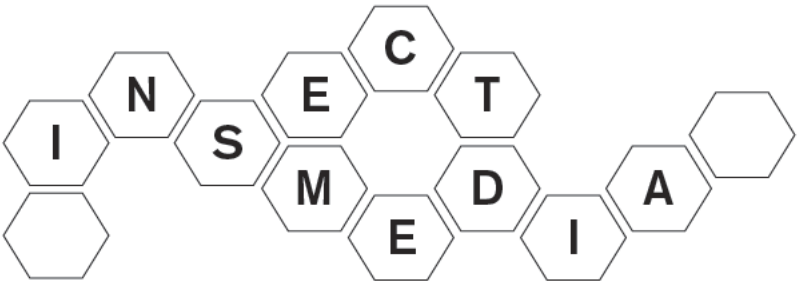

An Archaeology of Animals and Technology

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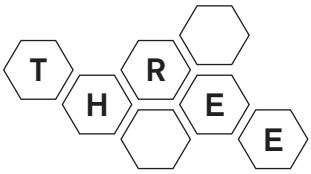
CONTENTS



TECHNICS OF NATURE AND TEMPORALITY

Uexküll's Ethology

> Science finds in the insect a world that is closed to us. There is no possibility of divining or even suspecting the impressions produced by the clash of the cymbals upon those who inspire it. All that I can say is that their impassive exterior seems to denote complete indifference. Let us not insist too much: the private feelings of animals are an unfathomable mystery.
>
> –J. Henri Fabre, *The Life of the Grasshopper*

This chapter continues some of the ideas introduced previously but with a special eye on Jakob von Uexküll's ethology—and the conceptual "animal" the tick. Through the tick we are able to discuss more in-depth notions of temporality and affect and realize that Uexküll provided important insights into a dynamic notion of nature relevant to wider theoretical applications of media ecologies.

One of Eugene Thacker's key ideas in his take on swarms, networks, and multitudes was to differentiate between effects and affects.[1] Whereas an effect analysis would stabilize the entities involved and regard them as predefined, an affect approach would focus precisely on the micromovement that is formative of the terms involved. In the context of networks, network effect analysis creates a spatial view of a network, an overarching survey of individual entities acting and reacting on a spatial gridlike structure, and an affect view of networks searches for the temporal becomings of the networks. In my take (already elaborated in *Digital Contagions*) such becomings are always multiscalar, and the affects of network culture involve not only technology but also a whole media ecology of politics, economics, and, for example, artistic creation.

In this case, affects are indeed passages among dimensions, contexts, and scales.[2]

Thacker's point relates to larger ontological and philosophical preoccupations and the need to discover dynamic models of thought that bypass the spatial thematics of ontology of, for example, Immanuel Kant and Leonhard Euler, the developer of graph theory. For Thacker, the problem is what the latter modes of thought owe to their stabilizing spatial ontology, in which networks become spatialized and stabilized in terms of nodes and edges that are primary to the possible relations and movements between them. In Kant's take, time becomes in itself a motionless condition of motion, but radical temporality remains secondary to this a priori conditioning. Here Thacker turns to Henri Bergson and his overturning of the space-time scheme. For Bergson, time as intensive, durational memory is the primary "stuff" of the world, which merely condenses into spatial and stable formations. Many of the problems that Bergson felt existed in evolutionary thought had to do with the danger of thinking in terms of already defined and formed entities (in the case of Herbert Spencer), or traits, which served as the immobile basis for notions of change. Instead, change was to be seen at the core of life, or organization, and change was not restricted to the future; this implies the possibility of approaching the past instances as something other than inevitabilities that necessarily lead us to our current state of being.[3] Bergson notes that it is of course our tendency (as expressed in physiological research on animal capabilities) to dissect duration into phases and such. The actualized perception, however, stems from the virtual forces that are captured by the present and actual concerns. Perception immobilizes the virtual intensity into such modes, where intentional and pragmatic action is possible.[4] This also marks a difference between perception and sensation—the latter being the virtual sphere of potentiality that is never exhausted in the actualized perceptions of the world. There are continuously elements that are too large, too small, too intensive to fit in the perception but still dovetail with it—enveloping a "multiplicity of potential variations"[5]—what Brian Massumi refers to as the "superempirical." Indeed, as this chapter will show, this superempiricality was developed in the midst of modernity, already at the end of the nineteenth century and in the early twentieth, in various fields from the arts to biological research, but of course also

in philosophy, as a way of "opening up" the closed worlds of animals and other nonhuman agencies.

In 1896, in *Matter and Memory,* Bergson offered his solution to the kind of temporalization of the world in which personal, actualized perceptions are actually contractions of nonpersonal durations—an idea that posited becoming and change as the driving force of the world. In Bergson's view, "matter thus resolves into numberless vibrations, all linked together in uninterrupted continuity, all bound up with each other, and travelling in every direction like shivers through an immerse body."[6] Here, despite our tendency to attribute movements to bodies, movement is a much more radical force that precedes the stable positions of the body. Duration is a force that finds solutions in actual forms of life and modes of perception, something that Bergson more concretely analyzed in *Creative Evolution,* which we also discussed in the first chapter. Here it becomes illustrative to see "insect-life" or "human-life" not as substances of a sort but as modes of living and contracting movements into actual entities.[7] As will later be seen, they form tactics in the *technics of nature*—technics that refer not to capacities that are fixed on certain species, categories, or technologies but to tendencies and affects that are concretely embodied in certain assemblages but at the same time are not reducible to repetitions of an essence or to any other prefixed notion. In other words, what is important are the affects and tendencies that nature can express and what can be characterized as technics without being technological.[8] These technics are primarily understood as a temporal becoming, a matter of affects, melodics, and contrapuntal interactions in the ethological and dynamic context proposed by the famous ethologist Jakob von Uexküll in the early years of the twentieth century. In this sense, a biologically tuned philosophy such as Bergson's can offer a much more temporal way of understanding phenomena such as swarms than can the mathematically oriented network analysis.

RADICAL EMPIRICISM, TAKE TWO

Swarms are time. Swarms are not ready-made organizations but are continuously on the verge of becoming one but also dissolving. They are radically heterogeneous but still consistent, local patterns continuously feeding into a dynamic global pattern, so to speak.[9] In the previous chapter we

moved from insect architectures and their capacity to attract dynamic but geometrically precise singularities to insect organization and the theme of swarms. Swarms, as articulated in the early twentieth-century theories of insects, animal behavior, and interest in emergence, were conceptualized early on as superorganisms that are not reduced to their constituent parts. Can we think of the superorganism as superempirical—a variationality of molecular kinds, a swarming of potentiality pulling it to various directions? Not a superorganism with a head, as grade-B horror movies often suggest, of an ant and other insect colonies evolving into a consciousness but a relationality of microperceptions that work in concert and unfold in time? Such patterns were much later reanalyzed in the contexts of computer and network science, systems design, and studies of, for example, biocomplexity, where they were deterritorialized from insect bodies into technologies.

Now we depart, momentarily, from Thacker's analysis into the constituents of contemporary concerns over swarms, networks, and multitudes (only to return there later) and continue the grounding of the themes surrounding ideas of relationality and temporality from the 1920s to the 1940s. This also includes a certain shift from Kantian themes of perception and man toward fields of nonhuman temporality. As I said earlier, the framework for understanding Uexküll's ideas and the points about ethology that resonate with a much more recent "wave" of revival of radical empiricism includes not only philosophy but also biological theories and novel post-Cartesian ideas in the arts.

In terms of philosophy, this chapter nods in the direction of Bergson but also A. N. Whitehead and William James. Resonating with several contexts outside philosophy, various new ontological theories promised insights into a nonhuman world. Whitehead's desire to find alternatives to the Western Aristotelian tension of subject-object led him to think in terms of events and process ontology, which has itself found followers in recent decades in Donna Haraway, Bruno Latour, Isabelle Stengers, and Gilles Deleuze, to provide some key examples of writers who have contributed widely to the discourses of posthumanism. Whitehead's philosophy of the organism from the 1920s proposed to allocate everything as a subjectivity and to think through the ways in which these nonhuman subjectivities are fundamentally connected with each other and hence open to changes through their dynamic relationships. Whitehead de-

scribes this through the concept of prehension, the process of how an entity "grasps" its environment. Instead of dealing with the world in terms of subjects and objects, this approach allows much more room to maneuver, because prehending subjects are as open to become prehended objects by some other subjectivities.[10] Deleuze adapted this approach in terms of subjectiles and objectiles, where *objectile* describes the new status of the technical object as a continuity of variation, a dynamic serialism of the automated production machinery. Subjectiles are the corresponding way of seeing the subject as a contraction of variations. This is a version of perspectivism that, however, states not a relativist position to knowledge but the truth in relations—that all of reality is a contraction of variation in which the subject is an apprehension of variation—or metamorphosis.[11]

Whitehead's idea, stated in his *Process and Reality* (1929), of thinking in terms of prehensions and superjects instead of subjects and intentions, gives us tools to understand how subjectivity can be contracted beyond the human form. It is the world of experience that *gives* the subject-superject, instead of the subject having an intentional relationship with the object-world.[12] Whitehead sees his "philosophy of organism" as an overturning of Kant. Consider Whitehead's words:

> For Kant, the world emerges from the subject; for the philosophy of organism, the subject emerges from the world—a "superject" rather than a "subject." The word "object" thus means an entity which is a potentiality for being a component in feeling; and the word "subject" means the entity constituted by the process of feeling, and including this process. The feeler is the unity emergent from its own feelings; and feelings are the details of the process intermediary between this unity and its many data.[13]

This also could be understood as the perspective of the metamorphotic subject—a subjectile that occupies points of view in variation, is a product of the real relations of the world instead of just a prefixed universal subject. We are being individuated by the objects as much as we individuate them, and perception becomes an event instead of a grid imposed on the world. Objects and subjects emerge through such concrete events, which always have a stronghold in the virtual defined as a potentiality of future and past actualizations.[14]

Without the assumption of perception in general, writes Claire Colebrook when mapping Deleuze's notion of affect, perception is deterritorialized, and the reterritorialization on man is not the only possibility for a transcendental philosophy.[15] Although we are not going to fully engage with Whitehead, it is important to point out the connection to the wider agenda of recent years. In a manner that resonates with Whitehead's metaphysics, the realizations relating to New AI and the design of swarming and evolutionary systems (whether software or physically embodied) exhibit a similar approach that underlines the importance of the coupling of the agency with its environment. The perturbations stemming both from the milieu and from the agent are what provides, or affords, the functionality of any agency, any assemblage. Here perturbations, variations, and "bugs" are not the elements that need to be excluded from a functional system but what provide it with a lived relationship and "life," so to speak.[16]

Radical empiricism also provides perspectives from which to understand nonhuman agency. William James shared with Whitehead a valuation of the virtual experiences of the world—that is, the potentiality of radical experiences beyond the confines of our actual experiences. Relations are not actual but have the potentiality for actualization.[17] Indeed, in his radical empiricism James tested primarily the limits of human fields of experience, underlining that there is always more in the world that we actually experience at one moment.[18] Yet, in addition, the speculative nature of such an enterprise implies radically nonhuman forms of being. Perception contracts the world, and there is a potential infinity of ways of folding the milieu and an organism. In this endeavor, Jamesian radical empiricism moves in another direction from that of the phenomenological enterprise from Brentano to Husserl, which had the disadvantage of not being interested in the existence of things beyond our human perception. For Husserl's refashioning of Cartesian philosophy (in his 1931 *Cartesian Meditations*), philosophy turned inward and the psychological and objective realities of the world were bracketed in advantage of the viewpoint of the transcendental-phenomenological ego. Here, the objective world (as experienced by this ego) also derives from the transcendental plane of the phenomenological subject.[19] However, *things* can also be seen as in themselves active interventions and "provocations for

action," as Grosz explains based on James and Bergson. Things, including technology, matter, and living things such as animals as inventors of bodily creation, are to be regarded as continuous experimentations, a "certain carving out of the real."[20] Beyond our phenomenological perspective, there is a whole plane of immanence on which *things* (including animal agencies) are interacting, as will be discussed later in this chapter.

It is worth noting that it was exactly these thinkers of temporality who were continuously popping up in the 1920s discussions concerning emergence and evolution, such as C. Lloyd Morgan's *Emergent Evolution* from 1923, in which he referred not only to Bergson, Whitehead, and James but also to Spinoza, Poincaré, and Einstein, among others.[21] This well represents how modes of experience, perception, and thought beyond the standardized human (male) model were continuously sought after in various fields, from different philosophical theories to the arts and biological research, for example.

But the main character of this chapter is not a great philosopher but a conceptual person (a contraction of the forces of the cosmos under a figure of a persona), perhaps, or a conceptual animal: the tick. It is curious how this tiny insect became one of the key philosophical conceptual entities of twentieth-century thought, an insect that was commented on by Martin Heidegger, Gilles Deleuze, Giorgio Agamben, and others. In this chapter I mostly follow Deleuze's ideas in which he connected the ethology of ticks with the concept of assemblages.

The tick and its cultural status are perfect examples of the work of translation and mediation, of how an insect and studies of insects can be transformed into a whole other discourse or a territory of thought, deterritorialized from its strict confines as exemplary of animal behavior to a mode of thought. But this mode of thought can also do things—and act as a vector from one mode of experience and perception to another scale and layer.[22] Perhaps the tick does not do much thinking, but it does, however, reside at the center of a whole discourse on philosophy, affects, and, as we will see, media theory as well. In addition to the tick, and the ideas of the life-world of animals and other entities proposed by Uexküll, we will track the ideas of "post-Kantian" experience in relation to some notions relating to insect worlds. Here, again, philosophical ideas such as those of James and others are "put to work" with the help of these little animals.

ETHOLOGICAL MAPPING OF MILIEUS OF PERCEPTION

Jakob von Uexküll was already enjoying high prestige during the 1920s and 1930s after having published works such as *Umwelt und Innenwelt der Tiere* (1909, 2nd edition 1921) and *Theoretische Biologie* (1920, 2nd edition 1928). Both introduced his ideas that the Kantian constitutive spheres of space and time, *Raum und Zeit,* were not so much absolutes but rather special conditions of variation found in all animals and entities that sense. As he wrote at the end of the 1930s, "Kant had already shaken the complacent position of the universe by exposing it as being merely a human form of perception. From there on it was a short step to reinstall the Umwelt space of the individual human being in its proper position."[23] Johannes Müller, despite his appreciation of Kant, had inaugurated a certain crumbling of Kantian apperception. In a similar manner, Uexküll wanted to continue the Kantian project into the life-worlds of animals as well but to push it further. In his mix of the physiological psychology of Hermann von Helmholz (where he saw the founding principle for a perception of things in the intensive qualities of sense organs) and Kant, Uexküll wanted to emphasize the role of the body (and alternative organizations of bodies) in perception as well as in the feedback loop between perception and action. As Jonathan Crary notes, this Kantian unity was shown to be exposed to various kinds of manipulations via the physiological system, and in a similar vein Uexküll, who appreciated Müller as well as Kant, can be thought to show the crumbling of the human apperception via the potentially infinite number of perceptual worlds existing in animals—with the world of perceptions too small or too large to comprehend from the human perspective.[24]

For Uexküll, what defined the objective world was not a single reality disclosed similarly to all its inhabitants but the way we perceive and act in the world. Put the other way round, the way we perceive, valorize, and act in a world defines its objectivity to us. From this perspective, there was no objective time or space but a reality consisting of various differing ways of *contracting* time and space.[25] Needless to say, Uexküll was here repeating the same realizations introduced in physics, modern art (e.g., cubism), and philosophy. He was not the only writer rethinking time and space through the nonhuman, and actually these ideas resonated with many of the emerging ideas in philosophy as well. Indeed, through vari-

ous philosophies of process and radical empiricism, the world of experience was opened up much beyond the human being. Kantian transcendental philosophy of experience was extended to the world of animals and things as well.[26]

Hence, ethological mapping of the perception beyond the human being can be connected to a broader philosophical task of understanding the human being as one singular way of contracting the world and as a specific capacity to signify, exchange, and communicate.[27] What can be seen as early phases of animal ethology were, however, according to Georges Canguilhem, much less focused on temporality and dynamics. Jacques Loeb's and John B. Watson's research into animal behavior was still more akin to the mechanistic (and later behavioralist) understanding of the relationship of bodies and milieus. Here the milieu is seen as determining the organism's pose as part of the milieu, a physical continuation (expressed in the centrality of "reflex" responses) of its surroundings.[28] Entomologists such as William M. Wheeler had grown dissatisfied with the morphological view in studies of animal life and proposed to move toward dynamics of bodies. This stance had something more in common with an ecological or ethological analysis, as Wheeler proposed in 1902.[29]

Uexküll also wanted to distance himself from a physiological and structural understanding of the bodies of animals. Such a mechanistic way of understanding interactions of the bodies and lives of animals did not capture the active, individuating ways of *living* in the world. So instead of seeing animals as mechanistic structures and machines, Uexküll adopted the idea that the simpler animals are, the more potential there is for undifferentiated openness in them. Hence, for Uexküll amoebas were less machines than horses, as the latter are more structurated animals in terms of their development.[30] He understood technology in terms of automation of functions and predetermination, but thought structural openness implied something else. Yet, because Uexküll did not want to succumb to an idealist or vitalist position, he continuously maintained his interest in the idea that the perception and action systems of animals are material and physiologically real.

What an animal perceives *(Merkwelt)* becomes structurally integrated into its action-world *(Wirkwelt).* Hence, the world of an animal is characterized by this functional circle, which integrates an entity into its

environment (or a milieu to other milieus). A tick is in this sense characterized by three modes, three ways of perception/action: it (1) smells a mammal with its olfactory tendency and then drops down from a straw; then it (2) perceives the temperature of the animal and (3) finds a hairless spot where it can stick its nose and draw some blood.[31] According to Uexküll, a physiologist would be content to regard this as a simple machinelike reaction-action pattern that expresses the functional connections between perception organs and the central nervous system. Animal-machines are mechanical entities that interact without the need to add any agencies into the picture. However, Uexküll's account provided a much more dynamic image of nature than that.

What Uexküll implied was that we are dealing not with predetermined objects of nature but with subject-object relations that are defined by the potentiality opened in their encounters. Entities of the world, such as the tick, are only in these relationships of significance and there is no world beyond these relations. As Agamben underlines, adopting Uexküll's example, a laboratory experiment in Rostock where a tick was kept alive for eighteen years in isolation without food demonstrated this. The tick sunk into a dreamlike state of waiting but, without time, a suspended moment. Uexküll's conclusion: no relationships, no world, no time. The world is fundamentally a dynamic one; where relations are temporal and without defining relationships, the world seems to stop.[32] In other words, there is no time "in general," but time is always folded through temporal relations that can be both actual and virtual. The temporality and reality of the world are then enacted through lived relations in a Jamesian manner.

Dynamics afford the structuration. Even though highly structured, a living form is continuously potentially open to its environment, with which it forms a functional circle (what cyberneticians would later call a feedback circle.) Life is a dynamic enterprise that forms through the relations of entities with each other. In a radical posthumanist way, Uexküll never got tired of accentuating that so far we have approached the world through our human, oh-so-human lenses but that there is a panorama of perceptions and ways of approaching the world that are closed to us humans but continuously lived by other life forms:

> Among the animals, with their smaller Umwelt horizons, the celestial bodies are essentially different. When mosquitoes dance in the sunset,

> they do not see our big human sun, setting six kilometres away, but small mosquito suns that set about half a meter away. The moon and stars are absent from the sky of the mosquito.[33]

SPYHOLES INTO THE WORLD

As I explained in chapter 1, animals offered lessons of "nonhuman perception" due to their capabilities to sense, move, and mold the world. The new animal worlds in physiological research and beyond (such as *Alice in Wonderland*–type ideas of Victorian England or the emerging science-fiction genre with its hyperbolic insects from the end of the nineteenth century) presented peepholes or vehicles that transported the human experience to worlds otherwise unperceived. The idea was that we do not know what a potential future mode of life is able to do. This was a very Darwinian idea, expressed in the *Origin of Species,* but was also used by such critics of Darwin as Samuel Butler, who in 1865 speculated on "mechanical creation," writing that "we see no a priori objection to the gradual development of a mechanical life, though that life shall be so different from ours that it is only by a severe discipline that we can think of it as life at all."[34] Exploration was not only part of the geographical travel of the scientists, but a more general mode of tapping into novel worlds of experience and perception.

Hence, in a fitting fashion, the popular and perhaps most celebrated entomologist, Jean Henri Fabre, in 1922 was pronounced the prototypical explorer, "Homer of the Insect World," excavating new environments as had Alice. As one newspaperman wrote of Fabre : "The insect—this 'little animated clay, capable of pleasure and pain'—is to him, as it were, a tiny spyhole through which he looks behind the scenes of the terrible, mysterious universe. His knowledge merely serves to deepen his sense of wonder and awe."[35] Just as the quests of the early entomologists created a new mapping of the superempirical (or subempirical to humans) worlds of insects, the novelists of the imaginary were able to invent worlds not seen, heard, or thought before, as in the case of Alice's plunge into Wonderland.

In the 1920s context, these new perceptual worlds, "spyholes," curiously resonate with the discourses of film and media technological deterritorialization of human perception.[36] New technological apparatuses,

as noted in the first chapter, were able to capture even wavelengths of sensation that would otherwise elude the human senses.[37] As Agamben explains, Uexküll's work is closely related to quantum physics and the artistic avant-garde movement in its valuation of the primacy of variation, an "unreserved abandonment of every anthropocentric perspective in the life sciences and the radical dehumanisation of the image of nature,"[38] and thus a continuous interest in an infinite possibility of parallel worlds.

But Uexküll was not keen on parallels between animals and machines. The animal was at best an imperfect machine.[39] For Uexküll, (media) technologies were still very much mechanistic machines. In a Fordist manner, he thought that machines meant clocks, factories, and blindly repeated processes whose physiological equivalents were the reaction-time experiments from the nineteenth century on.[40] Against this spatializing understanding of technology and physiology (something that, for example, Bergson also criticized), Uexküll proposed a more temporal take, a so-called musical approach to natural technics: animals were not mechanical machines, but they seemed to express technics understood as an art of perception and orientation, as do the bees who are able to coordinate on a field toward certain key forms of openness and closedness found in flowers.[41] In other words, instead of imposing external meters and measurements on the intensive capacities of animals, we should approach them as creating the measurements by their unfolding with the world. Animals create worlds as an unfolding not unlike the temporality of music, whereas physiological understanding of technology seems to be a mere tracing of this creation. This resonated strongly with Bergson's view in *Creative Evolution,* where he noted that even though matter was seen to express an order that was "approximately mathematical," the intensive forces of nature were not reducible to such a tracking. Instead, nature was a creative evolution without finality, a radically non-human-centered becoming.[42]

Curiously, Martin Heidegger picked up on Uexküll's points in his meditations on instruments, animals, and humans. To a certain extent, Heidegger was following ideas similar to those of Uexküll and even Bergson. The animal is different from machines in its dynamic nature, its temporal unfolding. The organs of an animal are not instruments in the sense of a machine because the latter are "ready-made pieces of

equipment" and always subject to preregulated forms of action. In addition, as Heidegger said in his 1929 lectures on metaphysics, the machine always needs a creator and an operator.[43] Organisms are radically contrasted to such an inert technology, which shows that Heidegger's idea of technology was very much stuck with the rationalized Taylor-Fordist paradigm of his age. Only organisms are seen as self-reproductive, self-regulating, and self-renewing. Even though there was a radical difference between his view and the Deleuzian and Bergsonian "machinics of nature," when Heidegger wanted to differentiate the animal from the human (the animal is poor in the world, it lacks history and self-consciousness and is not able to exist beyond its factual environment in the way *Da-sein* is able to be in the world), his view of the temporality and processuality of nature stayed in touch with Uexküll. The world is filled with events such as seeing, hearing, grasping, digesting, and so forth, all of which are "processes of nature."[44] Where animals differ from inert matter (such as stones) is in their nature as unfolding events, a behavioral relationship they have with their environment. Insect perception is localized not in the structure of the eye, for example, but in the continuous tension between the capacities of the insect that have formed the physiological eye and the environment as its needed partner in unraveling the perception event. The organs of an animal are not just instruments that follow the prescriptive paths but are bound to the animal's lifespan (to use Heidegger's words) and also to the temporal span of its environment: "Rather the organs are bound into and are bound up with the temporal span which the animal is capable of sustaining as a living being."[45]

Uexküll for his part used the idea of "emergence" to differentiate between the mechanical understanding of structures and the inert forces of physical nature. The Estonia-born ethologist thought an animal is to be considered a dynamic and living entity; it is always more than its bodily mechanism, which is built from the constitutive parts of cells and "formation building orders" *(Formbildungsbefehl)*.[46] Instead, life is music and melody, a curious kind of understanding of material forces that we should now turn to. This resonates with a broader ethological project as well, defined as an analysis of "patterns in time," some of which might elude the human senses and demonstrate alternative perceptions of time and bodily patterns.[47]

MACHINIC ASSEMBLAGES OF NATURE

A key part of Uexküll's "technics of nature" consists of the idea that compositions or aggregates of nature are centrifugal. Although such mechanical machines as watches are always turning only toward their inner principles, which are predetermined and rely on those components (i.e., are centripetal), the "building" of an animal works as a project that always orients away from a center to the world.[48] In *Bedeutungslehre,* a short and lucid explanation of his key ideas from 1940, Uexküll referred to this kind of understanding of technics as a melodic one; in other words, musical ideas of composition act here as the needed "lesson," showing that harmonies are always produced of at least two notes. Notes, punctuation, and patterns form, only together, a contrapuntal relationship both in music and in matter (nature).[49]

Uexküll thought that such melodics can conjoin various kinds of phenomena across scales, as his examples show. The leaves of an oak form a coupling of melodics with raindrops, the leaves themselves acting as a channeling and a distribution machine while the raindrops engage in a compositional becoming with the "living machine" of the oak and its cells. In the animal kingdom, an apt example is the living machine formed by an octopus and seawater, with the water becoming a "carrier of significance" *(Bedeutungsträger)* for the animal, which uses it for its movements.[50] Furthermore, in the world of insects, such couplings, or foldings with the world, are constantly taking place.

The perfect example is the coupling of the spider and its web with the fly. The spider is here referred to as a tailor but one that does not measure the fly with a measuring stick but somehow contains an image *(Abbild)* of the fly of an a priori nature *(Urbild).* A certain perfectness that parallels the previous chapter's focus on insect geometrics is evident here as well. The threads are in optimized composition regarding the size and perceptive capacities of the fly. Weaving the radial threads stronger than the circular threads allows the spider to capture the fly in the web, and the fly with its rough eyesight is not able to perceive the finely constructed threads.[51] As Agamben notes, the "two perceptual worlds of the fly and the spider are absolutely non-communicating, and yet so perfectly in tune that we might say that the original score of the fly, which we also call its original image or archetype, acts on that of the spider in such a

way that the web the spider weaves can be described as 'fly-like.'"[52] In the melodics of nature, entities possess a certain score that defines their affect-worlds, the potential affordances, potentials, or affects they have with the world, and in which the score of the spider and the fly are interlocked at least on a virtual level. One can find the same rhythmics and contrapuntal levels on various scales, from primitive levels of life such as that of amoebas and insects to social life, as Uexküll seemed to hint in his collection of biographical texts originally from 1936, *Niegeschaute Welten* (Unseen worlds): like ants and mosquitoes, counts, barons, and, for example, Neapolitans have their own closed worlds, a pattern that is multiscalar and defining.[53]

Such an idea of technics characterizing the whole of creation can be understood well with the emphasis Deleuze and Guattari placed on Uexküll's ideas. This is what Deleuze and Guattari refer to as a concept of machinic assemblages, the machinics of the world. There is a primary artificiality and technics that characterizes not merely the human historical world but creation in general, a sphere that precedes the division to nature and culture. What Uexküll constantly underlined was the need to see nature and its actors not as structures and predefined categories (species or genus) but as becomings that are dynamically intertwined with their surroundings (not static). In other words, "machines, devices, and technologies of animal and human life, such as spectacles, telescopes, lathes and so on, are to be viewed as 'perceptual tools' and 'effector tools' that are a constitutive feature of the 'worlds' of living things,"[54] as Ansell-Pearson clarifies. In this context Deleuze and Guattari use the idea of associated milieu as a structuration going on across various scales of living entities. Associated milieu works through the dynamics of capturing energy sources, sensing and perceiving relevant materials nearby, and fabrication of compounds based on the perceptions and captures—a responsive gesture toward environment, that is.[55] Drawing directly from Uexküll, the structuration of an animal milieu is seen as a morphogenetic feature that parallels the importance of the form of the animal. That is, even though Uexküll noted the importance of the physiology of an animal in a materialist vein, the structures are active only in their associated milieus:

> Since the form depends on an autonomous code, it can only be constituted in an associated milieu that interlaces active, perceptive and

> energetic characteristics in a complex fashion, in conformity with the code's requirements; and the form can develop only through intermediary milieus that regulate the speeds and rates of its substances.[56]

IMMANENCE AND THE ARTIFICE

The technics of nature relate to the idea of positing a plane of immanence on which the issue of categorical differences between animals and humans, nature and technology is bracketed and the view of affects, movements, and relations among parts is posited as primary. Deleuze (and Guattari) think Uexküll is best read here together with Spinoza in order to create a synthesis of ethological ethics: there is only one nature as a plane of immanence on which variations and interactions take place. In this framework of assemblages, bodies are primarily relations of speeds and slowness, motion and rest and defined by their capabilities to affect and be affected by other bodies. There is a plane of nature on which bodies are articulated as affects (passages between bodies) and change. Living things are singularities composed of relations and intensities, an approach that tries to think of life beyond structure, substance, or constitutive subject-object relationships.[57] Here the primary temporality and metastability of living entities is what characterizes individuals across scales, from the coupling of the tick with mammals to the emerging swarm or the spider and the fly conjoining in a common rhythm. This kind of ontological technics seems to have been, then, already in its emerging context in the early twentieth century, grounded in a new understanding of the primacy of temporality as a structuring force.

It is also worth noting the difference to phenomenological accounts of experience, something that Uexküll's research could also easily be seen to address. Whereas in phenomenology the experience of something is always conceptualized as a relationship between a subject and an object, the Deleuzian idea of a plane of immanence sidesteps this Kantian-Husserlian understanding and looks for the events of experience as constitutive of its participants. This is a field of experience designed for no one in particular, even though actualizing and resulting in actual bodies. This also implies that experience is not limited to one transcendental form of experiencing, such as the human being. This radical variation, or

radical empiricism, was already proposed by William James and can be seen as well illustrating how to move beyond the epistemological problem of how we can know or experience anything beyond our own human form.[58] A multiplicity of real relations are neglected by our perceptions, raising the question of on what level or scale those superempirical relations are experienced.

This was naturally the inspiration and the problem of research into unknown worlds in entomology, the arts, and philosophy, as well as the new technologies: how to grasp (or "prehend") fields of experience that would reach beyond our particular worlds. As one entomologist of the Indian tropic wrote in 1909, the problem was one of translation and transposition:

> The senses, the instincts, the modes of expression of insects are so totally diverse from our own that there is scarcely any point of contact. In the case of mammals, of birds and to some extent of reptiles, we have in the eyes, in the feathers and in the movements, a clue to their feelings, to the emotions that sway them, to the motives that guide their actions; in insects we have none, and the great index of insect feeling, the antenna, has no counterpart in higher animals, and conveys nothing to our uninformed brains.[59]

Heidegger tackled a similar issue as the primarily human faculty of being always beyond oneself (although not denying that animals could not transpose themselves).[60] On a broader diagrammatic level, biology and sciences of physiology tried to construct such planes of inspection on which they could try to track down the intensive qualities of animals and map them as media technologically determined functions. Such experimentation can be seen as in a way trying to construct subjectless spaces of experience, but still remained under a very functional logic of slowing down the uncanny experiences of alien nature.[61] As an alternative to such processes of slowing down, or phenomenological enterprises, one should also keep an eye on the radical difference at the heart of the world. Instead of a relativity of perceptions (phenomenology), we have a continuous reality of relations, as Deleuze underlines, backed up by James. The question is, How can one tune oneself so that a part of that radical difference, the experiences that overwhelm us, would be able to enter our registers of experience? How can one enter a plane of

immanence and open oneself up to durations of animals, insects, stones, matter, technology, etc.?[62] Or, in other words, how can one move toward the horizon of the unliveable and the inhuman forces and nonhuman material intensities and rhythms in contrast to the phenomenological enterprise of what can be experienced as human beings? This means, as Elizabeth Grosz notes, that we must replace Husserl with Nietzsche[63]—and humans with insects, we can add.

In resonance with Uexküll's ideas, Deleuze extends this plane of immanence to a technics of nature, in which "artifice is fully a part of Nature, since each thing, on the immanent plane of nature, is defined by the arrangements of motions and affects into which it enters, whether these arrangements are artificial or natural."[64] This means that we must focus on the affective potentials of animals, human beings, or any other interactional entities, a defining factor of existence as becoming: what affects is one capable of, what can they do, with whom, when, and with what results?

The answers to all of these questions, as Deleuze ceaselessly underlines, are not known a priori but only through experimentation. Hence, he also mentions Uexküll as a great experimenter, one who looked for the potential melodics in nature, from the scale of local interactions to harmonies of nature. The animal (or, if we want to talk on a more general level of becoming, the living entity) is continuously coupled with its environment, stretched through counterpoints such as the plant and the rain, the spider and the fly. It is not a question of a body representing drives, forces, or even ideologies but of intermingling with the world.[65] There is a material connection (beyond consciousness or representations) that the body folds with itself. Bodies always exist via their limits and membranes, points of connection with other bodies across scales. For Deleuze and Guattari as readers of Uexküll, the interior and exterior are intermingled and selected as well as projected through each other, which already echoes the theme of folding as constituent of subjectivity, something that Deleuze elaborates in his book on Foucault written a couple of years later (1986). An individuality is always constituted as a tension or a machination between elements. So even if, as Bergson notes, the technics of animals and insects are immanent to their bodily formations in contrast to the intelligent externalization we find in humans, these technics are in constant tension with an outside, a folding, instead of a self-enclosed system.[66]

EREWHON: TECHNICS OUT OF BOUNDS

Interestingly, Uexküll's ideas of technics of nature that move beyond a Fordist and mechanist understandings of technology have early precursors in the ideas of a critic of Darwinism, Samuel Butler. Having traveled to New Zealand in 1859 to become a sheep farmer, Butler published during the following decades numerous articles and books that were critical of Darwin (propagating, for example, Lamarckian ideas)[67] but that, in a funny way, continued Darwinian ideas of radical evolution. Hence, nowadays one connects Butler more closely to ideas of machines as dynamic, evolving creatures than to sheep breeding.

It is interesting, then, to read Butler's early writings as relevant to the development of the notion of ecologies of media as well. In Butler's 1872 novel *Erewhon,* set in an idyllic, isolated place reminiscent of New Zealand, technology is seen as capable of evolving and reproducing. More specifically, Butler proposed a kind of symbiotic relationship between humans and technology, something akin to the relationship of an insect and a flower:

> Surely if a machine is able to reproduce another machine systematically, we may say that it has a reproductive system. What is a reproductive system, if it be not a system for reproduction? And how few of the machines are there by other machines? But it is man that makes them do so. Yes; but is it not insects that make many of the plants reproductive, and would not whole families of plants die out if their fertilisation was not effected by a class of agents utterly foreign to themselves? Does any one say that the red clover has no reproductive system because the humble bee (and the humble bee only) must aid and abet it before it can reproduce? No one. The humble bee is a part of the reproductive system of the clover. Each one of ourselves has sprung from minute animalcules whose entity was entirely distinct from our own, and which acted after their kind with no thought or heed of what we might think about it. These little creatures are part of our own reproductive system; then why not we part of that of the machines?[68]

Humans and machines were interlocked in Butler's vision in a mutual agency that is actualized in event-assemblages. In a Darwinian (after) wake, Butler satirically questioned the idea of men as the innovative motors of evolution and technics and suggested in this quoted passage a more

complex view on the machinology of the living world. Machines were no organ-projection of the human form but exhibited a curious logic of their own. This view distinguishes Butler from the anthropological view on technics of Kapp and others and connects him to a more hidden history of seeing technology as *machinic connectionism*. This, I would suggest, is something that can be intimately connected to later ideas of Uexküll and the view of primary artificiality and natural technics. Uexküll thought the melodic partners in contrapuntal relationships form what could be called in Deleuze and Guattari's vocabulary machinic entities, and this idea already resonated strongly with Butler.

As Luciana Parisi explains, in a machinic view on cultural reproduction, there cannot be any privileged terms or origins, as Kapp- or McLuhan-inspired views might imply. Instead of seeing technological extensions as stemming from the body and moving outward, on a plane of immanence technical machines are always relative to a larger social machine. The technical machines are inseparable from their relations with biochemical, biosocial, and bioeconomical assemblages.[69] Butler contributed to such a view in which the human body or technology as a specific substance is not specified beforehand, a priori, but becomes selected in complex assemblages. In such a synthetic view, almost anything can become technological, a platform for intensification of certain potentials that can be called technical after the fact. For example, reproduction is not a matter of a specific center designed for the task (whether a biological form or a specific center in the human body).[70] In a much more cosmic take on sexuality, bees and clovers (and spiders and flies) are interconnected in a system of mutual becoming, and similar ideas of multirelationality can be seen working in spheres of culture and technology as well. In other words, nature is the perfect crystalization of technics as a potential for intensification and variation; media technologies are good runners-up. In a nature–culture continuum, the relations define and self-organize without an external principle or point of view in a process that was later incorporated into theories of autopoiesis by Maturana and Varela. Yet this kind of an autopoiesis does not recognize the existence of a harmonious state of balance but rather works with the realization of a continuous excess and overcoding. There is something that is always beyond the coupling, a potentiality of the new (deterritorialization). Multirelationality implies potentiality as virtuality: the ecological

principle of "there is always much more where it came from."[71] Thus it is not only the human body that affords technology ways of modulating movements, perception, and affection but bodies of animals and other intensities. In an assemblage, anything can be captured as an instrument and technology and can act as a project, prosthesis, or tool. With Butler, and various other examples that frame animal life as active and differentiating, the question of technology becomes deterritorialized from (1) a specific material form and (2) the human body as the primal locus of technological organization.

Ansell-Pearson explains that this mode of understanding evolution as a machinic engineering of desire echoes later Deleuze-Guattarian themes of machinic ontology. Butler saw this not as a vitalist stand (there is no unity before the machinic connections, a stance perhaps similar to that of Uexküll), nor is it a mechanist position (there is no fixed determination, again something that Uexküll wanted to underline with the dynamics of nature).[72] Invention and innovation are not characteristics of the human being creating machines but part of the essence of nature as art(ificiality).[73] This realization concerns not only the fact that insects have been treated as machines of a kind but, in addition, the idea that nature is itself a technics of radical invention, a virtual force of creation, also capable of mutations and accidents. In one sense, this could be connected to ideas raised by Darwin about the radical posthuman temporality of the world (expressed in variations and natural selection), which exceeds the teleological utility-oriented view of breeding artifices only for human purposes and as "images of man," so to speak. Instead, a radically temporal technicity/creation of evolution marks a technical time beyond the technics of humans.[74] Here perhaps Nietzsche can be seen as one of the continuers of Darwin's project,[75] but in a similar way all those other voices speaking of the technics of nature, from Bergson to Uexküll, entomology to Deleuze, have contributed to a machinology of matter and nature.

The machinology is also an expression of the aforementioned Spinozism, ethics-ethology underlining a fresh perspective of the dynamics of matter. What is interesting, and what I will return to in later chapters, is how these ideas of the dynamics of matter have also been incorporated as part of media theory and contemporary media design and biotechnology, for example, in robots and their dynamic coupling with their surroundings

or in artificial life projects of self-organization and "perception" of environment in software. The 1980s interest in distributed and embodied structurations of organisms in environments took advantage of this kind of low-level intelligence, an entwining of local bodies and a costructuration of environments and perceptions.[76] Already in 1929, Whitehead proposed the idea that a key lesson insects can teach us is that we do not need hierarchical unifying control to operate as bodies. We are, in any case, distributed systems with "millions of centers of life in each animal body."[77] Centralized control might characterize the cerebral existence of humans, but life has come up with various other ways of coordinating the living body with its environment—a crucial understanding in the artificial life paradigm of recent decades. Such kinds of a media archaeological rewirings, from the insect research of the late nineteenth and early twentieth centuries to contemporary media production, highlight a nonlinear understanding of media and its history.[78]

ETHOLOGY AS NOMAD, MINORITARIAN KNOWLEDGE

To conclude this chapter, we note that a creative, relationally unfolding temporality characterized the early twentieth-century ideas of the technics of nature. This connects with the notion argued by Thacker that in order to come up with a satisfyingly dynamic notion of networks and media technologies we have to find radically temporal approaches. Of course Thacker was writing mainly about network organization patterns, and we have been dealing with perception in a dynamic world of animals. However, these things are intimately related. "Being organized means *being capable,*"[79] Heidegger reminded us, saying that a form of organization is an articulation of the potential, of a potential dynamic unfolding. This implies, then, not an unchanging structure but a thinking through of organisms with their constant potentiality for a deterritorialization, a margin of excess. As it is, temporality stands at the core of the post-Kantian ideas concerning animal perception, coupling with environments and the idea of life as a becoming pertaining not to a universal time-space a priori but instead to a continuous variation. Themes raised in philosophy were doubled in biology and insect research, where animal perception spurred later notions of the dynamics of primitive life, from Heidegger to Deleuze. Whereas Heidegger was keen on clearly marking

the differences among inanimate matter, living animals, and conscious, self-reflective human beings, Deleuze (and Guattari) promoted the idea of ontogenesis or an artifice-approach that is characteristic of nature and beyond. They wanted to present an ontological view that would not differentiate between various "classes" of being but that would keep an eye on the potentials of affect: what is X capable of? In Whitehead's terminology, this amounts to a task similar to those of creative abstractions, which served as "lures" that philosophy can use to vectorize experiences, capacities, and tendencies to bypass false problems and false abstractions.[80]

The wiring of biological themes concerning coupling, affects, and temporality can also help us to understand the biopolitics of network culture, where technology is in a way using an increasingly biological mode of organization and logic. This does not imply that technological cultures would be "natural" in the categorical sense of following a predetermined plan beyond a politics of choice, framing, and valorization. Biology—or, more accurately, ethology as a mapping of complex interactions and temporality—can help us to understand how affects are captured as part of a capitalist creation of value and how new modes of organization are developing as dynamic, temporally tuned networks. Quite concretely, I refer to the historical modes of mapping and transposing biology not only on the level of politics, as writers from Michel Foucault to Roberto Esposito have argued, but also on the level of media technologies, where ethology gains new currency as a way of understanding the relational affording capacities of objects, processes, and agencies.[81]

In fact, ethology can be differentiated from the transcendental organization of biology as it emerged during the nineteenth century with its focus on organisms, functions, and norms. These are regulatory categories that designate bodies, what they can do (physiologically, socially, culturally), and how they should do it (norms as the way to stabilize variations). In ethological mapping bodies are not defined as organisms but are seen as dynamic systems "of non-subjectified affects and powers."[82] Ethology is more akin to experimentation and construction of a plane of immanence than to building a plane of organization that is a reactive mode of knowledge—a knowledge of definitions, classifications, functions, and spatialization. The sense of this ontoethologics, to use a term from Eric Alliez, flows from the dynamism that moves further from phenomenologies where (human) flesh and the organism is posited as the

starting ground of sensation and thought, and it also moves away from an understanding of ethology (presented by Konrad Lorenz) in which phylogenetic evolution explains the expressive becomings of entities in their environments. The internal "drive" does not explain how an animal occupies a territory, but there is the continuous tension and in-between of milieus of the inside and the outside. Here, exactly, ethology turns to an experimental probing, a superior ethology: "to think in terms of becoming rather than evolution, of expressive qualities rather than functions, of assemblages rather than behaviours."[83] Instead of a poorness in the world, animals can be seen expressing various modes of becoming, color-becomings and sound-becomings, which are expressions not of any inner drive or physiological structure nor of a simple environmental pressure but of the rhythms and counterpoints "set into a refrain by the animal in the movement of territorialization,"[84] as Alliez continues. This is where I see Uexküll distancing his position from that of Kant and moving closer to an experimental mode of transcendental empiricism, or radical empiricism. It moves from a Kantian and a phenomenological focus on the life-world and its conditions of possibility to the potentials of life beyond recognized forms.[85]

It is easy to overestimate the impact and ideas of Uexküll; ethological mappings also work toward fixing capabilities of bodies to species that are then understood as transcendental conditions. Especially in his earlier work, the 1920s *Theoretische Biologie,* Uexküll was prone to think of the environmental relation in very geometric terms as a gridding of the spatial surroundings. Furthermore, he was at times outspoken in his debt to Kant and at times far from the radical thinker of open-ended becomings he has later been filtered to be via Deleuze and Guattari. The melodics of nature in Uexküll are exactly melodics as strict predetermined structures whose first note determines the rest of the scale of possibilities. Hence, at times it seems that he was much more interested in transcendental laws of experience than merely in variation.[86] It is important to note the possible different ways of reading him and giving a bit more emphasis to different aspects. As is clear from what I have written here, I follow a reading that places emphasis on temporality and becoming in his work while paying attention to the specific contexts in which Uexküll's ethological theories emerged as well as their potential links to a rethinking of ecologies of media as well. A historical and contextual-

ized understanding of the role of ethological research can highlight, despite the difficulties, how Uexküll worked at the same time toward weird perceptual worlds in his process of tracking animal affects. He differed from Darwin in his insistence on the plan of nature but still offered a microtemporal view of the interactions in the world that can perhaps be well characterized as a temporality of breathing—of milieus in interaction and folding.[87] In this sense, a Deleuzo-Guattarian reading is able to take the ethological analysis into a mode of analysis that emphasizes experimentality, probing, and speculating as distinctive modes of animal bodies—and cultural analysis.

Here ethology becomes a mode of nomad knowledge, or science, in which variation is primary and becoming is rewired at the heart of an understanding of the world based on nonhuman events.[88] Instead of seeking universal laws to be reproduced (in the manner of structures, behavioral laws, or, as has later been the case, the determination of genetic programs), a nomadic interest in knowledge wants to look at the singularities and their movements and constitute an understanding of what "matter can do." This is a fundamentally and radically temporal way of looking at the world. It avoids the spatializing grids of royal science by paying attention to the "smallest deviation," where another step and another look will add something to the whole so as to constitute a change. Naturally Deleuze and Guattari have had their fair share of critique, or "correction," for example, from Mark Hansen. According to Hansen, Deleuze and Guattari's biophilosophy has neglected a thorough analysis of the organism, which has been too hastily discarded as being part of the "molar sphere" of rigid organization. Although Deleuze and Guattari do offer a consistent reading of and contribution to biophilosophy, with their work resonating with various holistic models of research into the interrelations of the body, the brain, and the world (Andy Clark); agency as an ecological event (Maturana and Varela, Bateson); and cognitive science that has opened up to adaptive behavior and dynamic models of cognition as part of the world (Rodney Brooks, Clark), they are still, according to Hansen, much too focused on the plane of immanence as the virtual, uninhibited force of becoming. Again according to Hansen, this is an abandonment of the organism as a restriction (but a creative one) that leads Deleuze and Guattari much too close to posthumanist ideals of the body as a programmable, completely fluid entity.[89]

This flags an important issue, even though I am not convinced that Hansen's critique of Deleuze and Guattari is accurate. In this model the body is not purely a restriction but a potentiality through which nonhuman virtuality might function. By insisting on a double-faced reality with the other face toward virtuality as a force not exhausted by actualizations and actualizations as the folding of organisms with the world, we are able to think the ecology of bodies as a dynamic but continuously material, animal enterprise, a kind of abstract materialism in which bodies are defined by self-variation.[90] Even if we accept Hansen's criticism of Deleuze-Guattarian biophilosophy that draws heavily on Uexküll's ethology, I would insist on the value of temporality it offers. Its focus on relationality and becoming through an unfolding in time is something that transports Uexküll from his own perception of machines as only mechanical to an appreciation of machines that are not reducible to the already defined. Deleuze and Guattari write their ethology in the age of temporal machines, soft machines of variation, metamorphosis.

Although rewiring a bit of ethology into existing understandings of media and culture might help us to summon a more dynamic approach, it also offers tools to grasp a politics of organization, perception, and coupling that takes place on metaphysical layers that bypass rigid distinctions between biology and technology, man and animal (or even man and insect). Following the "insect paradigm" of modern media culture seems to be continuously hinting at the importance of the animal not as a transcendent figure but as a continuous deterritorializing factor, a movement of sensations and perceptions that presents variables into thought. In this sense, insects act as art (creation) and media. They suggest new percepts and affects but also movements that can be taken up by philosophy and cultural analysis, which are keen on finding a more temporal, machinic, and ethological way of approaching the world as one of immanent becomings and territorializations.[91]

Next we turn to another mode of temporality and another theme of noncognitive modulation while continuing themes surrounding art and perception. It is no wonder that the curious metamorphosing animals from entomology to Franz Kafka also inspired the world of avant-garde artists. In this chapter I briefly mentioned that the discourse on cinematic and technological perception can be seen as forming an alliance with philosophy and biology, but similarly, between the two world wars

the surrealist movement in particular was busy coupling new modes of perception with a fascination for morphing insects—a biomorphing of sensory capabilities. In the next chapter I will turn to surrealists and avant-garde art, especially the work of Roger Caillois, who, most actively among the French, was interested in the zone between worlds of animality and worlds of artifice. Relatively recently, Caillois's work on games has been incorporated as part of the emerging field of digital game studies, but this link between his interest in animals and the research on games and artifice has not yet been excavated. What we need to focus on are the implications for understanding space and temporality that Caillois is suggesting and that the theme of animality in the work of Caillois and other surrealists is not a mere metaphor but a vector that can be used to more thoroughly understand the affect life of modern subjectivity.