This book collects together extended papers that were presented at The Psychopathologies of Cognitive Capitalism: Part Two at ICI Berlin in March 2013. This volume is the second in a series of book that aims attempts to broaden the definition of cognitive capitalism in terms of the scope of its material relations, especially as it relates to the conditions of mind and brain in our new world of advanced telecommunication, data mining and social relations. It is our hope to first improve awareness of its most repressive characteristics and secondly to produce an arsenal of discursive practices with which to combat it.

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Notes Toward a Synthesis

Few people, even within design today, are aware of how problems are formulated in our field, how they are constituted, and in relation to what forces and developments they are formed. If design may be described as a form of rationality applied to the organization of objects, environments, and behaviors, it is first and foremost a practice of modulating and compelling routines of experience or, within some modalities, a practice of clearing the way for unforeseen experiences to emerge. But what do we mean by the term experience? Much of contemporary research is directed to understanding the mechanics and operation—even the history—of what this term might cover and explain in the material and historical world.

In the worlds of design and art practice I would argue, attention has shifted decisively in recent decades from the signifying modes of communication of objects to illocutionary ones, in which the introduction of forms into the world can be said to result in a ‘transformation of states.’

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1 The theory of speech acts was initially developed by John Austin in the 1950s as part of a development in language philosophy that considered the ‘actual’ uses and operations of language, rather than its merely formal ones. Austin distinguished between ‘constative’ utterances whose primary purpose was descriptive of states of things in the world—utterances that ‘stated’ something—that could be subject to true/false criteria and ‘performative’ utterances whose primary effect (and purpose) was to effectuate something, to cause an action or change of state. In his inimitable words: “To say something is to do something”. Typical examples include speech acts such as “I do.” through which one changes one’s civil status (among other things). (Austin 1962).
Given this shift of focus, a new emphasis on ‘continuum thinking’ is emerging, in which, among other signal developments, we find an increasing concern with environments (rather than with objects, be these cities, buildings, facades or chairs).

This mode of thought emerging at the center of design practice and thought can be exemplified in a variety of works, even philosophical ones, of which a single recent example is Peter Sloterdijk’s Sphären. It is in a context such as ours here today that we can recognize some of the complex paths by which the so-called problem of ‘nature’ (and I use this term as a shorthand only) has impressed itself, both philosophically and practically, as an imperative to be incorporated into design thinking, or into the systematic accounting of what is in play by our, or any animal’s, being in the world.

Far from seeking to invoke Heidegger with the use of this latter expression, I wish rather to propose that we free ourselves from the common assumption that we are in the world when, in fact, as a great deal of the science we will here consider implies, we are the world itself (Stockhausen 1973).

By invoking the broad and frequently challenged term of ‘nature’, I leave to one side entirely the platitudinous objections of “cultural constructionists” for whom nature is a product of culture and history without independent ontological, or epistemological, status. By nature I invoke those parts of the world around us that are motivated by their own processes and which under normal circumstances are indifferent to our own. The fact that these undergo modification by us (and vice versa)—in the course of history—in no way mitigates the constancy and reliability of nature as an independent term and object of knowledge across a multiplicity of modes.

I refer to the study of the relations of history (society) and nature very broadly as ‘ecology’—and it is in this sense that I make reference to something called ‘neuroecology.’ For purposes of philosophical rigor I situate the origins of ecological thinking in the work—a century before Haeckel—of Alexander von Humboldt, to his On the Geography of Plants (1807). Humboldt’s work was the first to place plant species into their surrounding contexts—latitude, altitude, geology, climate, temperature, soil type, etc.—even into their human social environment and their relation to animal species, to account for the specific patterns they express. His phrase ‘Alles ist Wechselwirkung,’ typically translated in thought as well as in language, as ‘Everything is connected,’ is more accurately rendered, with due emphasis, as ‘All is interaction.’ (Humboldt 1803).

The phrase is in fact a description of what came, 150 years later, to be known as ‘the environment’ itself. This still nascent concept can be derived from the work of Johann Goethe, whose study of the morphology of plants proposed an algorithmic blending of—modular—processes of unfolding at different scales and at different rates, as a generative mechanism of responsive (living) form. Goethe identified three inputs: a type, a gradient and a cycle, that in any combination would not only produce a unique and specific plant form but would account for the variations of forms within a single plant itself: its petals, leaves, calyx and stem (Goethe 1790). His theory placed the improvisational integration of diverse temporalities—each input represented an impetus that unfolded at a different speed—at the center of natural process.

The model that served centrally in many 20th century formulations of ‘environment’—in Deleuze, for example, Sloterdijk, Agamben and Rene Thom, to name but a few—was the concept of ‘Umwelt’ from theoretical biologist Jakob von Uexkull, in many ways among the most useful ones to serve us today.
An Umwelt represents the practical world or environment that corresponds to the sensory and biological endowment of any given organism. In a famous set of cartoons from his book on animal worlds, *A Stroll Through the Worlds of Animals and Men* (Uexkull 2010) the point is made: the worlds of men, dogs and flies overlap, but they do not correspond. And yet each inhabits not only its particular Umwelt, each organism is fully continuous and consubstantial with it. The patches and aspects of the world that represent assets for the organism—in each case a small portion only of what might be said to be ‘out there’—correspond to a sensory system that is both possessed by, and which defines that animal. An animal represents a segment of a circuit that connects triggers in the environment to responsive actions in another part: the organism is a more complex and layered part of the environment itself. I will refer to this as the principle of ‘immanentism’ according to which the distinction between organism and environment, inside and out, is but one of degree: a greater or lesser compression or dilation of information or, as more common parlance would have it, of life.

Von Uexkull’s emphasis on the senses—the compound sensorymotor apparatus—as the constitutive actor that establishes the organism’s integration or “fit” into, or indeed as, its world, represents a significant antecedent to contemporary neuroecology (and formal neurobiology). The field of modern neurology itself, beginning with C.S. Sherrington’s *Integrative Action of the Nervous System* (1920) and Kurt Goldstein’s *The Organism* (1934) was built on the central observation of the brain’s irrepressible drive to cobble together smooth and integral functional routines from whatever partial materials—internal as well as external—that are in its immediate spatial and temporal vicinity. Even a severely impaired organism (brain) will assemble a seamless and whole universe from whatever its senses deliver to it.

From the point of view of design theory this idea has to be seen as a foundational element within any perspective that includes the material world as a site of interrogation. The model of such understanding, both highly developed and powerful, was not explicitly recognized in the brain sciences until the work of Gerald Edelman. I refer here to the principles of evolutionary theory, particularly to the habit of mind associated with what Ernst Mayr referred to as “population thinking” (Mayr 2001). Formerly an immunological biologist, Edelman had originally proposed a model for how a state of the world—a disease or pathogen—could engender a correlative, responsive (not passive) state in an organism—an antibody or immune reaction—with such confoundingly specific accuracy and speed. His discovery of the molecular structure of antibodies and the mechanisms by which they could vary, and his subsequent theory of how the immune system successfully and reliably couples with the world to respond with pinpoint precision despite the infinity of possible disease forms the world could present to it, earned not only a Nobel Prize in medicine, but subsequently served as a now widely-accepted model for how the open and multiplicitous environment in which we live sculpts the brain within what amounts to almost infinitely plastic parameters. This was not the aspect of brain dynamics to which Edelman was directly referring by his famous invocation of Darwin (Edelman 1987)—this was largely reserved for the competition of neurons for spatial and energetic resources during the proliferation and pruning phases of brain development—but the tacit model in which input (information) from the environment served as form-generating engines for the larger structures and competences that account for the brain’s more interesting and important social performance.

Hence, the understanding of the brain as the site of social and political as well as psychedelic innovation, or if not only of innovation, also of regressive subjectivation and coercion,
must be placed against a larger backdrop of environmental history. This, for all its strengths and weaknesses, means evolutionary theory. Just as the mathematician Rene Thom (founder of Catastrophe Theory, the first comprehensive attempt to mathematize the class of processes—transitional phenomena—that govern the biological sciences) found it congenial to posit ‘embryologies’ wherever in Nature, or in the world, it was a matter of form developing along partly deterministic pathways, I see no reason to not invoke the explanatory prestige of epigenetic factors to account for the prehistory of contemporary cognitive regimes.

We have learned to refuse the distinction between body and brain, but we have a way to go till we reflexively think the unity of our anatomo-behavioral biology in its full polyphony. Yet it is just the habit of mind most usefully and centrally featured in evolutionary theory, and sufficient reason to espouse and engage it.

**Paleopolitical Framework**

The primary pressures exerted on the development of human nervous response—thinking, feeling and perceiving—not different, for significantly long period at least, from the pressures on all other organisms—were those directed to predator and anti-predator activity.

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*The debates continue to rage around the claims of evolutionary psychology, neuro-archaeology, paleo-neurology/-anthropology/-anatomy, and so on with respects to what the targets of early developmental pressures on human cognition were (many focus on cortical plasticity, but many also argue for characteristic hardwired and relatively closed attributes). It is sufficient here to beg any final conclusion by emphasizing simply the diversity of uses of the brain in human history that remain, through one channel or another, essential legacies for present usages.

The subduing and incorporation (literally into our own bodies) of those portions of the environment that could serve us either for nutrition or for secondary economic advantage—clothing, shelter, leisure, or procreative opportunity—can all be considered as quarry and object of predatory activity, and regardless of what form of execution they take, can be subsumed under the category of hunt-and-capture. Similarly, the evasion of capture by other predatory agents, to the extent that early humans and prehuman hominins were competitors for the same resources and habitats on the savannahs with other social carnivores (the cats, hyenids and wild dogs) determined to a large degree the forms of vigilance, attention and the extreme acoustic, visual and even the running competences that endowed us in large part with the qualities we now routinely recognize in ourselves, as human (Lieberman 2011, 2013).

Most people outside the field of biological anthropology are surprised to learn that it has been a working hypothesis since the 1960s work of George Schaller and Gordon Lowther (1969) that the emergence of what came to be the human type was determined far more by relationships—convergent developments—with fellow savannah predator populations—lions, hyenas and dogs—than by the ape line from which we are routinely but misleadingly said to descend. Our forms of attention, our diet, our modes of association such as family groups, band size, social structure and divisions of labor, etc. more greatly resemble those of cooperative hunting and meat-eating species than those of the merely prehensile frugivores we left behind in the trees. In this same respect, research in the 1990s showed extraordinarily sophisticated execution of multipart strategies in the hunting methods of lions, hyenas, dogs and other savannah carnivores (Stander 1992, 445-454). Let it be said before moving on however that the adaptations here did not overwhelmingly point to the human as an effective predator.
On the contrary, much in our makeup pointed to our existence as a brutishly hunted creature, who adapted the necessary forms of neurosis, anxiety and fear, (and whose biology has been comprehensively worked out over 40 years by Melvin Konner) as well as the need, more than anything, for a multiplex new organ that could compensate flexibly and innovatively for our anatomical deficits (lack of claws, adequate carcass-penetrating teeth, etc.); a large, pluripotential and highly tunable brain (Konner 2002).

Evolution is in effect a form of biological tuning, especially when it comes to the brain and its modalities of attention. Some of its capacities are hardwired and innate of course, and some merely the result of environmental pressures on the individual rather than on the species itself. This is a topic of vast and serious debate that centers on the prefrontal cortex and on the avalanche of complicated issues that pertain to how this anatomical machinery is taken up and deployed within any specific neuro-ecological framework. The use of the prefrontal cortex is the materialist stuff of cultural history (which, as we know, is not yet materialist at all).  

But how the massive human cortex arrived is itself an important neuro-ecological story. Since animals must either ingest or evade one another in order to survive, they must attune their nervous systems to one another’s actions, and in particular to one another’s actions on the environment, to *spoor* of all kinds [4]. Living in social groups places further demands on the processing power of a species, insofar as one must also track and retain knowledge of past behaviors, character, etc. in order to detect and limit economic cheating, incest, debts, and so on.

More important is the expansion of the entire brain mass—commonly referred to in evolutionary biology as encephalization, a term that is effectively a synonym for hominization. Humans clearly enjoy their extraordinarily large brains but this does not mitigate the fact that their brains are exquisitely expensive. But not only are brains highly expensive to run, requiring a great deal of high quality food to power them, their high metabolic rate makes them prodigious producers of heat, and so they are also demandingly expensive to keep cool.

Brains are made of exquisitely sensitive tissue, even a four degree rise in its temperature is likely to result in death. One can’t have a large brain without a highly sophisticated cooling system. But as the newest accounts of the co-evolution of landscapes and organisms develops today, we are also learning that climate change—specifically the dramatic heating up of the environment between 4 and 5 million years ago—was a prime cause of encephalization and hominization.

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4 The English word *spoor* derives from the Afrikaans (and Dutch) and refers to any mark, trace, disturbance or sign in the environment caused by the presence or passage of an animal. It frequently connotes a linear series that in its aggregate produces a ‘track’ that is typically followed by a hunter and which lends to the word one of its most common, but narrowest, meanings. *Spoor* refers not only to tracks that one follows, but to the entire system of legible modifications of a world by the organisms that comprise it. Arguably, an organism is inseparable from its *spoor*, and its relationships to other organisms consists in large part of the readings and communications generated by them, which is arguably the principal task of any nervous system in nature.

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3 One significant point of light on the horizon is Daniel Smail’s plea for a ‘new neurohistory’ that accounts for the constitutive role that psychotrophic processes play in shaping and driving human history. See his *On Deep History and the Brain*, University of California Press, Los Angeles, 2008 and Andrew Shycock and Daniel Lord Smail, *Deep History: The Architecture of Past and Present*, University of California Press, Los Angeles, 2011.
As the environment grew hotter, it also became dryer (at least in Africa where it mattered most in the late Pliocene and early Pleistocene) causing forest habitats to shrink and savannas and grassy plains to flourish. Apes, as the now partially discarded but still useful story goes, needed to find food out in the open—a dangerous place fraught with seasoned predators—and so required an advantage of some type to protect them. What they got were several interconnected ones. The first set of problems requiring solution was how to move quickly through the dangerous open spaces while carrying one’s young. This problem was believed to be solved by upright posture and the freeing of the hands for novel uses. With a new set of ecological potentials for the hands (freed from locomotion) came new cultural possibilities (the central problem of hominin ecology). Freed hands provided an opening—perhaps even a demand—for a new and enlarged brain to program them. But the new environmental heat placed unprecedented stress on the animal to keep cool. A large, sensitive, heat-producing and expensive brain represented a dangerous added burden, unless the animal to keep cool. A large, sensitive, heat-producing and expensive brain represented a dangerous added burden, unless the animal could be found, and it was. The invention of this novel air conditioning system is widely considered to be the defining feature of, and evolutionary impetus behind, the emergence of the human species.

Because humans have large brains, short faces and small, specialized teeth—all effects of the environment-derived pressures to change diet and by extension to change all modalities of combustion including information-processing ones—we do not possess snouts and therefore lack the hollow nasal chambers

and the venous adaptations in the head that most other animals use to cool the blood that feeds the brain. (Snouts serve as radiators.) If apes aspired to compete in savannah habitats they were going to require innovative adaptations to manage the heat stress that came with this environment. All other savannah mammals use ‘selective cooling’ based on the protruding face, the hollow snout and an anatomical formation known as the carotid rete in which blood is pooled in the sinus area or neck for cooling. Humans cannot do this; their brain is proportionately too large and would require a neck as wide as its thorax. Humans must use general (full body) cooling.

The first adaptation towards this end is said to be the achievement of upright posture, which has been calculated to cut heat load by more than 30% by exposing less of the animal’s body surface to the direct rays of the sun; it also moves the brain and organs away from the ground surface where temperatures are significantly higher. The second is the shedding of the fur covering, the development of naked skin and the profuse sweating that permits ultra efficient radiation of heat through evaporation. But for this last adaptation, the animal would require regular access to considerable quantities of water on a highly regular basis; the increase in travel range and the size of hunting and scavenging habitat was an important result both of the entirely novel form of human bipedal locomotion and the cerebral cortex used in calculating interrelationships, navigational and otherwise.

But water resource management is clearly a very different affair in highly encephalized mammals—it is cognitive and not only perceptual—as even I have observed, such as in elephants who track and remember locations far beyond perceptual range.7

What we encounter at every turn, is a ‘modulus’ or network of relationships and especially forms, each changing in collaboration and communication with the others. But there were other more internal and less visible transformations that matter, ones involving feedback phenomena. Among the most important is how the emerging human form—and the human cultural type—managed not only its heat budget but its metabolic budget as well. If the brain is made up of expensive tissue that requires a great deal of extra calories and water to maintain, it is also true that no animal could maintain such a high-maintenance economic life if it did not have a very large brain. But more basic than this, is the way the body itself sought to balance its books. It has been widely noted that the human gut is very short compared with that of other mammals for its relative size (half the predicted length).

Physiological studies show that the intestines contribute as much or more to an animal’s “basal metabolic rate”—the rate at which it combests energy at rest—than does the brain. Intestines it in sum are also very expensive tissue. The massive increase in human brain size, according to the current benchmark theory of Leslie Aiello and Peter Wheeler, was thus balanced by a concurrent decrease in gut size, and this secondary adaptation had definitive repercussions on every aspect of the human world. The first and most basic effect was to require a systematic new approach to eating8 the absolute requirement for very high-quality nutritious foods that can be ingested in small quantities yet at frequent and regular intervals. This meant highly selective foraging behavior and judicious identification particularly of reproductive organs, the most nutritionally dense parts of the environment: seeds, tubers, nuts, eggs [ibid.]. In addition to this, environmental accounting on yet another level beyond kinship structures, orientation, and predator and prey monitoring was required—the consistent registration and calculation of distance to and from water sources since a distance of more than a day’s walk would almost certainly result in death. It also meant procuring protein and fat in the form of meat, an activity requiring considerable adaptations for strategic hunting, which included the need to act in coordinated and cooperative social groups, and even, as some have suggested, to the rise of the family group structure, divisions of economic behaviors along age and gender lines, and to the particularities of the age-old relations between the sexes (ibid.).

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7 These capacities and performances by elephant groups have nothing to do with ‘migratory’ impulses as is the sensationalized case with herding and grazing ungulates such as wildebeest. Robert Ardrey drew an important distinction in the early 1960s between “open” and “closed” programs (or instincts), much the same way Henri Bergson described the increasing complexity and sophistication of life forms as “the injection of increasing amounts of indeterminacy into matter.” Ardrey sought to distinguish between mechanical and automatic responses to the environment that secure certain organisms’ success in certain niches, from more general forms of direction and proclivity that are worked out in essentially improvisatory manner on an ongoing basis by an organism as it sustains its processing or ‘combusting’ of the information and resources in its world. See The Territorial Imperative: A Personal Inquiry Into the Animal Origins of Property and Nations. New York: Atheneum, 1976 (1966).

The large brain is at once directly and indirectly both a product and expression of climate and ecology: it emerged as a response to an increasingly hot and dry environment and in tandem with the evolution of a novel and biologically unique cooling system. But once the movement toward encephalization began, a broad set of relatively independent social and proto-political regimes necessarily were triggered, based on the budgetary need to extract from the environment the resources to keep the brain running.

Human life in all its diversity and manifoldness, and the human physical form that enacts and gives style to it—and in this I include our beautiful (intelligent) faces, flat stomachs, dexterous hands, subtle humor—our complex behaviors, and our notable species achievements such as language, technology and culture, are certainly at least in part, ecological responses to the broader and more mundane economics of satisfying the dietary and ethological demands of a large brain (Reader 1998, 90).

The Cognitive-Environmental Circuit

Human social, political and historical life depends upon, but also integrates and exploits, the consequences of our peculiarly formed and organized brain. I follow here the recent work of Bruce Wexler (Wexler 2006; see also Wexler 2010). Following the last three decades of developments in neuropsychic theory (summarized in the work of Edelman, Huttenlocher and others⁹) we learn that the brain’s explosive early developmental schedule of cell multiplication and construction of connective networks (as many as 100,000 per second during the first 6 months) requires that human young be born as still developing fetuses and undergo the greater part of brain development and expansion outside the womb. (The large braincase of the mature human baby would not be compatible with the hip structure of an efficiently bipedal mother.) Hence the period of newborn dependency in humans is immensely prolonged beyond that of any other animal—perhaps by 3 years at least. But most importantly, the billions of cells and quadrillions of neural connections that must be assembled in the immediate post-natal years, and the cognitive functions that they must develop and support, are entirely physically dependent on sensory stimulation to realize themselves. From the moment the fetus is separated from the shelter of its womb, its main business is to extract input from the environment around it, each bit of which triggers reception scenarios in the cellular matrix that are subsequently concretized, and retained and maintained, more or less for its life.¹⁰ In this way the brain “uses” its surrounding environment and the relations it finds within it, as a kind of model or “homologue” to fashion its own internal and functional structure. This process establishes a deeply fateful “coupling” relationship with the world. There is no metaphor here: Sensory input is not an “immaterial”—it is the environment itself, and it is the “becoming brain.”¹¹

The world is literally ingested through all the senses, and not only through the mouth.

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¹⁰ The latter is a crude approximation that belies the reality that the brain is a dynamic structure that ceaselessly reorganizes, regenerates, and reforms itself—within parameters that are themselves variable and heterogeneous in both its temporal and spatial dimensions (such as the “critical periods”, etc.).

Besides the Darwinian term 'homology' that I used a moment ago to describe the blueprinting of neural structure by external event structures in the world, we are compelled to deploy here also Darwin's broader concept of 'fit.' Fit would describe the lifelong adjustment of inner to outer states that is the fate and destiny of the massively encephalized organism. The human cannot help, given the overriding impetus to thrive, but seek a complex relationship of continuous accommodation with the world, such that inner and outer states and the forms that represent them, find a degree of dynamic sympathetic mutuality, that can indeed be, as befits us humans, extraordinarily complex—consider only the one we find in the achievements of musical composition and performance or indeed again, in the recreational use of psychotropic substances, be they alcohol, caffeine, psilocybin or opiates.

To return now to Wexler's hypothesis, we note his overriding insistence on two general periodicities in the human life cycle determined by the scheduling of neural development. There is the early period of massive profusion of internal structures—leading into the late teens and characterized by a 'rearing economy' within the protected home environment, and the period that follows that may be characterized simply as the organism's adult phase. The critical shift that needs to be noted is that during the rearing phase the organism's primary orientation is toward stimulus and sensory input (attractiveness of loud music is one characteristic, arguably scheduled, 'episodic' demand) in order to complete and fully enrich the insatiable demands of a trillion trillion neural connections, but during the adult phase, the focus shifts toward reversing the action of the sculptural knife, so that the shaping now of the external world becomes the main priority, in order to bring about, or simply extend, what I call "the dynamic sympathetic mutuality with reality."12

It is only humans that have such a prolonged phase of neural development and dependency on the environment, only humans integrate the structure of their environment ('secondary repertoire') at the ontogenetic level (a supplement to evolutionary capture at the phylogenetic level or 'primary repertoire') and only humans are then, shall we say, neuroecologically compelled to modify their worlds, and produce objects of meaning and affective capacity in order to modify in turn their internal body states (art, culture, etc.). Only humans have political relations written into their biological substrates and only humans are biologically as it were compelled to expend energy on nonproductive activities like art, culture and design. And the impetuses, if we are to believe the arguments, are linked.13

For every maturing organism notes, almost without delay, the unavoidable non-match between its internal (rearing) environment and the persistent elements of those of the previous (parental) generation's, and hence seek almost immediately to impose upon it images, shapes, relationships whose effects will better correspond to, and generate, the desired internal states that have become existentially necessary to their intuitions of freedom and well-being. This is a profoundly creative as well as destructive and aggressive act.

13 The famous and endlessly invoked case of the Bower bird as an animal who dedicates a great deal of its energy to the arrangement of its environment for attractive or aesthetic purposes does not belong to this category for the simple reason that its performance is not responsive or connected to its temporal or spatial surroundings in any specific way, it neither deploys, nor does its bower display, any innovation that might be called historical or transformative. It simply reproduces, as if according to a closed and pre-determined plan a form that provokes a response in a female bower bird as a set, and relatively inflexible engram.

12 It bears underscoring here the centrality of psychotropic aspects of historical unfolding and the relevance of the developing claims of the 'neurohistory' group around the work of Smail.
Through this line of reasoning, one discovers at once an interesting naturalization and historicization of the principle of 'creation' not so different from that of Bergson's (whose ideas underwrote a considerable portion of architecture theory and production in the 1990s in relation to the digital revolution). Let it not go unnoticed that what we have here is not only a full blown cultural theory but also, a neurally-mediated, biologically and ecologically determined "homology politics"—a neuroecological politics. Might the foundations of class struggle (dialectical materialism) and design practice be discoverable in the brain?

It would be useful and appropriate to leave off here with these admittedly outlandish proposals. But there is a final set of ideas that demands to be tabled before ending. First, the environmental dependency of human neurogenesis has a larger-scale evolutionary efficiency that requires serious accommodation: it overwhelmingly favors, in fact guarantees, not just 'good' or efficient brains but regionally specific and highly diverse ones. We are not all the same, and the differences, distributed spatially and hence implying a whole political neuro-geography of another order, require theoretical attention. Second, the advent of writing in human neuroecology is naturally and arguably the first major development in the cultural enterprise of abstraction, one that models and precedes (by almost 2 millennia) the advent of money and the social partitioning it ushers in. But if writing was first evolved as a tool to record economic transactions it soon evolved its dominant function: to record and externalize both "temporary and more enduring" internal states of the organism, and to make these accessible to others (Wexler 2010) Writing is the model of environmental modification whose purpose is first and foremost to transform. And thirdly: The commonplaces of superstructure/base relationships in the analysis of power relations may have here met a further withering refutation.

Uncontested findings in the neurobiological world show that in human and many other mammals, the essential relationship to environment is skewed not toward economic activity and the procurement of food, but toward the extraction of sensory stimulation in order to modify mood and body states. In other words, and once again, psychotropic activity, not economic, is the biological imperative followed by human populations and organisms, the stuff of which civilization is made and transmitted. If class war can be situated in and for the brain, it is driven by poesis, not accounting. Design in its essence is, and in every one of its instances is compelled to be, 'revolutionary.'

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14 See Bruce Wexler, Brain and Culture and Shaping the Environments. The concern with 'body states' is an immensely important one, developed throughout Smail and derived from Joseph LeDoux and Anthony Damasio.


