to an ahistorical substratum that merely provides the material basis for transformations of social relations or 'true' history. "The social and the natural may have been brought together and made historical and geographical by Marx," Swyngedouw argued, "but he did so in ways that kept both as a priori separate domains."¹⁵ To move beyond this dialectic, Swyngedouw drew heavily on both Latour's spatial network analysis and Lefebvre's emphasis on 'processes of becoming' to propose a theoretical framework for water studies centered on the production of a thoroughly hybridized 'socio-nature.' The external dialectics of nature-society were here internalized within material things themselves. Analysis thus shifts from the relations between discrete entities—such as humans and rivers—to the set of relations constituting a thing, such as a styrofoam cup of water. Crucially, in Swyngedouw's framework, nothing is pre-formed or separate from processes of production—the cup is thus both a product and agent of socio-natural change.

Self-consciously hybridized approaches such as Swyngedouw's quickly came to bear on the disciplinary boundaries of environmental history, encouraging a post-2000 wave of important inter-disciplinary cross-pollinations. The study of hybridized subjects called for hybridized approaches. The field of envirotech, for instance, emerged as a particularly fertile combination of science and technology studies (STS) with environmental history. Studies such as Sara Pritchard's post-World War II history of France's Rhone river revealed the extent to which White's subtle complication of the nature-society dialectic had since been amplified to revise widely held methodological approaches and analytical categories.¹⁶ Pritchard specifically advocates for an "envirotechnical" method that pushes technology studies to incorporate nonhuman nature into its frame of analysis while drawing historians' attention to technological objects and systems as sites of inquiry. Where White sought to complicate a river basin, approaches such as Pritchard's seek to reveal the hybrid character of knowledge systems. The envirotechnical thus "extends Richard White's notion of 'the organic machine' beyond either the 'natural' dimensions of 'technology' or the 'technological' features of 'nature' to challenge the very boundaries between both these categories and artifacts."¹⁷

While the hybrid turn remains a significant trend in the field, approaches such as Swyngedouw and Pritchard's have attracted some criticism. Sutter is not entirely

¹⁴ Erik Swyngedouw. "Modernity and Hybridity: Nature, Regeneracionismo, and the Production of the Spanish Waterscape, 1890–1930." *Annals of the Association of American Geographers* 89, no. 3 (September 1, 1999): 443.

¹⁵ Swyngedouw, 446.

¹⁶ Pritchard, Sara B. *Confluence: The Nature of Technology and the Remaking of the Rhône*. Harvard Historical Studies 172. Cambridge, Mass.: Harvard Univ. Press, 2011.

¹⁷ *Ibid.*, 20.

comfortable with what he perceives as hybridity's obfuscation of persistent power dynamics. Echoing Worster's concerns about a growing 'particularist squint' within the field, Sutter has expressed a general sense of "angst" regarding hybridity's "haze of moral relativism."¹⁸ Yet proponents of hybrid approaches have not necessarily ignored relationships of unequal power. While Swyngedouw's socio-natural hybridity complicated the theoretical basis of water histories, when applied to actual historical settings such as his chosen focus of modern Spain, his conclusions contained remarkable echoes of both Worster and Wittfogel. Swyngedouw's analysis of the production of Spain's siconatural waterscape in the nineteenth and twentieth centuries traced both the reformist and fascist turn to large-scale hydraulic projects. One can't help but recall Worster's analysis of reclamation rhetoric in Swyngedouw's delineation of successive Spanish regimes' insistence that hydro-engineering enables, "the correction of defects imposed by the geography of the country." Similarly, there is more than a whiff of Wittfogel's despotic state formation in Swyngedouw's conclusion that the fascists eventually "pushed through" to consolidating power by asserting "this enterprise of geographical rectification could, because of its range and importance, only be carried out by the central public authorities."¹⁹ In short, the turn to hybridity did not necessarily change the basic insistence on water's intimate connection to the consolidation of social power emphasized by earlier scholars. It complicated theoretical and methodological approaches, introducing new emphases on haphazardness, holism, and socio-material hybridity while simultaneously upholding water's basic role in producing unequal power structures. It was thus less a correction of Worster's narrative than an extension of the frame of analysis inwards (à la Swyngedouw's hybridity) and outwards (White's organic whole).

Agency and Materiality

As the hybrid turn of the 1990s extended into the new millennium, an additional new emphasis in broader critical theory began to come to bear on water history. Various labels post-constructionism, 'new materialism' or simply, the 'material turn,' this field expressed a certain level of frustration at hybridity's emphasis on relationality, contingency, and representation. It advocated a renewed attention to the particular characteristics of material 'things' and their formative effect on human and non-human behaviors and relations. In the world of water history, this meant a call to reconsider how the physical properties of water render it an historical agent, allowing it to consistently influence—and frequently confound—humans' relations with the non-human world.

Veronica Strang has provided some of the more prominent early materialist theoretical formulations and case-studies in water theory. Strang advocates a central place for water in materialist analysis, highlighting the fact that water's fluidity and omnipresence in organic life means it physically touches and connects all organic

¹⁸ Sutter, 118.

¹⁹ Swyngedouw, 460.

things, including humans. This flow across "micro and macro scales" means it can be particularly productive for scholars to "think with water."²⁰ The result of such an analysis, Strang contends, is a new awareness of how the material properties of water—its fluidity, transformative capacities, conductivity, and connectivity—combine to produce recurrent socio-natural patterns of engagement across diverse cultural and historical contexts. For Strang, these persistent macro- and micro- patterns of behaviour, shaped in part by water's material characteristics, serve as a counter-balance to instrumentalist narratives that unproblematically conceive of human 'management' of the non-human world.²¹

As with Swyngedouw's hybridity, Strang's materialism contains surprising echoes of Worster and Wittfogel. The emphasis on recurrent patterns of social organization and behavior recall Wittfogel's identification of patterns of state formation in semi-arid contexts. Similarly, her emphasis on water's physical fluidity and the resultant socio-political importance given to "where it pools" aligns with the "institutionally decisive" role Wittfogel assigned to water's "tendency to gather in bulk."²²

Yet, as with hybridity, the new materialism has modified water theory in a number of critical ways. In terms of methodology, Strang's 'thinking with water' provides a new model by which to structure historical analyses. While Wittfogel and Worster incorporated river systems into their analysis, their overall approach remained centered on transformations in macro socio-political formations. In contrast, Strang follows the flow of water through a landscape, unpacking the various socio-material engagements with it step-by-step along its journey. This does not mean there are no attempts to address large-scale questions—her analysis of waterscapes in Queensland, for example, leads to discussion of a number of global-trade networks including water-laden fruit, water-dependent animals, and even materially-abstracted 'water credits' for sale to corporate irrigation companies eager for an avenue to legalize their water use. The benefit of a materialist approach, according to Strang however, is the ability to work "on all scales" to better connect local and individual actions with the "larger flow of events."²³

Beyond methodology, materialist approaches also alter the narrative trajectory of water-centric histories, shifting from domination and declension to complication and pluralization. Worster, for example, focused on the state "pushing rivers around" to consolidate an increasing imbalance of capital and power in western America.²⁴ Strang's narratives are less uni-directional. Water 'pushes back' via its materiality, driving human and non-human actors into certain patterns of behavior consistent across diverse contexts. The results of such an approach are scholarly narratives that trace increasing complexity, where no actor exerts complete control, and future trajectories are

²⁰ Veronica Strang, "Fluid Consistencies. Material Relationality in Human Engagements with Water." *Archaeological Dialogues* 21, no. 2 (December 2014): 133.

²¹ Strang, 133.

²² Strang, 146. Wittfogel, 18.

²³ Strang, 149.

²⁴ Donald Worster, "We Enjoy Pushing Rivers Around." *New York Times*. February 23, 1986.

uncertain. The accumulative capitalist-state is still a crucial actor in materialist narratives, it is, however, not the only one.

The Hydrosocial Synthesis

These three broad moves in water historiography—social formation, hybridity, and materiality—provide the basic building blocks of the ‘hydrosocial’ cycle. Although the label has floated around various disciplines since the early 2000s, Linton and Budds’ recent effort to standardize and define the concept can be seen as representative of an emerging consensus around the term.²⁵ As evidenced in its play on the hydrologic label, the hydrosocial cycle is an attempt to better incorporate the broader socio-political contexts that shape and are shaped by water. In contrast to the hydrologic cycle’s sanitized diagram of water’s flow through an idealized ‘nature,’ the hydrosocial “attends to the social nature of these flows as well as the agential role played by water, while highlighting the dialectical and relational processes through which water and society interrelate.”²⁶ We see here an attempted synthesis of Worster, Swyngedouw, and Strang in Linton-Budds’ emphasis on the “social nature,” “relational processes,” and “agential role” of water.

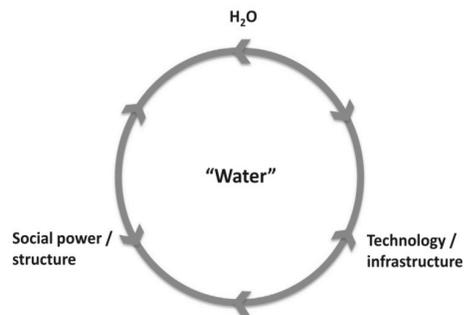


Fig 1. - The Hydrosocial Cycle

(Source: Linton, Jamie, and Jessica Budds. “The Hydrosocial Cycle: Defining and Mobilizing a Relational-Dialectical Approach to Water.” *Geoforum* 57 (November 1, 2014): 176.)

Linton and Budds draw on each of these three elements to propose a new diagram of the water cycle (see Fig. 1). In many ways this simple visualization captures our historiographical conversation so far. The structure of three nodes—society, technology, and water—connected by bi-directional arrows is meant to indicate all three categories

²⁵ Jamie Linton and Jessica Budds. “The Hydrosocial Cycle: Defining and Mobilizing a Relational-Dialectical Approach to Water.” *Geoforum* 57 (November 1, 2014): 170–80.

²⁶ Linton and Budds, 170.

are “hybrid objects, internalizing the relation they have with each other.”²⁷ H₂O here represents water’s materiality, the arrows indicating its ability to both influence and be acted upon by social power structures and technology. Paralleling recent formulations in envirotech circles, the authors include technology as a node in dialectic relationship with both social structure and material water (envirotech scholars would broaden this to the material environment at large).²⁸ Both the technology and social power nodes in the diagram could be seen as stemming from the broad analysis of water’s connection to social and state formation by the likes of Worster and White. Both authors contended the large hydro-projects of the American west, for example, intermittently drove and resulted from changes in American social structures and physical waterscapes. Taken all together the visualization of the hydrosocial cycle invokes the myriad structures and processes involved when one speaks of “water” at any one historical moment.

What might all this mean in practice? Linton and Budds suggest a simple starting point of questioning what exactly is meant by ‘water’ in any given situation. The visualization above should indicate that this will inevitably lead to broader questions of social structures and power relations. The hydrosocial “makes it impossible to imagine water issues as simply water issues, prompting us to ask how these issues are shaped by the social context, and directing our attention to the ‘bigger picture’ beyond the actual water in question.”²⁹

The inevitable tie between water and power structures sounds remarkably similar to where we began with Wittfogel’s hydraulic despotism. However Linton and Budds offer a number of specific areas where the hydrosocial appears to provide new insight. First, the hydrosocial claims to reveal that water, as a socio-natural hybrid, is *produced* rather than naturally and neutrally ‘existent’. In practice, this allows, for example, a clearer understanding of how water shortages are consistently driven not by physical scarcity or population pressure, but by civil services designed to funnel water to high-income groups.³⁰

Second, by exposing the contingent socio-natural structures comprising ‘water’ at any given moment, the hydrosocial draws attention to differing knowledge and meaning systems and the power interests they articulate. The authors cite Bouleau’s study of modern French hydrology as a particularly noteworthy example. Bouleau employs a hydrosocial lens to demonstrate how scientific discourse on European river systems was shaped both by vested disciplinary power interests and the materiality of the particular waterscapes at hand.³¹

²⁷ Linton and Budds, 176.

²⁸ Note, for example, Figure 3 in Sara B Pritchard, “Toward an Environmental History of Technology.” In *The Oxford Handbook of Environmental History*, edited by Andrew C. Isenberg. Oxford Handbooks. Oxford ; New York: Oxford University Press, 2014.

²⁹ Linton and Budds, 178.

³⁰ Linton and Budds, 178.

³¹ Gabrielle Bouleau, “The Co-Production of Science and Waterscapes: The Case of the Seine and the Rhône Rivers, France.” *Geoforum* 57 (November 1, 2014): 248–57.

Third, the hydrosocial emphasizes a dialectical dynamic inherent to water and its contexts. Not only is water socio-technically produced, it in turn reshapes those very same structures and processes, resulting in an ongoing spiral of change rather than a static equilibrium. White's narrative of the increasingly frenetic 'management' of the Columbia basin seems particularly prescient in this regard.

Finally, Linton and Budds contend the hydrosocial is able to capture the multiple scales at which water-producing processes work. This scalar range works across space and time. Whereas the hydrologic cycle limits itself to largely contemporaneous physical processes (evaporation, for e.g.), the hydrosocial takes into account diverse and long-running social and material processes working at multiple scales in the production of water. Strang's discussion of Queensland waterscapes is a particularly wide-ranging example of the scalar flexibility of hydrosocial analysis. Her discussion of the 'transpiration' of Queensland water, for instance, leads to an analysis of the local, regional, and international wine, rice, and aforementioned water-credit industries. The cumulative effect is a practical demonstration of the hydrosocial's claim to "see beyond the water."³²

The Case of Bali

Given its synthesis of dominant themes in water historiography and recent turns in critical theory, the hydrosocial model has gained considerable traction across a number of disciplines. We have ventured quite far afield into critical geography and political ecology in order to understand the interdisciplinary genealogy of the hydrosocial school. We can now turn to a specific test case from Southeast Asia in order to: 1) explore the extent to which a hydrosocial approach can critique or alter existing historical analyses and 2) consider the limits and blindspots of the hydrosocial frame.

Post-Wittfogel, Southeast Asia received a steady stream of scholarship with a water-centric focus. The island of Bali and its extensive irrigation networks became a particular focal point for scholars. Both C.J. Grader in the 1960s and, more famously, Clifford Geertz in the 1980s offered interpretations of Bali's waterscapes that could be read as challenges to Wittfogel's hydraulic despotism. They contended the island's irrigation networks were managed as cooperative, even autonomous, networks.³³ Stephen Lansing has since built on these earlier conclusions, producing a substantial and influential body of scholarship on Bali's waterworks that insists on the essential 'bottom-up' management structure of local irrigation networks integrated by a distinctly non-state regional religious structure.³⁴

Lansing's argument has generated considerable debate in water historiography and thus deserves to be spelled out clearly. He argues the traditional association of the

construction and management of Bali's complex irrigation networks with its feudal dynasties is a colonial-era myth generated by the Dutch. Irrigation structures were initially locally and separately built. However, the unique pressures of extensive rice terrace systems in terms of coordinating water flows and suppressing pest populations required a certain degree of cooperation. This was enacted, not through a heavy-handed feudal state, but by a system of local and regional "water temples" who induced cooperation via symbolic ritual rather than taxation or force. Bali's polity was thus characterized by a "hydraulic solidarity" rather than authoritarianism.³⁵ More recently, Lansing has tied this supposed egalitarian approach to a fundamental epistemic difference between western and precolonial Balinese understandings of selfhood. Where the European glorification of the autonomous subject led to totalitarian rationality, Balinese ties to Brahminical Hindu and Buddhist traditions promoted an ethic of self-mastery and interdependency that promoted egalitarian, self-regulating social organization.³⁶

A number of elements in Lansing's argument resonate with hydrosocial approaches. For instance, his outline of the unique physical dynamics of rice terrace ecosystems that incentivize large-scale cooperation provides a materialist strand to an otherwise anthropocentric analysis. Furthermore, his attempt to trace differing emphases in precolonial Balinese epistemology aligns, at least superficially, with the hydrosocial's emphasis on the production of differing knowledge systems.

Yet there are some critical moments of tension between Lansing and the hydrosocial. Both offer important correctives to each other. A hydrosocial approach would suggest a reversal in the direction of causality in Lansing's discussion of precolonial systems of knowledge. Lansing speaks of an episteme (Balinese 'Brahminism') informing socio-political practice (egalitarian irrigation management). The hydrosocial framework suggests knowledge is produced by the material, technological, and socio-political power formations on hand in a given setting. Perhaps unsurprisingly, Lansing struggles to reconcile the hierarchical language and meaning systems of Brahminism with his overarching contention of egalitarian irrigation practice. A hydrosocial approach would suggest the grammar of Brahminism is perhaps an indication Balinese irrigation practice was less democratic than Lansing lets on.

This brings to the fore a second, more prominent, moment of tension in Lansing's account—the assertion of a weak to non-existent state throughout the construction of the Balinese irrigation networks. Lansing is clear that the water temples and religious rituals he sees as responsible for inducing cooperation were not a one-for-one substitute for state structures. Rather they displaced power normally reserved for a political figurehead and dispersed it through a ritual system in which no one person had prominence:

³² Linton and Budds, 178.

³³ C.J. Grader, "The Irrigation System in the Region of Jembrana." *Bali-Studies in Life, Thought, and Ritual*, 1960, 267–288 and Clifford Geertz, *Negara: The Theatre State in Nineteenth-Century Bali*. Princeton, NJ: Princeton University Press, 1980.

³⁴ John Stephen Lansing, *Priests and Programmers: Technologies of Power in the Engineered Landscape of Bali*. Princeton, NJ: Princeton University Press, 1991.

³⁵ Lansing, 128.

³⁶ John Stephen Lansing, *Perfect Order, Recognizing Complexity in Bali*. Course Book. Princeton: Princeton University Press, 2012.

the Temple of the Crater Lake has no control over a specific irrigation system; there is no question of a material logic of hydrology dictating the scope of its powers. Nor does it possess coercive powers like those of a *sedahan* or a Dutch officer. Yet it exercises the power to create new irrigation systems, to decide where irrigation water will flow, and to resolve disputes over water rights. The sources of this power lie in the logic of the symbolic system, in the concepts of holy water and productive cycles. Ultimately, it is the flow of holy water that generates the flow of water through the irrigation canals.³⁷

At first glance, while perhaps idealistic, this suggestion of an apolitical symbolic system directing the flow of irrigation water appears to have a plausible alignment with the hydrosocial framework. The 'Social power/structure' node visualized in Fig. 1 does not necessarily refer to a bureaucratic political state à la Wittfogel. Yet there is a strange absence of human actors in Lansing's account. It is "concepts" and a "symbolic system" and finally just an "it" that "exercises the power to create new irrigation systems." How these abstractions produce the actual, material flow of water through irrigation canals is left unsaid. Lansing's neutral, non-human language seems to deliberately obscure the people no doubt involved in the chain of ritual and material production outlined above. The 'social' in any hydrosocial frame most certainly involves human actors and thus is political by definition. Lansing's assertion of a water system controlled by a non-human, non-material, abstract symbolism that essentially flattened political power structures—producing "hydraulic solidarity"—is thus drawn into question by the basic structure of hydrosocial analysis.

Perhaps unsurprisingly, Lansing's conclusions regarding Balinese egalitarianism have been recently contested by a number of scholars. Brigitta Hauser-Schäublin has argued the precolonial Balinese state was neither symbolic nor weak. She contends Lansing's "democratic irrigation model" is based on a "selective reading of the sources and the partial use of ethnographic data."³⁸ She argues the supposedly autonomous "localities" that constructed the irrigation networks were in fact the product of regular, state-induced, mass migrations. Furthermore, the water temples at the heart of Lansing's symbolic power system, were owned by the state and considered critical sources of income and social control.³⁹ Henk Nordholt has made a similar critique, arguing that Lansing seems to "ignore the role played by regional dynasties and noble lords in the pre-colonial period."⁴⁰ According to Nordholt, "large scale irrigation in the pre-colonial period was unthinkable without dynastic involvement." Intriguingly, he

³⁷ Lansing, 1991, 132.

³⁸ Brigitta Hauser-Schäublin, "The Precolonial Balinese State Reconsidered: A Critical Evaluation of Theory Construction on the Relationship between Irrigation, the State, and Ritual." *Current Anthropology* 44, no. 2 (2003): 153–81.

³⁹ Hauser-Schäublin, 153.

⁴⁰ Henk Schulte Nordholt, "Dams and Dynasty, and the Colonial Transformation of Balinese Irrigation Management." *Human Ecology* 39, no. 1 (February 1, 2011): 21–27.

suggests the 'weak' state Lansing observes in Bali was likely due to Dutch colonial political transformation rather than traditional "authentic self organizing processes."⁴¹

This is not to say hydrosocial approaches have nothing to gain from Lansing, Geertz, and the long trail of scholarship on Bali's waterworks. Both scholars' emphasis on ritual, symbolism, and religion highlights an area of particular weakness in recent theoretical formulations of the hydrosocial. While the discussion of social power structures certainly allows for analysis of religion and ritual, there is little to no discussion of it in recent historiographical syntheses such as Linton and Budds'. This is perhaps simply a by-product of the twentieth century North American/European foci of many hydrosocial histories. Yet religious processes—specifically: ritual, ideology, and display—appear to have played a critical role in shaping most premodern historical waterscapes. The construction of a series of large reservoirs in sixteenth-century western India, for example, was accompanied by *years*-long circumambulation ceremonies, elaborate gift-giving rituals, and monumental religious construction. These forms of non-agricultural, non-instrumental interactions with water appear under-accounted for in current formulations of the hydrosocial.

Conclusion: Is there a cycle?

As suggested by the case of early modern Bali, aspects of the hydrosocial approach can help to uncover structures and dynamics obscured by idealized portraits of water systems in nature or, more precisely here, Orientalized nature. Yet one can't help but note the key corrective in the Bali case—the uncovering of state monopolization of water resources—is an emphasis from Wittfogel and Worster more than the hydrosocial. The elaborate structure of the hydrosocial frame, with its dialectical flows and hybridized constructions, was not uniquely useful in revealing the basic power inequities denied by Geertz et al. In fact, one could argue hydrosocial formulations on complexity and contingency, in the case of Bali at least, do more to obscure than highlight these dynamics. Sutter's concerns regarding a hybridity-induced haze thus gain some traction here.

While components of the hydrosocial—namely, the material, hybrid, and socio-political power aspects of water—are clearly of fundamental importance to any historical analysis, its attempted structural synthesis of these ideas remains of limited utility to the environmental historian. Perhaps its original desire to 'correct' the hydrologic cycle is in fact what limits the hydrosocial moving forward. Its emphasis on *re-diagramming* flattens the framework, limiting it to structural configurations that struggle to account for change over time. In fact, as diagrammed by Linton and Budds, the hydrosocial cycle looms as a visual enactment of the pitfalls of hyper-hybridity and contingency as an end-all conclusion. Inequality and damage, to humans and the non-human world alike, are obscured by two-dimensional, reciprocal, clean, circles of arrows. This is not to advocate for a return to blindly linear narrative. It is simply to

⁴¹ Nordholt, 27.

register dissatisfaction—based on both case-study application and existence in the present age—with the continued resort to cyclical structure in a time of unforeseen change.

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