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IV: Sand

The Digital Connection in Nature, Technology and World Creation

> Nature as an ocean of noise, entropy or non-information, and culture as dense clusters of dirt and sand particles condensed out of the swirling mass of droplets is a thought-model that Flusser believes can only really be visualized on a computer screen.
> Anne Popiel, *Of Pixels and Particles*: 31

> Flusser's creative interdisciplinary process of actualizing new natures, because it is based on a fundamental abstraction from an older nature, will congeal islands out of oceans slowly, gradually packing sand and shells tighter and tighter as holography, virtual reality and other technologies develop in sophistication.
> (Ibid.: 42)

Under the microscope, nature and culture at the molecular level both look the same to the Flusserian eye. This perspective affords the kind of creativity Flusser imagines for the immediate future of his telematic society. The first chapter of this study examined through Flusser's metaphors how human culture re-synthesizes nature's bits and pieces into a negentropic, purposefully directed second nature, a seamless nature-culture blend. The second chapter explained that when the world is understood as both natural and artificial, science and art can play equal roles in the creative synthesis. The third chapter showed how this combined epistemology helps humans understand nature's bits and laws enough to playfully nudge them into improbable configurations. Relying on both metaphor and machine technology to allow these configurations to emerge brings the creative impulse further by explaining the world as something we ourselves project and can therefore change. These interconnected paradigm shifts Flusser so adamantly urges work to effect a shift in how humans perceive the world; it makes us aware of our porous skins. Flusser's method of merging opposite concepts like nature/culture and art/science overlaps very different conceptual nets to create new information filters with different-sized holes through which different-sized bits of information may flow. Once we recognize that we can alter our filtration nets, and thus the world we perceive, once we know the rules of the game and possess the tools—to use his terminology—all that is needed are the parts, the playing pieces.

1 This excerpt is from Anne Popiel, Of Pixels and Particles. The digital connection between nature and art in Vilém Flusser's philosophy, LAP, Saarbrücken 2012, S. 121-133. We thank the author and the editors for the possibility to reprint it in *Flusser Studies*.

This final chapter examines closely the last stages of Flusser's media philosophy from the late 1980s and early 1990s as it breaks down humans' entire second nature into its tiniest parts to reveal aspects of a digital structure in what are often considered non-digital phenomena. Seeing the same digital structure in nature as in computers means for Flusser that humans can digitally manipulate and even re-create substances and life forms of natural origin in fulfillment of human cultural desires and requirements. The digital connection Flusser finds between computer technology and nature can be problematic if it alienates or deceives human beings, he warns, or reduces living things to random piles of isolated cells and genes, but he emphasizes rather that the relationships between particles are the real meaning and substance of life. New patterns, objects and even life forms can be created by manipulating pixels, cells and genes as part of an interconnected whole, a system out of which unpredictable novelty can emerge through the interaction of chaos and machines. Understanding the world as digital allows humans to recreate it with their digital technology not against, but in cooperation with nature's laws. An examination of Flusser's understanding of digitality in nature and its connection to digital technology will be supported by additional theoretical approaches to the digital in nature and ultimately applied to concrete examples of artistic practices Flusser could only imagine. This analysis, then, will serve not only to further explain and support the preceding sections of this study, but also to draw out future directions for human creativity inherent to Flusser's metaphorical media philosophy.

Flusser's Digital Nature

At the most basic level, Flusser views natural and cultural phenomena alike as clusters of particles that can be broken apart and rearranged into other relational configurations. As explained in previous chapters, his metaphors describe the world as watery clouds of trembling plankton particles or grains of sand that congeal into islands and dissolve again in an entropic cycle of random, temporary information creation, a process humans want to harness to purposefully play chance against chance to conquer entropic death. Many of his metaphors treated earlier in this study can be overlapped to focus on the same referent, the world as tiny specks full of creative potential for human beings. Flusser's call for art to take us back through the un-naming process to the pre-conceptual or pre-filtered wordless soup from chapter three parallels his call for a conscious return to the bubbling broth of unrealized possibilities with the creative *Schöpflöffel* from chapter one. Seeing the world's particulate nature, Flusser sees not objects but objects that could be: the borders between objects dissolve and the eye might easily arrange the particles into other configurations. Zooming in this close on reality makes reality not disappear, Flusser would say, but a little less real, to the point where other realities would be equally possible.

Seeing this particle mass is all a function of human rationality, which according to Flusser's etymological analysis stems from the ability to cut things up into rations ("Das Ende" 53). After scientific reason divided objects into atoms and individuals, "([o]ne often forgets that 'individual' and 'atom' are synonyms)," it later proved itself even more cunning/cutting (*schneidiger*): the division went on indefinitely, atoms turned into neutrinos and quarks, individuals into actomes and decidemes, and in the end they all started to lose their reality ("Das Ende" 53, my translation). In this way, Flusser wants to see the whole world as a mixed-up cloud of indistinguishable animal-vegetable-mineral particles. Of utmost importance here is not to stop after this dissection into the unreal subjunctive cloud of isolated particles and lose one's orientation in an absurd *Bodenlosigkeit*, but to reassemble them (or prompt them to reassemble themselves) into a networked ecosystem through a combination of art, technology and nature's blind chance. "Is a quark, that atomic particle, not something like an equation? And is an actome, that particle of an individual behavior, not an objective movement if I have fed it into a robot? In this particle swarm, atoms and individuals, objects and subjects blur together; subatomic processes turn out to be dependent on individual observation; and machines begin, when fed with decidemes, to play chess, to decide. In this way, by means of the long detour through science, reason hits upon what words have always already known: subject and object are relative concepts, atoms and individuals are fictions, and real is the relation, the circumstance, the subject-object-interlinkage. ("Das Ende" 53, my translation)

Here are the nuts and bolts behind his theories of intersubjective relational fields and immaterial information exchange presented previously: it all comes down to the relations between the tiniest particles, their abstract, calculable nature. The calculi are the playing pieces in this game of second nature—what can calculate can create.

Even before our powers of abstraction and rationality, perceiving the world in particle form is for Flusser always also a function of the physical human body. Flusser's microscope examines the human brain and sensory organs as conglomerations of digitally distinct calculi all working in the function of calculation—information that processes information, natural beings creating culture naturally, digitally. Because the sensory nervous system "receives point-like jolts," that is, "digitally coded stimuli" or "information," perceiving an object as real just means that the central nervous system has sufficiently "computed" or "processed" the incoming information bits ("Das Ende" 53, my translation). "[T]hanks in part to electromagnetic and chemical methods already understood," Flusser writes of the central nervous system—not of a machine— "these stimuli, this information is processed in the system in order to form heterogeneous complexes, something like perceptions, sensations, feelings or thoughts" ("Das Ende" 53, my translation). Furthermore, the central nervous system itself Flusser reduces to a swarm of point elements which receives and computes the similarly-shaped point elements of internal and external stimuli. As both sides of the

subject-object relation are of the same stuff, Flusser would say, perception has really to do with an overlapping of multiple fields of possibilities, to use his term—now more real, now less real: dreams differ from waking life only in that they are more poorly processed by the central nervous system.

As bodies and environmental stimuli blur into one and the same "foaming" ocean of possibilities, subjects and objects are only real to varying degrees, Flusser writes. Everything, including humans, is so saturated with this ocean that from up close we are all made of water: "This ocean of possibilities in which we swim saturates us. (Like deep-sea organisms, which upon closer analysis indeed turn out to be just specialized seawater.) That which we call "self" is *one* among the waves of the ocean of possibilities. The waves crash and foam up, because each is filled with the urge to become ever more probable, to press ever closer to this limit value that we call "reality." This urging and foaming of the waves, this push toward reality of possibilities is called "future" ("Das Ende" 53, my translation, italics in original).

Again the creatures of the deep come to our aid in observing our own kind, here the human subject is a "floating island" in the ocean of possibilities that grows more real the more "waves from the future" break upon our shores ("Das Ende" 54). Neither self nor world ever reach reality's hazy horizon, remaining only temporary constellations of points, "extrapolations" from the undulating ocean of possibilities, "corpses that were fished from the raging of virtualities" ("Das Ende" 54). Because bodies and minds are no longer Whats, but rather Hows—not things, but processes by which "virtualities," potentialities, are realized—technology need not focus on changing things in the world, Flusser insists, but can instead create whole other "real" worlds like Aphrodite out of foam.

At Flusser's moment in human history, the realness continuum and the turbulent waves of the possible must be digitized in order to be manipulated. Writing just at the end of his life, in the last decade of the 20th century, Flusser already sees technology creating digitally, so that he writes that quality must be converted into quantity, and the world, Aphrodite's "beauty born of foam," must be recoded into numbers, blown apart to its tiny bubbles ("Das Ende" 54). Reality is a function of probability, Flusser explains, something that can indeed be quantified. The more improbable something is, the more information it contains, the less entropy is present, and the closer together the molecules are located—for, as Flusser defines it, "'real' is a function of the density of distribution of virtualities," a function of the relative distance between atoms, molecules, pixels or otherwise ("Das Ende" 54, my translation). When the stimuli are more densely distributed, or as Flusser says, better defined, they will be processed in the central nervous system as real, he explains, whereas a looser distribution will be registered as unreal. If a wooden table is perceived as more real than a hologram of the same table, Flusser writes, it is only because the technology of the holograph has defined the stimuli more poorly than the central nervous system can process it, a

circumstance that will change in the future. Flusser imagines a future in which "our central nervous system defines out of the possibilities a world that we perceive to be real, and other systems define other alternative worlds perceived to be just as real" ("Das Ende" 54, my translation). It is a question of quantity, of density of distribution and condensation, by which Flusser means to say it is a question of processing chance.

Flusser's project for humanity rests in part on what he sees as science's return to Democritean atomism, where all things are created by chance particle collisions. According to Flusser's customary etymological analysis, Democritus believed that "everything was a product of chance. By 'chance' (*Zufall*) he meant what the word says, namely the falling (*Zufallen*) of one particle into another. The particles falling parallel like raindrops divert slightly from their paths, fall into one another, and only thus are all things created" (Flusser, "Das Ende" 54, my translation). Further, the process by which humans and their central nervous systems arose is for Flusser too improbable to be explained by chance alone, although such explanations correspond to some of the most recent scientific theories on the origin of life and the universe. Linking chance with necessity, Flusser figures that all possibilities must necessarily come about when the universe operates according to the laws of chance—it is only a matter of time before all possible configurations of particles would randomly, and therefore necessarily, occur. All possible worlds, so Flusser, must necessarily emerge randomly from the ocean of possibilities over the course of a sufficiently long span of time. Contrary to negating all value in purposeful human creation, however, this formulation actually fundamentally supports Flusser's central emphasis on the importance of humans' artistic creative freedom. Understanding the science behind nature's ways, as far as it is possible, makes clear that intention is necessity inverted, that "'purpose' now means extraordinarily accelerated chance," purposefully skipping steps in nature's random sequence of particle collisions ("Das Ende" 55).

A direct consequence of humans' power to accelerate chance groupings of atoms and molecules is Flusser's belief that living organisms can therefore just as easily be created as nonliving objects by inverting nature's laws—that the course of genetic evolution can be manipulated in exactly this way with technology sufficiently advanced. Creative computation turns necessity into intention, the uninterrupted slow progression of random particle collisions into improbably accelerated chance. When biological evolution is a dice game, Flusser reasons, when the playing pieces are genes and all possible genotypes must necessarily and randomly arise, the evolutionary game "may be numberized, codified, and fed into computers" to be so processed that what would take billions of years may pass by in a number of hours ("Das Ende" 55). Previously unimaginable life forms should emerge from the ocean of possibilities with the slightest tweak of an algorithm and its expression in genes expressed in phenotypes. This, perhaps Flusser's most surprising, if not "somewhat Utopian" example, as he admits himself, should eventually contribute to whole

"alternative" ecosystems being born from the frothing ocean of not-yet-realized potentialities ("Das Ende" 55). The same basic process of accelerated computation of chance conditions underlies cyberspace, virtual reality and other simulation capabilities Flusser mentions that were just emerging when these words were published in the year of his death. With these examples Flusser means to herald a new form of creativity based on quantifying qualities, recoding experience into theory, and calculating probabilities. Such game strategies will allow us to create alternative worlds—"alternative spaces and times, with alternative objects and life-forms, and (why not?) alternative humans" and has already begun to free us "from the tyranny of a supposed reality" ("Das Ende" 55, my translation). Freed from reality's unattainable horizon, the constraints of selves and objects dissolve into "sheer soap bubbles overlapping and piling on top of one another," and creating whole worlds from the foam of our particulate second nature evolves humans in turn to a *homo ludens*, "a second evolution into humans" ("Das Ende" 55). Instead of despairing as our sense of reality vanishes, we are freed for a life of the ultimate artistic creativity.

Regardless of what Aphroditean beauty we may birth from the semi-real foam, however, Flusser cautions that no new worlds will be intrinsically any more meaningful than the first one, and humans must not expect to become any less absurd. Such a view is in fact the very precondition for our creative freedom. One of two strategies Flusser presents for surviving worlds acknowledged as changeable yet absurd, the evolution to *homo ludens* permits us to throw our button-pushing fingertips into the swirl of nature's game of blind chance and speed it up to our delight, deliberately manipulating the playing pieces simply to amuse ourselves. If "dumb nature" were to automatically realize all possibilities contained within it regardless of human intervention, "[w]e can produce wonders a little more intelligent than the idiotic wonder of nature (of which we ourselves are a good example): a little more intelligent atoms, molecules, living organisms, human beings" ("Wondering" 107). The artistic response is that of the *homo ludens*. The second strategy for surviving a world perceived to be absurd is to confront it "by going it one better:" "let us be deliberately absurd. Let us admit that science and technology are absurd gestures, that "artificial" wonders are absurd wonders, and let us make these gestures and produce these wonders precisely because they are absurd. This is a familiar answer, aphorized long ago by *credo quia absurdum*: I believe it because it is absurd. This is the answer given by *homo religiosus*." ("Wondering" 107)

Thus, all possible realities are open to us in our search to weave a cloak of humanness over the abyss of *Bodenlosigkeit*. When one reality web randomly, entropically disintegrates to its absurd parts, a more appropriate one can congeal that forms new connections and new meanings, even if only temporary. What matters for Flusser are the complex connections between selves/things, a rich intersubjective field of relations processed at the microscopic level. Digitality, defined more extensively in the following sections, pervades Flusser's nature as a mass of particles that interact

dynamically, and once understood, can be rearranged by humans into more meaningful relationships.

Computing Nature

Breaking apart the environment into bits, digits or atoms opens nature to direct manipulation by computer technology. The particle nature of the raw materials combined with the process of calculating the particles' collisions provides the fundamental tools with which artists/scientists may intentionally accelerate the accidents of nature to produce new, temporary, but perhaps more human worlds. When Flusser explains the particulate universe in detail, he bases his description on the general big-bang and heat-death theories from physics, narrating the process in his own terms as an expansion of a "cloud of gas and dust particles" spreading out towards ever-increasing entropic heat death, which despite the name, actually refers to a lack of heat and information where all particles of matter/energy are uniformly distributed, that is to say, too far apart to cohere into objects ("Wondering" 106). Random but necessary collisions create temporary clusters of particles that synthesize information in the form of molecules, planets, organisms and the like, only to subsequently degrade and dissipate again as entropy gradually and inevitably gains the upper hand. The whole effect of Flusser's take on the birth and death of the universe gives his reader a sense of a smooth flux of particles alternating between density (things) and sparsity (nothingness). "We may call the particles "energy" and the clusters "matter" if we keep in mind that these terms are relative to each other, for "matter" is closely packed energy, and "energy" is loosely distributed matter. The pattern followed by the spreading cloud can be plotted as overlapping fields of particles, clusters, and emptiness. We shall then find that we ourselves are clusters wherein several fields intermingle." ("Wondering" 106) Fitting together a smooth flux of time and distinct particle clusters into constantly changing matter-energy fields, Flusser manages to emphasize the quantifiable nature of life's mysteries.

Particles, human beings and planets, that is to say, can all be plotted as wavy field grids at a level of definition only possible on electronic processors. Crucial for Flusser's creative project is the access to computer technology that can calculate the algorithms describing the actions of these particles. Such technology first allows humans to visualize the translation from algorithm to universe in ways previously impossible. Simply by typing the algorithms governing nature's physical laws "(Einstein's relativity equation, and so forth)" into a computer programmed to carry out the mathematical tasks would cause apparitions like "[w]irelike nets...to show the patterns of the fields" and "baglike protuberances" in the nets to be actualized on the computer screen ("Wondering"

106). The protuberances, Flusser explains, should be read as heavenly, vegetal, animal and human bodies of varying degrees of complexity, all made up of the same subatomic bits in different configurations. All these forms arise and dissolve on the screen in a somewhat fluid motion that condenses millennia of galaxy formation into a handful of minutes. "If we 'animate' the image, we may watch these protuberances form and complexify. Then, gradually they will grow shallower, until finally they fade back into the regular grid of the nets. The spectacle will end when all the net's irregularities have disappeared without trace, when the pattern stretches uniformly (without form) in every direction. If we feel like it, we may call this happy (or unhappy) end of our computer-generated video 'thermic death'." ("Wondering" 106)

Again writing very late into his career, Flusser finally finds in digital technology the means to visualizing his earlier theories of nature's entropy ("heat death") and culture's negentropy as elaborated in the preceding chapters.

Not only are digital computers essential for making sense of nature's complexities, visualizing its hidden order and chaos and reorganizing it into possible second natures, but for Flusser this is because they also share at their most fundamental level some of the same basic structures as nature itself. Beyond describing nature's particulate consistency and the random collisions that build and destroy its molecules, organisms and solar systems, Flusser goes so far as to equate the generative potency of nature's forces with the information processing capabilities of digital technology. The clearest example of this view is his metaphor translating wind turbulence into digital computation. The calculi, or small pebbles used for counting, are in this case truly both inorganic mineral compounds as well as abstract tools of calculation. Flusser's metaphor explains that the wind "calculates" the physical world, grinding it up into grains of dirt or sand and computing them like 1s and 0s into new combinations, "that [the wind] grinds up (calculates) the tangible, accessible ground into tiny grains, and scatters (dispenses) them, in order to pile (compute) them into dunes " (*Von der Freiheit* 61, my translation). Flusser's obvious statement is that the chaotic natural world as it has existed since before human influence relies on the same strategies of digital computation that also govern humans' technological inventions. This further implies, however, that humans in coordination with digital computer technology need only to comprehend and extend nature's particle-calculating power in order to create a second nature that really is natural as well as cultural, a cultural extension of nature. To harness the turbulent winds of chance and necessity is to intentionally sweep sand into dunes that would have occurred anyway, only much later.

Of course, from previous chapters it is clear that Flusser's crisis of science sees humans now doubting the eternal truth of nature's laws, as he suggests that the human scientific observer instead projects an invented order onto natural phenomena in order to explain them. It cannot be argued that Flusser was not fundamentally influenced by the burgeoning digital technology of his day

before suddenly noticing everywhere the digitality in the organic world around him. However, Flusser's theories have always been above all a product of his own social and technological context, a fact he not only does not deny, but on which he bases his most fundamental claims. What he never forgets is that four-, three-, two-, one- and zero-dimensional codes are still always present in culture simultaneously in different ratios at different times, and because the digital code weighs in heaviest at this fleeting moment in the universe, it is digitally that we must explore our creative potential and our changed relationship with nature, others and ourselves. Smooth continua and analog processes must be converted or read through digital lenses at this moment, because that is the type of tool most highly developed, and their creative potential is far from exhausted. Humans' digital skin is but one way to filter, process, conceptualize and manipulate information, one well enough understood to inspire the imagination as well as be practically implemented.

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