BODY, SETTLEMENT, LANDSCAPE: A COMPARISON OF HOT AND COOL HUMID PATTERNS

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This article presents the findings of a cross-climatic, cross-cultural phenomenological study of bodily experiences, built form and settlement patterns, and hot-humid and cool-humid landscapes. It results from fieldwork in the rain forests of the Yucatan Peninsula of Mexico and the Olympic Peninsula north and west of Seattle, U.S.A. For these two rain-forest areas the article describes and interprets the embodied life-world experiences of the climatic realm (both physiological and culturally modulated), the characteristics of the specific rain-forest environment, and the correlation of these dimensions with both housing materials, structures and uses and settlement orientations and forms. Finally, the article proposes tentative points of similarity and difference between the two humid environments studied. An empirical gestalt emerges: with interesting differences, both coherent indigenous worlds are complex, heterogeneous, and “closed-in.” These characteristics are quite opposite to the modern, Western conception of space as the homogeneous context for “preferred” clear and distinct perception and behavior.

Phenomenology has shown itself to be a fruitful method for empirically and holistically describing vernacular environments. For the most part, however, scholarly work in this field has focused on “beautiful,” “pastoral” or “picturesque” environments, or on the classical, romantic and cosmic landscapes explored in the seminal work of Christian Norberg-Schulz. In addition, too often what is actually a tentative phenomenological description based on the observations of a single researcher is misunderstood as a final phenomenology. In order to move beyond these limitations, and also to remain insistently provisional, this article utilizes the experiences

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and perceptions of cross-cultural groups to explore systematic variations that appear in two types of the thus-far ignored environment of rain forests. It does so in a manner that surely will invite further observations and changes in understanding.

The phenomenological method is usually understood to consist of four activities: 1) bracket off assumptions, 2) collect descriptions through close observations and open-ended discussions, 3) systematically vary the phenomenal parameters in order to discern variables that change the essential patterns of phenomena (this allows discernment among related, but distinct phenomena), and 4) seek interpersonal corroboration, especially through cross-cultural or cross-environmental comparison. This method was put into practice here by beginning with a study of hot and humid climates that had already been underway for four years, and working through variations by 1) comparing other hot and humid environments and experiences with those originally studied, and 2) comparing cool and humid environments and experiences in the United States Pacific Northwest as the focal and systematic variation — in each aspect through interaction with focus groups of inhabitants and researchers.

The outcome is a more detailed description and analysis of personal-landscape-settlement configurations or patterns. In the context of this larger study, it is possible to focus, for present purposes, on the important dimension of human thermal self-regulation, and specifically on the manner in which inhabitants define “comfort” and “discomfort” and attempt to regulate their environment to be maximally comfortable through behavior, diet, dress, and, especially, settlement pattern. Though it is beyond the scope of this article to work the relationship out explicitly, the results of this focus on “comfort zone” in humid climates have important implications for making explicit the differences between the current humanistic concern with function, efficiency and comfort and many differing traditional environments and practices based on other kinds of social and sacred value systems. Such a project contains many implications for design and resource allocation policy today, especially with regard to the continuing questioning of what is, or should be, desired as culturally and ecologically appropriate design in relation to traditional forms, materials and values.

**THE BASIC STUDY: THE HOT-HUMID ENVIRONMENT OF MEXICO’S YUCATAN PENINSULA**

The embodied experience of the hot and humid environment is that it is sultry, so that one's body is constantly sweaty and clothing sticks to the skin. Even minimal exertion increases the body's heat level, making a person feel hotter and sweat more. Because the atmosphere is so saturated with moisture, sweat cannot evaporate from the body's surface or from clothing. People become self-consciously aware of their skin since they must constantly wipe it to clear off perspiration or put cool, moist cloths on the hottest areas (forehead, face, neck, chest, etc.). People will seek out breezes, avoid direct sunlight, remove clothing, slow down activity, breath more shallowly. When they rest, they try to touch nothing, since contact with solid materials increases the feeling of discomfort. Hence, people display a tendency to perch or lean on the edges of things; alternatively, they squat in the familiar “sprawl,” which allows them to be as spread out as possible, with minimal touching of anything else.

In high heat and humidity, it is common for people to say that the surrounding atmosphere is “too close,” or that it “closes in on you.” The air is reported to feel heavy and pressing in; it feels hard to breath. Empirically, the higher the temperature, the greater the amount of water vapor that can be held before the atmosphere becomes saturated. At a high enough point the body is unable to cool itself by sweating or through air exchange in the lungs. “Sultriness” is considered to be the range where air temperature is between 25 and 30 degrees Celsius and humidity is at levels of 50–70 percent — the range of physiologically defined discomfort. Because of the difficulty of reducing the body’s core heat through the exchange of air by the lungs or the evaporation of water from the skin (especially from the thermo-receptors in the face), the experience is one of the atmosphere “closing-in.”

As biologists Helmut Plessner and F. J. J. Buytendijk analyze the phenomena, organisms act and grow in terms of an identity that is strongly correlated with that boundary which belongs to them. An organism’s boundary helps constitute it insofar as the boundary is “controlled” by the organism itself. When the organism’s physiological (in this case thermal) self-regulation is threatened, the boundary — the organism’s independence — is called into question. This is experienced as discomfort, that is, as removal from the taken-for-granted life world. Thermally, it appears that human beings are self-sufficient when their skin temperature remains between 32 and 34 degrees Celsius (which would be experienced as comfortable). Discomfort serves as a warning of threats to autonomy and ordinary insertion in the environment; it focuses a person's attention on his or her situation and current behavior.

The landscape pattern of the continual forest of the Yucatan Peninsula has three major dimensions: sky, forest canopy and vegetation, and floor, all distinctively manifesting the continual circulation of water. The sky is dominated by low-hanging clouds generated by high surface temperatures and
high humidity. This process may occur seasonally or when the day becomes hot enough to collect a large amount of evaporated water (FIG.1). The clouds form at low mean levels, e.g., under 2,000 feet (in comparison with 6,000—7,000 feet over the southwestern U.S.). The Yucatan is far enough away from the equatorial zone that there is a seasonal range of shorter and longer showers and thunderstorms.

The generally continuous canopy, with few natural openings, filters out most of the available light, so that only a small amount reaches the floor. The forest beneath the canopy is very dense: the profuse undergrowth is filled with insects, animals and birds (FIG.2). Because of heavy rains, the forest floor is very moist and is the scene of rapid growth and decay of vegetation, promoted by termites, bacteria and fungi. The surface rocks provide the environment for the abundant life forms and processes. The floor is dramatically variable because the rain falls unevenly through the canopy, and then flows down tree trunks and vines, and runs unevenly over locally hardened soil surfaces and varied rock outcroppings and through root systems and tunnels in the soft stone (a differentiation increased by the locally uneven flow and varying distribution of salts, which increase the dissolution of solids).

The environment below the canopy and above the floor feels "closed-in" because it is saturated with water vapor and heat, and because it is densely filled-in with wildly diverse vegetative and organic life such as vines and creepers — an effect heightened by the continuing sound of insects and birds. Thus, the landscape can be phenomenologically described as enclosed and heterogeneous.

The settlement forms within the inherently closed landscape of the hot and humid forest involve clearings, both for dwellings and for modest agricultural activity. Settlements of any significant size require gaps or openings, since the environment is too dense for easy movement or living. It is crucial to note that the first indigenous inhabitants of the area, the Maya, implemented a powerful cosmology in establishing and maintaining the openings for their civilization (FIG.3); in other words, their settlement form within the forest environment focused on opening and maintaining connections among the multiple levels of power and life. Because all the beings of the Maya world — the gods, who were the paradigm beings for passing among realms (the Harpy Eagle-Snake, the Osprey-Alligator Gar, the Crocodile-Jaguar, and the Bull-Shark, for example), as well as human beings and animals — fundamentally existed through complex and painful passages of transformation across boundaries, the mode of connection and opening were cosmically critical. As a correlate, since it was assumed that life was difficult, the concern with "comfort" that I am addressing here, and which is a focus of design and building today, was not of much importance.

The profane dimensions of Maya settlements — forms, materials and patterns — manifest various responses to the hot-humid environment described above. While the sacred complexes of long ago were built of light-colored stone and placed in clearings, people's ordinary dwellings were, and are even today, constructed so as not to collect or hold heat. The light-colored materials reflect the maximum amount of sunlight, and the use of woven and porous materials and forms screens out the sun and promotes ventilation (FIG.4). Maximum ventilation, already a problem where continuous growth blocks breezes, is enhanced not only by use of appropriate materials, but by openings and orientation to site. Of course, since buildings must shed water, roofs and surface drainage are also important.

The requirements in relation to sun, wind and water are maintained equally at the scale of the settlement. A diffused settlement pattern lets the heat out and breezes in. Hence, not only the buildings but the entire settlement is reminiscent in its form of a sprawling human body. Thermal cooling by breezes or tem-
temperature differentials (for example, in relation to water in cenotes or offshore — there are no significant slopes in this environment) requires a sophisticated orientation to the windward edges of clearings and within the general surroundings.

Such self-regulation through settlement forms passes full circle to other forms of self-regulation such as behavior, diet and clothing. Social forms of opening and closure are complex: screenings are needed to deal with insects, noise and privacy in buildings that are otherwise open for ventilation. Techniques also have evolved to filter light and sound. So too is clothing minimized, and it tends to be of loosely woven, non-water-retentive fibers, light in color. And diet is an important factor in body-heat regulation. Since protein generates body heat, inhabitants consume less protein than their counterparts in colder climates. The patterns of procurement and preparation of food also contribute to reduction of heat build-up and retention. Hunting and forms of agriculture that involve substantial exertion are avoided in favor of modest gathering and cultivation, or in favor of fishing which allows people to be cooled by the sea.

THE CASE VARIATION: THE COOL-HUMID CLIMATE OF U.S. PACIFIC NORTHWEST

The same three basic dimensions of the humid environment — embodied experience, landscape patterns, and settlement forms — are phenomenologically described and compared for a cool-humid environment through close observation and open-ended discussion with local inhabitants and researchers.

The area around Seattle, U.S.A., especially just to the north and west along the Pacific coast, including the lands of the Tulalip tribes, is not considered by residents to have the usual four North American seasons. Rather, the cool-humid season described here is generally taken as lasting from early November through April, and is then followed by spring and summer. During this cool-humid season, instead of the experience of sweating in a sultry environment, a person regularly feels damp and cold. The high humidity and constant mist keep everything wet, including clothing. The cold is described as "penetrating," as piercing through clothes, as "chilling to the bone." The humidity is high enough that at 45—50 degrees Fahrenheit a person can easily work or exercise enough to become soaked with sweat, but, since there is not sufficient heat, a person becomes very chilled. People report that their extremities become especially cold, so that they shiver and huddle. Special attention is given to keeping the hands, feet and head warm.

The phenomena of sweat from the inside and of mist and condensation from the outside result in a feeling of being surrounded by moisture. Since heavy fog or clouds often obscure environmental features and substantially reduce the light, residents report a strong sense of enclosure and lack of orientation (e.g., in regard to the horizon) (FIG. 5). (While the mean annual lifting condensation level is around 2,000 feet, during this season many areas average significantly under 1,000 feet.) Thus, though different in many respects from the hot-humid environment, this cool-humid climate is experienced in terms of "enclosure."

The fundamental landscape patterns of the cool-humid site involve the sky and the middle-sphere, as do those of the hot-humid realm. Whereas the hot-humid atmosphere is dominated by low-hanging clouds and reduced light inside the canopy, the clouds in the cool-humid realm are not seen as such; in other words, the clouds are not seen in contrast to the ground, horizon or sky because clouds and mist are continuous (FIG. 6). It is not easy to see where things start and stop. The clouds are on the ground and go all the way up. As a result, the perception is of gradations of fog-cloud-mist rather than separate realms. While homogeneous in one way, the overall effect provides subtle diversity within a small range. One occasional dramatic feature is the "sun break" that occurs when a break in the clouds allows the sun to shine through, illuminating the bottom of Mount Rainier, the Cascade or Olympic Ranges, or the underside of a cloud bank. Generally, however, the conditions are what some describe as steady light rain, but which others characterize not as rain but as a constant mist. The air is full of moisture: mist everywhere, a film of moisture on all objects, condensation on the outside and inside of everything.

Within the blanket of fog-cloud that lasts these five months the landscape is wet and cold. The earth absorbs so much moisture that it tends to turn to clay and clump together.
Where it is not “hard and nasty,” as one informant put it, it may be springy, because of the cedar needles that fall and become incorporated into it. Like the hot-humid landscape, the cool-humid is the scene of phenomenal growth. Generally, it is noted that one cannot see the earth because of the massive growth. Everything seems to grow: bushes, trees, trees growing from fallen trees, vines, creepers, ferns, lichens, and the ever-present mosses. The dominant smell is one of wetness and mildew. Slugs are everywhere, especially forest or banana slugs, which are noted for the slime trails they leave across tent surfaces or sidewalks. Insect life is abundant, especially mosquitoes and crane flies, although their sounds are dampened by the heavy, moist atmosphere. The silence is deepened by perpetually damp vegetation, where leaves and twigs do not become dry enough to make much sound even when something moves among them.

Though it is not the focus of this paper, it is worth noting that — similar to the gods of the heterogeneous and only apparently monotonous Yucatan peninsula — the Pacific Northwest rain forest’s oldest gods also crossed multiple realms. The outward blanketing and obscurity of foggy, undifferentiated realms hides the actuality of multiple environmental differences that are penetrated or crossed by the deities. Thus, the water, earth and sky deities such as the raven, whale, frog, bear and mink are combined on totem poles or on complex wooden carvings, in double masks where an outer mask opens to reveal a second mask inside. An especially powerful being is shown in the form of the raven, whose sharp cry is one of the few sounds able to pierce the enclosed environment. Both humid climates, then, have gods of heterogeneity and transformation across boundaries.

In terms of the profane world, buildings are subject to becoming and remaining coated with water, as is everything else. Moisture covers and seeps into surfaces on the outside; it condenses and lingers inside. The feeling inside buildings is one of being “filled-up” — not only because of the foggy air, but because the smells of the mildew, the mold growing behind the furniture, and the multitude of spiders and spider webs all clutter the interior space.

In the Pacific Northwest rain forest, building and settlement forms and materials control the moisture and cold of this environment by attempting to maximize ventilation and warmth, by working to retain heat, and by pulling moisture out (FIG. 7). In this area and time period, as noted, rainstorms do not clear off the humidity, nor do winds dissipate the fog. As with light and sound, breeze is dampened. Because there is very little air movement, settlements are not oriented to the ocean, nor toward prevailing winds. Solutions devolve upon

the individual building: since hanging humidity and mold generate a stuffy environment, it is important to open windows and ventilate buildings at every opportunity, to utilize every bit of movement in the relatively still air.

The task is difficult since the task of ventilation requires openings, while the dominant cool, damp air can only really be modulated by heat, which requires closure: every effort is thus made to develop a sphere that is dry and warm. Inside buildings, a low fire is regularly kept burning and efforts are made to circulate the warm air not only to remove the dampness and chill, but to reduce the humidity that is a spur to mold growth. Since there are many wood stoves in addition to furnaces, the smell and sight of burning wood are atmospheric characteristics. On a larger scale, buildings within settlements cluster together to maximize the positive concentration of heat and dissipate the fog (FIG. 5). It is reported that in the regional vernacular before World War II dwellings had very small windows for maximum seal and to minimize condensation inside the glass, and that many Native American dwellings were windowless, centered around the fire inside.
FIG. 8. (TOP RIGHT)
Buildings cluster together to concentrate heat and dissipate moisture. Olympic rain forest.

FIG. 9. (BOTTOM RIGHT)
Roof forms and materials are critical in moving moisture away from buildings.

FIG. 10. (FAR RIGHT)
Indigenous cedar promotes dryness and air movement. University of Washington replication of traditional construction.

Roof forms naturally are important (FIG. 9). Roofs are large in this area, especially in regard to overhang, which can extend as far as twelve feet to funnel off the rain. Given this feature, the moisture moving off the house relegates the sides of the building and the side yard to a minor role, emphasizing the front and back even more than usual. The moss that grows on buildings, especially on roofs, commonly is scrubbed off, though since it disappears in the summer, many residents just let it come and go seasonally.

Materials are important too. Cedar, split into thin sheets, is prototypical (FIG. 10). Not only is it effective in keeping out and channeling water, but it will dry itself (if it is not nailed to plywood). When joined in a way that provides adequate circulation spaces, cedar promotes dryness and air movement. Hence, the indigenous material of the earliest inhabitants remains useful today. Complementary with the landscape and its experience (a landscape of subtle gradations and subtle experiences), successful building forms are the result of many small adjustments. Settlements provide micro-adjustments to the environment, not macro-changes.

Among small-scale self-regulations, many behavioral, dietary and clothing practices seek to control warmth and dryness. Generally, since the dampness is penetrating and water is everywhere, warm (especially woolen) and waterproof clothing is important. Yet, micro-adjustments must also be made. For example, the sense of enclosure is combated not by staying inside to remain warm and dry, but by going outside. But since a sweat is easily worked up while working or moving around outside (a psychological imperative), impermeable and warm clothing can cause further discomfort. Of course, when a person becomes significantly damp with sweat or mist, he or she will have to change clothes. As a result, in order to maintain the right range of comfort while active, inhabitants tend to manage heat levels by adding or removing layers of clothing. A person can thus begin an activity warmly with several layers, then remove some as his or her body heat increases. New, breathable but water-resistant or waterproof fabrics also are valuable. Wearing glasses remains problematic because of condensation.

In contrast to the hot-humid climate where the face and body trunk become overheated, in the cool-humid environment core temperature is not a problem. Rather, a person's extremities may become too cold. Thus, special attention must be given to keeping one's head, hands and feet warm and dry. People regularly rub their hands together, put their hands under their armpits, or sit on their hands to warm them. Warm, water-resistant, and breathable hats, gloves, socks and shoes are critical. The above environmental factors may also explain the rage for coffee drinking in the Pacific Northwest: a hot cup of coffee can keep one's hands warm, it can warm
one's inside, and it can stimulate the body in a stuffy and closed-in environment. Thus, with all its paraphernalia and constant small-scale adjustments and routine practices, the immediate cool-humid life world appears filled-up, though in an entirely different way than in the hot-humid environment.

CONCLUSIONS AND IMPLICATIONS

The significant differences between the hot-humid and cool-humid climates and environments follow discernible patterns. The tendency in hot and humid climates to spread or open out is common to personal posture and building and settlement forms. It provides a biological and cultural response to the dangers and discomforts that result when heat builds up that cannot be dissipated. While there are individual variations and preferences and cultural-religious practices superseding the maintenance of comfort, “sprawl” nonetheless is displayed as a feature of the environment. In contrast, in the cool and humid realm, the configuration of gathering in, found in body posture and building interiors and settlement arrangements, helps to promote the heat necessary to dry out the damp and minimize the surface exposed to constant wetness, mold and cold. The interrelated moisture and heat levels in both cases are regulated toward a comfort zone by differing, almost opposite, responses.

At the same time, many similar features manifest themselves in the two environments, strongly suggesting that these are essential features of all humid landscapes. Among these are the patterns of “being closed-in” and “filled-up,” and of “appearing homogeneous but in fact being complexly heterogeneous in subtle ways.” Culturally, this means both realms are places of potential transformation across multiple dimensions of a coherent life world.

In the case studies above two different responses emerge to the dominant environmental conditions and experiences. In the case of the hot and humid life world, some people find the conditions “uncomfortable,” and they consciously modify their built world and practices to decrease the heat and humidity — or at least the effects of these conditions. Meanwhile, a second group may find itself “comfortable,” in the sense that their preferred patterns of action and self-determination are not hindered by the conditions, or that they enjoy a type of heat that sinks into their bodies and a moisture that continuously bathes them.

Similarly, in the damp and closed-in cool and humid realm, many people feel claustrophobic and depressed. The sense of confinement and suffocation emerging from the enclosure of fog and moisture is correlated with attempts to find relief through behavior and built forms that provide contrast with or exception to the dominant environment. Other people, however, may find the closeness “comforting,” and prefer materials, colors, forms and experiences that maintain continuity with the snugness and enclosure. A significant set of policy and design issues begins to emerge at this point. Socially and politically, there are distinct constituencies, each with differing reactions to and valuations of the same environmental characteristics. How is it possible to provide for what members of each group desire, or even need, while appropriately dealing with the sense of identity of the settlement and community and the environmentally appropriate response to the biocultural region? Culturally and economically, problems of allocation of limited resources and accommodation or change on behalf of economic development, such as tourism, raise questions concerning the continued or renewed use of local, traditional materials, forms and construction methods. On a larger scale, nontraditional building forms, settlement patterns, and internal and external climate modification (with heating and air conditioning, or through larger settlements that actually change heat and wind patterns) pose policy and ethical decisions that involve the issues of sense of place and sustainability.

Further cross-environmental and cross-cultural studies — as well as further investigation of the cosmologies of indigenous life worlds, with their suggestive characteristics of deities operating across multiple dimensions (as would fit the visually limited environments, with their emphasis on movement or transformation across variable modes, and the images of depth, weaving, and the importance of low, carrying, or sharp penetrating sounds) — would also clarify when, how and why overriding sacred or cultural values have allowed for, but not revolved around, such modern imperatives as “comfort” and “efficiency.” Thus, attention to these latter elements would enhance understanding of historical, sacred or cosmological settlements. The complementary investigation of materials, forms and practices utilized in establishing and maintaining a group’s self-regulating autonomy, and thereby its profane identity and comfort, has continuing importance today for appropriate biocultural design and settlement practices, especially in the present time of intercultural movement.
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2. See Mugerauer, “Phenomenology and Vernacular Architecture.”


All photos are by author unless otherwise noted.