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4 — 19
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THE CHAOTIC SWERVE:
A LINE THAT TWISTS

20 — 25
MOHAMMED SALEMY

EIGHT THOUGHTS ON THE AESTHETIC
PHILOSOPHY OF LIGHT

REZA NEGARESTANI

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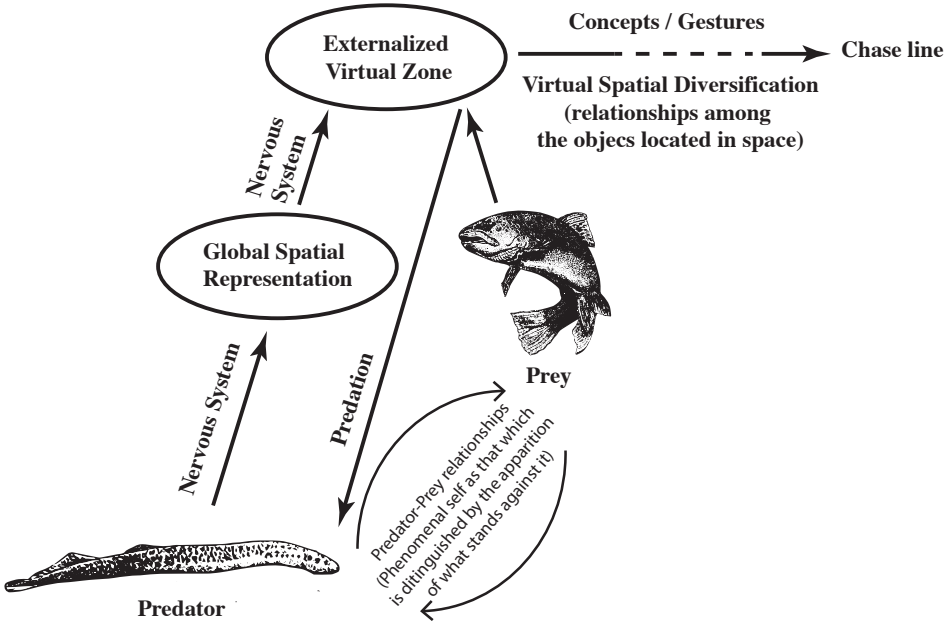
THE PREDATOR'S GAMBLE: THE CHASE

From the most puzzling question of evolution—how to differentiate oneself from the conceptless gulf of space, food, and the predator—the nervous system was born. We can call this evolutionary problem, "The predator's gamble and the prey's black box." Predation and survival, however, need not be associated with separate organisms of predator and prey. We can easily recall, for example, the rudimentary autophagic organism, a life-form that is its own prey. In evolutionary terms, the problem of autophagia is the result of an organism mistaking itself as its own food. In a nutshell, the organism treats itself not as itself but as something other than, for it is not equipped with a system through which the apparent distinction between the phenomenal self and the other can be drawn—even at the level of bodily integrity. To resolve this problem, the organism must be equipped with sensors and effectors capable of generating cues by way of which it can minimally distinguish itself from its environment. Such cues, however, were not fully realized until the Cambrian explosion that marked the transition from multicellular organisms to vertebrates. At the dawn of the evolution of vertebrates, and coinciding with the complexification of the nervous system, these cues were primarily sensitivity to light, sensitivity to the vertical gravitation of the earth, and the effectuation of muscular memory by, respectively, the eyes, the inner ear, and the muscular system.



As the eyes and ears of the prey or predator register the presence of something foreign, the eyes rapidly jerk from one direction to another automatically in a saccadic movement, enabling the organism to either fix its gaze in a new direction or detect the chaotic movement of a foreign body. The saccade —one of the most rapid bodily movements—sets the orientation of the prey (the smooth line of the pursuit). On the other hand, as an organ formed by the evolutionary pressure imposed by the earth's gravitation, the vestibular system of the inner ear can detect changes or deviations stemming from the inertial field.

As the predator registers the presence of its prey, it begins to compute the possible orientation of the prey by way of the saccadic jerk. It then generates the gesture of movement: the muscles are primed and place the predator in a chasing position (or, for that matter, the prey in the position of flight). This mobile deviation from the vertical gravitational pull is simultaneously registered and stabilized by the vestibular system of the inner ear, permitting the predator to form a dynamic yet stable chase line (a gesture of an embodied movement in space) to hunt the prey. This chase line, however, is not neutral, for it is the very neurophysiologically enabled abstraction that allows the predator to differentiate itself from its own prey and the surrounding space. In a sense, the escape from the conceptless exteriority of space—the undifferentiated void—requires drawing a neoconceptual abstraction of a line as a chaotic mobile unit. Wandering in space is tantamount to thinking about space. But more importantly, making new abstractions of movement coincides with producing new cognitive technologies for navigating space. Such cognitive technologies enable the extraction of various relationships that objects hold in space, and finally, derivate new concepts of space far more elaborate and expansive than the concept of space given to us by our senses.

The gamble of the predator is that the distinction between the self and the other (the predator and prey) is always a form of hypothesizing, even though it is made automatically and unconsciously by the nervous system. By drawing a mobile gesture of the line, the predator perturbs the black box, which is the given identity between itself and itself (the predator as its own prey). This disturbance of the black box generates an output that is not expected by the predator qua observer but also differs from its unconscious assumption regarding what is the case. The unfolding disparity between the act and the output object then forces the predator to see the black box—the prey—as something else, something that is contrasted with its act, just like a hypothesizing act, which can only be confirmed once it is pitted against reality.

LINE AS A CHAOTIC MOBILE UNIT: A GAMBLE WITH REALITY

Unlike the concept of the line, the nonconceptual line has no width. It bears no mark and enjoys no corporeal status. Whereas the Euclidean geometric line is immobile, the non-conceptual line envelopes a gesture of mobility or Heraclitan swerving. It is thus not of a purely mathematical or axiomatized form, but rather, a marriage between the messy problems of mobility (physics) and the intricate computational problems of modeling and navigating the environment or the surrounding space. Avoiding the thesis that this gestural line is indeed sufficient for thinking the problems of space and the differentiation of items that are in it, we can instead propose that the abstraction of mobility—rather than the abstraction of a continuous line—is that which is necessary to think about space. To appropriate Henri Poincaré's take on the hypothetical import of geometry for physics, we can say that if geometry is about the generalization of the concept of space, then creating new abstractions of mobility—or a mobile line—in geometry leads to the diversification and broadening of the concept of space, and hence, to the renegotiation of the relationships that objects stand with in regard to one another. This is nothing but the greatest achievement of mathematical physics: the further we modify and change our basic geometric concepts, such as lines,

points, and frames of reference, the more likely it is that we end up enlarging our field of experience of objects located in space. In this sense, the geometric constructability of the notion of the observer in physics can coincide with the renegotiation of the observed universe.

In Euclidean or classical geometry, the issue of mobility as the core problem of line is, however, repressed. That is to say, it is only expressed as an aftereffect of the line itself, but not as what effectuates the line and makes its abstraction possible. What remains from the originary gestural line as a mobile unit is only the absence of width or depth, that is, abstraction as an object but not an act. Yet, the mobility implied in a gestural line is, first and foremost, an abstracting act, not a final product of abstraction (i.e., the abstracted). If both the Euclidean concept of the line and the gestural line are widthless and depthless, it is because they are both the products of a process of abstraction. In the mobile paradigm, this abstraction is the result of an inconclusive or inexhaustible mobility as an abstracting act (mobility as that which precedes the hard distinctions between the abstract and the concrete, matter and form). Whereas, in the Euclidean paradigm, this ambiguous and erratic mobility is buried in favor of the concept of the line as both the abstracted object and the abstracting act. The intuition of mobility as that which draws a line is supplanted by the intuited

axiom, or the definition of the line made of a successive flow or transition between points, which only leaves a vestige of movement. But in so far as points themselves are defined in terms of intersecting lines, the definitions of both points and lines remain underdefined, if not undefined. The ensuing crisis of Euclidean geometry in the wake of modern (projective and non-Euclidean) geometry is the result of a long-endured repression of issues regarding mobility within geometry.

It is only when the problem of mobility is brought to the surface once again that geometry becomes a cosmological delirium in which the role of geometry as the organ of hypothesizing about the physical universe is canonized. The arrival of modern geometry, in this sense, is marked by a thoroughgoing reconfiguration of the concept of space in terms of gestural mobility (for example, a line is now defined in terms of bundles, vector spaces, and more generally, *moving frames of reference*, to use Élie Cartan's phrase). The implications of this reconceptualization are immense. In the fields of geometry and topology, we can now differentiate between local and global structures where local structures are Cartesian products of a family of topological spaces, and whose global structures may completely be different in terms of the topological structure. In the latter case where the global structure is topologically different from its local structure, we are dealing with a twisted

connection between the local and the global; the small local regions of *E* or total space are no longer equivalent with the product *B* x *F* (i.e., the base space and the fiber, which can be intuited as how points or small local regions are glued together in order to make a global structure). To this extent, a torus can be said to be a trivialization over bundles, since the global structure, the whole of a torus's space, is similar to its local regions/ structure. In other words, the global is merely produced by the association of sections or local regions. In a more technical sense, regions or sections of *E* behave similarly to the projection map from $B \times F \rightarrow B$. Whereas, in the framework of nontrivial fiber bundles, this simple connection between the global and the local does not work. *E* is not just *B* x *F*. The map between the total space and the product space is endowed with a global twist.

The noetic richness of this conceptual revision of space is by no means restricted to modern geometry and topology; its upshots also reach physics and philosophy. What does it mean to rethink the notion of space in physics so as to see the universe as an unfolding expanse? What does it mean to rethink the legacy of universalism where the universal is no longer a free association between local situations or a grand universalizing formula imposed on local contexts and strictures? In the first case, the disparity between the phenomenal representation of space and space as a species of abductive

reasoning or hypothesization results in a renewed notion of the observer, one that is mobile, uprooted, and adrift. To this newly modeled observer, the universe does not appear as a pure outside or a Kantian conceptless exteriority, because the observer's frame of reference is not anchored. The universe of this observer knows nothing of the outside and inside, for only a moored phenomenal observer sees the universe outside of itself. The drifting observer, which has a mobile frame of reference, sees not only many universes under the banner of a universe (a multiverse is just a perception of how universes are glued to one another under the rubric of one or the multiple), but also how the given configuration of the phenomenal inside and outside (the experiencing subject and the constraints of reality, spatial and temporal experience, and self and the other) breaks apart and reveals itself as a process, rather than a totalized state of affairs. The same pronouncements can also be made in terms of the legacy of universalism. A revamped universalism does not bottom out in the free association between localities or particularities of human experience, nor does it begin with a pre-determined formula of universal or global features that should be extended to all particularities, situations, and contexts. Both top-down and bottom-up approaches, micro-localism, and classical universalism are shunned in favor of a universalism that is context-sensitive and attentive to local stringency but,

nevertheless, can think coherently about how the integration of such localities or particularities are not merely equivalent to the sum of their associations. The task of the universalist project is then understood as making concrete the undergirding connections between particularities that are only identified as particularities by virtue of participating in some general traits, behaviors, and characteristics. Yet, they are nevertheless unconscious of these generalities that inform their very perception of their particularity. The global twist, in this case, is an epistemological twist: the global conditions of the possibilityof experience have different structures than the particularities of the human experience, and even more significantly, one cannot have any particularity of lived experience without such a global condition. The question of universalism as a task then becomes the question of how to integrate local or particular experiences of the world and being a person, according to the concrete elaboration of the general traits shared among all who can be counted as a person epistemologically and axiologically.

A REMOBILIZED LINE, A RE-EXPERIENCED UNIVERSE

As mentioned above, even the Euclidean line has an implied mobility. It is just that this mobility is no longer prior to the definition of the line. It is rather the product of prioritizing the object of abstraction (line) over the act of abstraction (mobility). This prioritization of act over its object turns out to be a source of unresolved issues in Euclidean geometry, such as the enigmas wrought by hyperbolic and elliptic geometries: imagining the parallel lines curve away from or toward an intersecting point. Or for that matter, the redefinition of the concept of space: Is space given to an observer in its entirety (as a whole), or is it given in discrete steps (as parts)? This crisis is, of course, not limited to the field of pure geometry. It also has consequences for physics. If we structure the world by mathematical objects, then the redefinition of an even basic element such as a line can have massive consequences for how we perceive the world. The questions, such as the observer encountering the universe in terms of an inside and outside, or the issue of the exact relationship between an idealized observer and the observed universe out there, are effectively canceled as pseudo-problems engendered by wrong geometrical models once we redefine

elementary geometrical objects. This is not, by any means, a positivistic thesis. We no longer suppose that there is a fundamental identity relationship between basic mathematical structures and atomic observational data. All we can assume is the hypothetical status of mathematics, and geometry in particular, with regard to the furniture of the world. In moving away from given identity relations to hypothetical relations, we have no choice other than to take the correlation between a geometrical model and physical reality as a metastable or negotiable link. Both the geometrical model and the picture of the universe can change at any time if we come up with new geometrical hypotheses supported by new data within an acceptable threshold of confirmation. Of course, this is not a straightforward solution. The data, the hypothesis, and the threshold of confirmation are all thorny problems. How much data is required to support a given hypothesis? How can a geometrical model become a hypothesis for a given set of data about the world? These are not the questions that can be answered by fanatics in either physics or mathematics. Any form of hypothesization requires an account of sensory processing, rules, the criteria of admission of rules, and the objectively agreed-upon threshold of confirmation for a particular hypothesis, given thus-and-so variables.

Having addressed the problems of the geometrization of the physical universe briefly, we can now ask: “So what happens when we shift from Euclidean concepts of geometry to those of modern geometry?” Do we see the universe in a different light? The answer is, emphatically, yes. The shift from the line or point as abstracted objects to apparitions of mobility as what begets such elements as lines and points was a decisive turning point in geometry. If it is the mobility that plays the role of an abstracting act, then if we reimagine this act, if we see the mobility as an erratic form-cum-matter, then we can correspondingly think of how matter is organized in a new vein, how objects can stand in new relationships with one another, and how space can be articulated as whole, but not a whole that assimilates all its parts (just like a line that is at once a flow between individual points and is irreducible to the successive transition between points).

To this extent, the question is simple: What happens if we revive implicit mobility in the concept of the line? What kind of universe do we see if we decide to bring the repressed mobility of a line or a point to the foreground? What kind of worlds can we make if we choose to not abide by the given objects of abstraction but to adopt new abstracting acts, new forms of mobility? In so far as we hypothetically observe the universe based on our geo-mathematical models, does a modification in our geometrical models lead to changes in how we see the

universe? The answer is yes. The main thrust of modern geometry is that of bringing back the problems of mobility as the abstracting act to the central concerns of geometry. To reinvent what is geometry by renegotiating what is mobile and how it can be diagrammed is the very core of today's mathematical physics.

In the Euclidean paradigm, the line was nothing but a uniform flow between successive points. Correspondingly, points were the circular products of lines. But what if we see points in terms of vector spaces? The line regains its mobility since extending from one vector to another requires, more than anything, erratic mobility, not the unbroken shift between Euclidean points. The reconciliation between algebra and geometry paved the road for a new definition of the line. What if the line does not move uniformly from one point to another and instead twists and bends according to the constraints imposed by vector space? Here we have two different species of geometrical elements: those that have suppressed their mobility and those that have assumed mobility as their abstracting act. To this extent, we have basic geometric elements such as points and lines. In the first paradigm, all we can produce or abstract are self-similar, namely trivial objects. Take, for instance, a cylinder. You can easily generate a cylinder by rotating a fiber (a hairline section of the cylinder) around its vertical axis. But what about exotic objects such as a Möbius band or a Klein bottle, where

there is no identical relation or canonical symmetry between the line (the product of abstraction and the mobile act of abstracting, i.e., a gestural line that can assume different orientations).
In such exotic entities, we always have a global twist, meaning that the produced object is never similar to the act that begets the object. In other words, in terms of these exotic objects, we are dealing with a twist: the act of making an object is asymmetrical to the object begotten by that act. One might see a cylinder at space1 and time1, but at the time-spacen+1, there is only a nontrivial fiber bundle such as a Möbius strip. In this global twist, the world that appears to us does not reaffirm itself. Instead, it goes through a radical change only to reconnect with itself. Within such a model of the world, all phenomenological perspectives are only local perspectives, the totality of which characterize the very twist whereby the world as *the unconditioned* connects with itself. The universe, more than anything, is a potential for various oblique navigational routes. To talk about reality without oblique approaches is somewhat a betrayal to the ideal of reality.

It is only in the above sense of the aforementioned twist that we can make sense of Daniel Young and Christian Giroux's work. Making a toy model of a roller-coaster (of thought, of abstraction, and of physics) is not by any means a form of averting the issue of mobility, but to see it as both a primary abstracting act in the order of geometrization and a problem that cannot be resolved until and unless it is rendered commensurate with the erratic problems surrounding the question of mobility. But to describe *Film Path / Camera Path with under-titles* (2019) as a toy model is not to suggest that it is indeed the model of the world with a global twist, but rather a model of a model, or a series of models and perspectives. For every model can be either a model of a real phenomenon or another model. In this case, what we are encountering is a pluralistic toy model of other models, a geometric filmic montage pieced together—in the manner of a Tinkertoy—from various models and local phenomenological sections. In this setup, the camera is, more than anything, a virtual observer that gestures toward a model of the world in which the shift of models or perspectives and their frames of reference build a new world-version: one that is mobile yet stable, locally self-similar but globally not.

MOHAMMED SALEMY

EIGHT THOUGHTS ON THE AESTHETIC PHILOSOPHY OF LIGHT

1. Temporality is bound by light. If time is not tangible and only an emergent effect of motion, by being the phenomenon that sets the speed limit for motion, light is an integral part of time and temporality. The opposite of light is not darkness but gravity. According to Einstein, cosmic time-space relativity is rooted in the invariability of the speed of light; thus, both space and time must be flexible and relative to accommodate the absolute sovereignty of light via time. By being the ultimate decider of the realm of temporality, light is also self-appointed as the arbitrator of space, and while darkness is visually boundless, light sets the horizon of imagined space.

2. Light germinates life, energy, moving, seeing and being on Earth, in that order. Life on Earth stemmed from the interactions between sunlight and its surface. Light fuels the growth and movement of plants against the grounding force of gravity. Conversely, plants and animals are depositories of light conserved as energy. Thanks to technology, today solar panels convert photons of light from the sun into electricity by exciting electrons in silicon cells, altogether saving light from entering the torturous cycle of life on Earth to become energy.

3. The entire visual sensorium of the animal kingdom vital for reproduction and survival was evolutionarily developed around the presence and absence of light. Almost all species of animals share the basic visual sense perception and cognitive processing that coordinates *seeing* with *moving* and, essentially, *being*. This trinity has light and time as its yin and yang, as light essentially regulates seeing, moving, and being in time. In respect to sexuation, seeing is the precondition for the production of visual sexual desire, mate selection, and the subsequent coupling across many species of animals. Thus light, vis-à-vis seeing, contributes on another level to the proliferation of sexual desires and subsequently animal life on Earth.

4. It is not surprising, then, that in addition to completing the cycle of life on Earth, light creates a second order of life (second life) in the form of images. Long before the emergence of painting and the invention of photography, this second life was manifested by shadows, which trace the multi-dimensionality of matter in two dimensions as a moving one-bit image (zero/one, dark/light). Light produces contact images from the physical and chemical interactions between itself and the surfaces it hits over time. If this is not sufficient, think of reflective surfaces like water, mirror, and steel and how they are transformed by light into an immediate photo-copy of the world. This is the brief history of the life of the image.

5. Images can be considered an artificial and automated form of life because their life-like proliferation and reproduction depend on light. This is valid not only because seeing precedes the production of mental images for those who possess vision, and also for those who have lost their vision, but also because both analog and digital photography, even to some degree X-ray and other electromagnetic types of imaging, are more or less impossible without light. Needless to say, looking at all photographic and printed images also requires the existence of light.

6. Cameras are like clocks for measuring space in their own terms. And like clocks, they are more than merely a measuring instrument. Just like how quantifying time with clocks proliferates new temporalities on many planes, quantifying space with cameras also engenders new forms of spatiality. If the invention of the clock was the insertion of an artificial form of cosmic temporality—as measured time—into the logic of human affairs, the invention of the photographic camera was the expansion of the logic of light and reflection back into the existing lucidity of light-addicted human society. Later on, and resulting from the amalgamation of the camera and the clock via cinema and television, the moving image became the literal expansion of the existing life-forms on Earth and not just their representation.

7. Photography and cinema together helped shape the modern world by standardizing how it ought to look. The spread of images from around the world in the late nineteenth century fuelled the imagination behind the development of cities, societies far away from places where most images were produced, in a way acting as a meta form of transmittable architecture and influencing, perhaps even standardizing, the appearance of infrastructural projects around the world. This automating function of photography is why, instead of the mechanical reproducibility of images, Benjamin really should have probed deeper into the auto-motive function of photography, recognizing it not only as the proper operation of the medium in art but also its multiplying power in the expansion of life, both real and artificial, via the replication and dissemination of images.

8. Since light precedes life, it must also precede subjectivity; it is not our subjectivity that produces our perception but light and its offspring, photography. Thus, a photograph does not present us with a picture of the world but the process through which the power of light turns the corpse of the supporting material alive. If our thoughts on light, life, image, and photography are nontrivial, it is because they can be utilized toward setting photography free from moonlighting in the service of mere mimicry. Photography's liberation from representation, as Françoise Laruelle contends, has significant ramifications for art in general: "If photography liberates painting, it does not do so by occupying the most dismal real, abandoning the imaginary to painting; on the contrary, it does so by showing painting that what it believes it paints is a false real, and in dissolving the prestige of perception on which painting believes it nourishes itself. In freeing itself from the real, photography frees the other arts." [1]

1 Françoise Laruelle, *The Concept of Non-Photography* (Falmouth: Urbanomic, 2012), 122.

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