Beyond Error: Philosophy of Indeterminacy in the Age of Algorithms

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Introduction

Since around 2001 I have been experimenting with uncommon modes of perception which foreground a blurry, amorphous, plastic sense of entanglement with the environment, a kind of proto-autistic way of perceiving the world as indeterminate and inseparably part of oneself. This is at odds with predominant ways of perceiving and thinking the world as split in endless categories, forms and functions, which I find part of a problematic regime of perceptual reduction.

Predominant commonsense notions about space, time and movement are biased by the Newtonian, mechanistic tradition and by a mode of vision invented in the Renaissance: linear perspective. These have installed in us the belief that we inhabit a homogenous, linear and measurable world in which bodies follow causal trajectories. When expected alignments are not met, error appears. Common sense still lingers in this kind of perception, but things have moved beyond with Cybernetics' and Information Theory's embrace of a complex and unpredictable world.

Since the birth of Information Theory, the field for conceptualizing error opened up problematically: Claude Shannon's *Mathematical Theory*

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of Information and Norbert Wiener's *Cybernetics* embraced around 1948 a post-Newtonian and unpredictable world in which trajectories were no longer known in advance. More sophisticated and dynamic systems were elaborated that could constantly readjust to the changing movement of the world, in the ongoing attempt to measure, predict, reorient, modulate and control it.

In Information Systems and Cybernetics, error is no longer the deviation from a predictable trajectory, rather, error appears when a system is not capable of generating patterns from the noise of information: ambiguity and indeterminacy are the new threats. But even if Information and Cybernetics are largely about dynamic anticipation of the changing future, they are still grounded on old modes of framing perception and movement. The fundamental frame in this regard is still the one enacted around 1436 in Florence with linear perspective. Digital interfaces today are still remarkably indebted to the highly rigid sensory organization that perspective orchestrated: the fixed point of vision, the erasure of multisensory movement and a discrete manual-visual kinesthetics.

This is what I will call an algorithmic organization of perception that operates by reducing the intrinsic ambiguity of multisensory movement and by establishing a rigid sensory hierarchy, subjected to an equally rigid geometry where movement can be segmented, quantified, calculated, codified and recodified. One can find even earlier examples of such organizations, for instance in urban grids since ancient Greece. They are part of what I call the Algoricene, the era where algorithmic organizations of movements, perceptions and bodies become dominant.

The Algoricene is a reductive sensory regime which is at odds with the highly plastic ways in which multisensory movement underlies most of our experiences. I will attempt to claim the intrinsic ambiguity and indeterminacy of multisensory perception and movement as necessary for a livable life and as important political claim within smart ecologies of control that are grounded on its reduction. One could exemplify the problem I am posing through Catherine Malabou's (2008: 12) distinction between neuroflexibility and neuroplasticity, where the former implies passive adaptation to the continuous reorientations imposed by smart ecologies of control, based on interfaces that reduce the perceptual spectrum, whereas plasticity has the capacity for creation and dissolution, as well as for resistance and reconfiguration (Hayles 2012: 101), which I relate to a widening of the sensory-motor spectrum.

For my proposal to reverse the mechanistic approach to movement based on fixed external viewpoints, I will expand on proprioception as a sense of internal movement of the body. My focus turns to proprioception because it is a highly diffuse sense which needs no external reference, you are always inside it, it is thus the opposite to perspective, it exceeds localization, it is multimodal or transmodal, as it integrates all other sensing modalities in the body's capacity to move, it's barely conscious, always in motion, and also relational.

My proposal for a radical movement philosophy, as one that gives a fully positive account of movement's complex indeterminacy, will take proprioception as the main reference for how perception, movement and bodies operate, thus inverting the mechanistic tradition (based on fixed external observation points). Proprioception will afford means of thinking indeterminacy as a fully positive openness whose reduction also implies a reduction of our cognitive-affective plasticity.

Expanding on Brian Massumi's suggestion to use 'proprioception as the general plane of cross-referencing' in elaborating 'technologies of emergent experience' (Massumi 2002: 192), and of recomposing the *peaks of experience* (Massumi 2017), I want to suggest that what is at stake is to *create less defined peaks of experience, less directed and reductive modes of perception* than those which dominate in the Algoricene. Erin Manning's notion of autistic perception (Manning 2016), as the perception that is open to the uncategorized, will be another cue for thinking perceptual-cognitive indeterminacy. This implies claiming *neurodiversity as plurality* of perceptual modes, whereas neurotypicality is the alignment with dominant and reductive modes of experience in which movement and thought follow linear paths.

I will also propose to reverse the predominant tradition, and its thrust to reduce indeterminacy, by turning to an ancient preplatonic concept from over 2500 years ago of the Milesian philosopher Anaximander: the *Áperion*, or the undefined, as principle of all things, and as principle for justice. I will propose to reframe this concept in contemporary culture in the attempt to assign to movement's indeterminacy a positive value. This implies shifting from ontology as the theory of being, to an *Apeirontology* as theory of becoming in which movement's complex indeterminacy is proposed as sole a priori.

The central concept for this proposal will be *Metabody*, as a way of thinking our worlds in terms of highly complex fields of movement

relations defined by greater or lesser degrees of indeterminacy. A metabody is an indeterminate field of proprioceptive relations that I will call the proprioceptive or alloceptive swarm. Metabody is an invitation to contemplate the greater or lesser degrees of indeterminacy of our ecologies, as well as their problematic and complex alignments. Thus I will ask: Why is it that in some circumstances movement's potentials are highly foreclosed so that certain prescribed or predictable trajectories impose themselves, leaving little or no room for other potentials, as in power relations or in performances of social normativity? Likewise, how is it that in other situations there is a greater indeterminacy at stake that allows movement to emerge with lesser subjection to lines of foreclosure, as in some creative activities, in some dancing or music-making or sexing or walking where movement may proliferate in excess of dominant alignments? The charge of indeterminacy of an ecology will be its measure of openness.

Power and domination are the reduction of indeterminacy. Opening up dominant alignments that reduce indeterminacy will imply hacking and opening up to indeterminacy the reductive organizations of movement and perception underlying different kinds of domination. This implies hacking the hidden matrices that orient perception and movement. Ontohacking is the pragmatics I propose to open up to indeterminacy any reductive perceptual organization. Ontohacking addresses the 'ontological force' of media, their capacity to choreograph relations, perceptions and thereby shape our ecologies and worlds.

I will refer to a number of projects of perceptual, bodily and artistic experimentation from which many of the concepts here proposed have emerged over the past 15 years, feeding back on the practice in return. I will describe my own experimentation with multisensory interactive environments whose intrinsic characteristic is perceptual ambiguity. Along the way, I propose a double reversal of error, from being the collateral damage within an established causal field, through seeing how its status has already changed in hypercontrol systems where error is the system's incapacity to anticipate novelty, to proposing movement ecologies where indeterminacy reigns as positive value.

Considering life as movement toward greater indeterminacy implies that negating indeterminacy is a nihilistic move. A radically plural culture will be a culture of perceptual generosity, a neurodiverse[1] culture that does not impose reductive perceptual ratios, one where varieties of cognitive-motor ratios other than logocentric reason can coexist. Such

plurality of perceptions is more urgent than ever in a culture of Technological Singularity[2] that is based on an unprecedented and accelerated homogenization of perceptions conquering bodies in all scales, from atoms to the planet and beyond. Digital technologies, big data systems, and 'Smart' ecologies, are grounded on sensors and interfaces that orient our movement by reducing our sensory spectrum, so that we constantly readapt to a changing ecology whose aim is to predict and anticipate future behaviors. As resistance to, and in excess of, that thrust to control based on impoverishing experience, I propose practices that mobilize an ever-greater richness of multisensory movement.

From Error to Ambiguity (1st Reversal of Error)

Philosopher Gilles Deleuze spoke in his *Postscript on Societies of Control* (1990) about the turn happening in the second half of the twentieth century from disciplinary societies,[3] which were about organizing bodies in more or less stable patterns of behavior, to societies of control, which are about continuous modifications of the environment enacted by Information Systems as they readapt constantly to a changing world, in the attempt to better capitalize and control the novelty that is continually emerging.

Nowadays, Information Systems do not operate merely at a local level of desktop computers, but of planetary-scale computation systems, billions of sensors, big data and the 'cloud'. In such systems, the dynamism of the algorithms and the way in which they constantly change the environment points to a hypercontrol that attempts to not only measure the known but to anticipate the yet unimaginable future. Hypercontrol is about predicting potential movements, behaviors and desires, so as to capitalize on them 'on the fly', as they emerge, before they emerge, preempting the future. At least since the turn of the Millennium, but more broadly since the birth of Information Theory and Cybernetics in 1948, the new logic of power, or as philosopher Brian Massumi (2015) calls it, ontopower, focuses on potentiality, on the infinite field of the yet unknown, rather than limiting itself to the field of the known.[4]

Within older disciplinary regimes, the imposition of repetitive behavior patterns in the bodies could be resisted through deviant behaviors that generated new, perhaps more dynamic patterns. But the production of new patterns has become a cornerstone of current regimes of hypercontrol. With this as a background, this chapter addresses a key

question: How can such a power be contested, resisted or escaped? Within disciplinary and mechanical regimes, error was the malfunction in a deterministic causal system. With the advent of Information Systems, error in communication, as the noisy or unpredictable, became subject to new techniques of capitalization. A crucial revolution in this regard was enacted in Claude Shannon's *Mathematical theory of Information* from 1948. Shannon inverted the traditional relation between information and entropy and affirmed that more entropy implies more information. Chaos or noise became conceptualized as disorderly presence, overfull of potentials that need to be turned into patterns. Shannon, being an engineer of a communications company, understood the importance of capitalizing the new in communication.[5] A revolution in power was thus enacted, opening up the way to ontopower.

In parallel, Norbert Wiener's attempt to predict the flight of German airplanes during the Second World War resulted in a theory of control and communication called *Cybernetics* (Wiener 1948), which introduced a novel dynamic model of feedback, based on his algorithms of movement prediction, in which measurements of movement can readapt to changes, as a kind of mobile grid or topology in continual feedback with the changing world.[6] Shannon, from the standpoint of the consumer-oriented corporate world, and Wiener, from the standpoint of state-military related research in the Second World War scenarios, established the foundations for new dynamic control systems, which acknowledge the fundamental indeterminacy and dynamism of the world while trying to reduce and control it.

Nowadays, noise and unexpected behavior, as long they can be turned into a pattern, can be capitalized in the new logic of data economy. This implies making the ambiguous unambiguous, making patterns out of noise and fuzziness. What dynamic computational systems of pattern-making allow is an unprecedented dynamism not only in looking for pre-existing patterns, but in producing novel, yet-unthinkable patterns and by projecting them onto that noise, on its movements. Detecting potential vectors of movement allows to anticipate emergent behaviors by producing new patterns that orient future movements, in a constant reattunement of the ecology. This is what goes on continually in 'smart' ecologies of control, where modulations operate within the highly reduced spectrum of algorithmic movements of the interface.

In such dynamic systems, there is no strict preconception of what an error can be, instead the systemic error will be in not being able to reduce ambiguity to patterns. Chaos, noise, ambiguity, entropy or indeterminacy is considered a presence that needs to be reduced and capitalized. This leads to a radical *reconceptualisation of error itself*: error appeared first as the effect of closed causal systems (static algorithmic organizations) and of expectations that follow predictable or prescribed trajectories. However, the onset of Cybernetics and Information challenged this notion of error as its conditions (closed causal systems) dissipated within dynamic information networks. Since then, error is no longer the deviation from a known trajectory, but the incapacity to predict or orient emergent deviations, to make patterns out of movement by adapting the system to potential vectors. Error is thus in the system's incapacity to change and readapt.

Pattern vs. Movement: The Algoricene (Or the Invisible Matrix of Reduction)

I suggest that the fundamental operation for reducing ambiguity is the reduction of movement to patterns. This reduction is the effect of sophisticated geometries that have organized bodies and their environments throughout millennia, allowing us to frame and fix portions of the moving world.

Movement is not a priori a pattern. Movement needs to be framed in order to segment it and turn it into a pattern. Framing movement is an ontological gesture that eliminates its essential ambiguity and indeterminacy.[7] A pattern or form is a provisional fixation of movement at two levels, of what you see, and of how you see, of perception itself. I will approach this reduction through the notion of the algorithm understood as a codified sequence of discrete movements (steps).

Both static causal systems and dynamic prediction systems rely on highly sophisticated sensory organizations that attempt to fix, frame and calculate portions of the world. The reduction of movement's complexity to algorithmic, calculable patterns relies upon sophisticated organizations of movement and perceptions that have been going on for millennia. Algorithmic organizations had a first series of systematic abstractions in Greece, with the grid, the sphere and Euclidean geometry orchestrating

Fig. 1 Engraving by Albrecht Dürer showing a perspective machine, ca. 1525 (OASC, Public Domain—Metropolitan Museum of Art)

perceptions and bodies. These underwent a revolution in the Renaissance when linear perspective conformed an algorithmic geometry of perceptual rationalization, based on a fixed point of observation in relation to a frame (see Fig. 1). Newtonianism and Cartesianism, biomechanics as well as the dominant traditions of movement analysis, from the Weber brothers in the nineteenth century[8] to 3D motion capture nowadays, entirely rely upon the fixed point of vision of linear perspective. Current digital interfaces are still based on that principle, which eliminates movement and the multisensory spectrum of experience.

Algorithmic organizations underwent a second major revolution as grids became dynamic with the advent of Cybernetics, Information and Computation. We are now in the midst of another revolution, as algorithms and computation systems in big data culture become emergent, ubiquitous, hyperconnected and mobile. Current digital infrastructures multiply points of capture through billions of interfaces and sensors that frame portions of movement and segment it in highly dynamic ways.

Algorithmic ecologies, societies, perceptions and citizens have thus been around over long periods of time. We inhabit a complex architecture of grid-like structures and other geometries that were systematized, possibly for the first time, in the Hippodamian grid, the urban grid or gridiron, over 2600 years ago. The Algoricene is the name I propose for the era in which such algorithmic formations traverse and format all levels of the social body, acquiring increasing complexity.

Apeirontology and Radical Movement Philosophy: Movement from Within (2nd Reversal of Error)

As we have seen, the fundamental malfunction in Information Systems is not the deviation from a given pattern, but rather the incapacity to generate patterns out of ambiguity or indeterminacy. In Information Systems, indeterminacy is the 'enemy within'. I will now attempt to invert the negative value of indeterminacy as lack of form, as disorderly presence that needs to be ordered, to indeterminacy as openness and as necessary condition for a plural culture, one that affords the creative co-emergence of its movements, relations and bodies, rather than imposing on them a ratio of organization, calculation and reduction.

For this purpose, I will turn to an ancient preplatonic and pre-parmenidean concept, the *áperion* from the Milesian philosopher Anaximander. The *áperion* as the boundless, qualitatively infinite, undefined or indeterminate is proposed by Anaximander as principle (*arché*) of all things.[9] This notion of an indeterminate (cosmic) principle resonates with diverse western and non-western cosmologies[10] and mythologies, which leads us to another crucial term: *chaos*, which in the old Greek etymology is understood as *opening*, as in the beginning of Hesiod's Theogony.[11] We see here how *ápeiron* and *chaos* had a positive meaning as indeterminate and open principles. These resonate further with the epicurean concept, brought to us by Lucretius,[12] of *clinamen* or implicit microdeviation of atoms from any trajectory, as that which accounts for novelty and freedom in the world.

This mild homage to ancient philosophical concepts is strategic in placing the origin of causal, formal thinking as historically contingent, indeed anomalous. I want to suggest that the positivity of indeterminacy as openness in these ancient concepts relates to an understanding of movement that was not yet fully contaminated by the emergent logic of fixity and form introduced later by Parmenides, Plato and Aristotle as part of the articulation of mature slave societies, grounded on increasingly abstract hierarchical organizations and dualisms. The reduction of indeterminacy would be part of the articulation of slave societies and power regimes, not a universal condition of life.

In order to expand on these positive conceptions of indeterminacy and movement, I will propose to invert the traditional mechanical tradition that segments movement observing it from fixed external measurement

points and propose instead to think movement from within: from proprioception. Proprioception, as noted earlier, is the internal sense of movement of the body.[13] Its nebulous and swarming character resonates with how bacterial colonies, the weather, currents, flocks, plasmodiums and numberless other phenomena move. Proprioception emerges from the non-linear connections happening in the body between billions of internal sensors configuring vague sensations, mostly exceeding rational consciousness. These sensations actually relate to all other sensing modalities, as the nature of perception is always crossmodal or transmodal. I call this the *transmodal sensory continuum*.

I conceptualize the blurry and non-linear nature of proprioception as a *proprioceptive swarm*, a dynamic and indeterminate cloud of emergent microperceptions that conform a sort of quantum field of perceptual indeterminacy at the core of the most subtle, intimate, unavoidable and evanescent of our bodily experiences. But proprioception is never a bounded inside, it is always expanding in relation to an environment and across sensing modalities. I will thus also speak of the *alloceptive swarm* as the emergent, always more or less indeterminate nature of bodily experience, where allo- implies a relational becoming that is open to indeterminacy, an alien otherness which is undefined.

Think of your internal movement sensations or proprioceptions, where are they located, right now, in their molecular swarming? Think of fluids and elastic bodies such as muscles or tissues, of insect swarms and of relations of movement in ecologies with no immobile elements. Think of clouds or nebulae, or of bacterial colonies. As soon as we move outside the narrow field of fixed, single point of vision in relation to a gridded frame, i.e., from perspectival vision, it is hard or even impossible to reduce movement to single trajectories with precise starts and ends, nor to displacements happening within a given space. What all these examples are pointing to is to a conception of movement as fields, or a general Field Theory of movement, which I call Radical Movement Philosophy and in which proprioception appears as the trope for field-perception. Fields consist of internal distributions of movement-force relations, this is the arché-proprioception of any movement field, which senses itself as it changes internal force distributions in relating to a world, thus sensing the world in the same act, and in transformation.

What algorithmic environments have done is to freeze the proprio-/alloceptive swarm by imposing exo-referential geometries as cues that orient movement. The ever-changing relations between sensing

modalities that constitute every perceptual action (*transmodal sensory continuum*) become fixed into a rigid hierarchical organization through models like perspective. Smart ecologies of control have problematized this further by multiplying points of capture in dynamic networks. How to resist such a dynamic capture? The multiplicity of internal tensions, microtorsions, microsensations of pressure, touch, temperature, elasticity, etc. that the body *vaguely* feels, *almost* imperceptibly, *nearly* consciously, in its continuous micro-motions is particularly useful in understanding the irreducibility of *felt* movement to neatly defined patterns and trajectories.

My proposal expands on neuroscientist Francisco Varela's[14] account of embodied and enactive cognition in saying that not only cognition emerges from movement relations with an environment, but that the entire ecosystem is also made of movement relations. We co-create our ecologies with our movements, and this may happen in very different ways; some more open or plastic than others. The degree of sensory plasticity of a body and an ecology can be analyzed in terms of how open and plastic the alliances between sensing modalities occur in any given experience or in relation to particular affordances. Perspective imposes a closed and rigid hierarchy of sensory organization based on a fixed, external, geometrically positioned observer, but in most of our experiences, senses cooperate in less rigid manners, and we can explore and expand the plasticity of those transmodal connections.

For example, in the action of holding a glass there is a unique and variable cooperation of senses of touch, pressure, equilibrium, temperature, vision, etc. In every experience, senses cooperate differently and in motion, as suggested by Alain Berthoz (1997). The variations of those sensory micro-movements across sensing modalities are eventually the very core of experience in its ongoing and infinitely subtle qualitative change.

The rigid and fixed sensory hierarchy of perspectival vision appears as an extraordinary anomaly, a true regime of perceptual reduction, affording a calculable and algorithmic account of the world by orienting bodies to geometric affordances of capitalization and control thus negating the fundamental value of indeterminacy and plasticity for sustainable, bottom-up, creative ways of living and co-creating our worlds. This way of capturing attention, which Hayles (2012) calls hyperattention, relates to what Catherine Malabou (2008) describes as adaptive neuroflexibility, as opposed to creative neuroplasticity.

Summing up, my proposal of a Radical Movement Philosophy not only takes movement as the only a priori (rather than form), but it elaborates a positive thinking of its complex indeterminacy and does so by proposing an alternative way of thinking movement, not from the fixed external point of vision of perspective and mechanism, but from within, starting within our own proprioceptions. I do this by conceptualizing proprioception as a quantum-like swarm of emergent microperceptions moving across a *transmodal sensory continuum*. Taking proprioception as main plane of cross-referencing for experience, as Brian Massumi (2002: 192) suggests, means rethinking the body and its environment not as an already defined field populated by defined things, but as a field that emerges a priori from molecular swarms of perception.

'Metabody' is my concept for rethinking bodies, environments, ecologies and worlds of any kind in a bottom-up and nebulous way, through the trope of the alloceptive swarm. A metabody is a field of movement relations that is primordially emerging from the complex dynamics of molecular swarms of microperceptions. It is about rethinking any reality in that way, but especially our own perception and relation to ourselves and the world. Subatomic particles, bacteria, insects, the weather, but also our bodies or social bodies, can be rethought as alloceptive swarms, as metabodies.

What this concept proposes is to look at the movements underlying what we usually perceive as fixed (including our own perception) and to look at the degrees of indeterminacy of each field of movement relations. The charge of indeterminacy will be the measure of openness, sustainability, freedom or health of an ecology. Openness means capacity to compose, to affect and be affected, sensitivity. Reduction of indeterminacy in a metabody will be associated to domination and violence.

What characterizes a particular *metabody*, a field of movement relations, is its degree of openness, of relative indeterminacy that allows movements not to follow predictable trajectories, maximizing indeterminacy, and the lack of goal: the only 'goal' is to sustain indeterminacy. By focusing on proprioception and paradigms such as the swarm, we may rethink the (meta)body as a field of movement relations that may sustain high degrees of indeterminacy without having to follow the abstract logic of certain geometries. We may thus complicate the reductive, mechanistic notion of trajectory and look into the multiplicity of blurry orientations in which proprioceptive movement proliferates, and its capacity to deviate from any given lines of reduction and domination. This implies a second

reversal of error. The first one implied considering indeterminacy as disorderly presence that needs to be capitalized, where error, instead of being the deviation of a predicted trajectory, becomes the system's incapacity to change and readapt to deviations. The second reversal is in considering indeterminacy not as disorderly presence that needs to be reduced to patterns, but as degree of openness of an ecology that need to be sustained and maximized.

Indeterminacy is not an absolute term, there is no absolute indeterminacy, rather, every ecology will express different degrees and modes of indeterminacy. There is neither pure order nor pure disorder in nature-cultures, it is always about degrees along an *indeterminacy continuum*. This implies doing away with the dualistic vision of order/disorder and consider our worlds as always more or less indeterminate and metastable (neither stable nor unstable). My reversal further points to highlighting indeterminacy as necessary constituent of ecologies, as measure of their *openness and aliveness that should be sustained or maximized rather than reduced*. Then there can be no error. The problem is in reducing movement fields to causal lines defining a teleology, bringing about the idea of error in consequence.

Ontohacking and Minor Ecologies (Or How to Sustain and Maximize Indeterminacy)

I will now inquire into how to cultivate proprioception and its complex indeterminacy. I propose a two-way approach. I will describe bodily perceptual experimentations which I have been developing over the last 15 years, and from which many of my concepts have emerged. In these practices, one can find techniques that on the one hand awaken a swarm-like sense of proprioception, and on the other undo or open up the dominant alignments which have reduced the plasticity of multimodal sensing.

Ontohacking is proposed as intervention in the perceptual infrastructure of a relational ecology, in the ontological force of perceptual organizations, looking at problematic alignments that reduce the sensory-motor spectrum and at the way in which they structure our ecologies and interactions. Ontohacking is about mobilizing creative plasticity instead of adaptive flexibility. For instance, the rigid sensory organization of perspective, based on categorical splits between an observer and an

observed, enacted through fixed points of vision, have been choreograph-ing all kinds of relations and spaces over the past 600 years. It is a sort of invisible matrix of world reduction. Disaligning any of its reductive parameters (axis, fixity, distance, etc.) immediately reconfigures sensory perception, mobilizing the transmodal continuum and the proprioceptive swarms. Ontohacking is about understanding the problematic alignments of particular movement ecologies, as in the rigidity and hierarchical orga-nization of perspectival vision or current interfaces, while reintroducing greater degrees of sensory plasticity within our experience that may resist the continuous capture of smart control environments and their reduction of experience.

The challenge though is in creating *ecologies* that *sustain* degrees of indeterminacy, even more so as they need to resist the onset of ongoing reduction and homogenization imposed by dominant ecologies. Minor ecologies would be relational fields in which certain levels of indetermi-nacy are sustained, not imposing alignments and thus open to reconfigu-ration in relation to other ecologies. Acknowledging the plurality of more or less plastic perceptual ratios of different ecologies is crucial, rather than considering the world and perception as homogenous fields.

I will now briefly describe several projects I have been developing over the past years that experiment with minor perceptual ecologies, under-stood as articulations of perception that don't impose a rigid ratio and logic, as in the case of perspective, but mobilize *alloceptive swarms across the transmodal sensory continuum.*

Disalignments[15] are movement improvisation techniques focusing on proprioception that mobilize the body as diffuse swarm of micropercep-tions (the proprioceptive/alloceptive swarm) while the residue of con-scious awareness is used for the sake of inducing subtle deviations from known patterns, gestures, postures, temporalities or proximities. Disalign-ments explore almost imperceptible micro-movements, focusing on the elasticity of internal movement sensations and their alien indeterminacy, opening up a sensory landscape that was not previously there but emerges with the very exploration. The techniques are anti-choreographic, focus-ing on the ongoing and subtle deviation from any previous pattern, and on letting the body move without a subject guiding it, in excess of deci-sional trajectories. The quantum field of proprioceptive indeterminacy opens up and the body moves in excess of any external cues that reduce its orientations, unfolding multiple simultaneous and continually shifting

zones of tension and torsion. Disalignments expand in relation to Flexinamics techniques and the other projects I mention in the following paragraphs, each of them proposing a particular focus on proprio/alloception.

Flexinamics[16] is a technique for building translucent, foldable, flexible, dynamic physical modules or (meta)structures that operate as wearable architectures, bodily extensions that move with the body, as they have their own liveliness, elasticity and resistance, inviting the body to explore unconventional torsions, focusing on the elastic kinesthetic connection to the structures. Flexinamics metastructures expand the sense of proprioception into a larger environment through elastic relations. The fundamental experience they propose is from inside, when you lose a sense of shape. They constitute an emergent physical architecture, an attempt to create a non-Cartesian space, one that is not available to measure and navigate but which co-emerges continually with the movements of the bodies. It is an intra-active[17] space insofar as it doesn't presuppose a given sensory organization, rather, *the very subject co-emerges with the space along with the changing multimodal sensations and proprioceptions*. The flexinamic modules can be connected composing larger structures, suspended, in multiple layers, scales and shapes, so that one can intervene with them in any indoors or outdoors space, in daylight or in darkness, projecting on them an environment of amorphous digital architectures, light and sound called Amorphogenesis.

Amorphogenesis[18] is a *metagaming*[19] project in which amorphous digital architectures and spatialized electronic sound are further deformed through sensors disseminated on the body. My approach to metagaming design avoids manual control, representation of Cartesian spaces, or simulation of anthropomorphic avatars, and develops non-linear correlations between the movements of the intra-actor and the deformations of the architecture. Like in *Flexinamics*, it is about creating a non-Cartesian architecture that emerges with the movement, a non-linear space that is never actualizing in an extensive space, never available to navigate.

One is never in control of the space, rather the intra-actor's sensations emerge in the process, as the body explores subtle and alien changes in tilting and acceleration, which expand proprioception into the digital meshes. Your micro-torsion of an arm and shoulder suddenly connects in alien manners with the torsion of the architecture, which could also be an alien creature, an abstract or amorphous avatar. Metagaming thus subverts and inverts the aesthetics of simulation and control, based on manual control, Cartesian spaces, anthropomorphic avatars and linear relations. In

Amorphogenesis, the digital architectures are an extension of the body's proprioception as much as the body is an extension of the architectures.

The architectures are projected on the mobile and translucent Flexinamic structures, either indoors or outdoors, thus becoming a nomadic environment which dialogues with other spaces while constituting itself a relational field. The more varied the movements the richer the environment, thus expanding *disalignments*, as anti-choreographic improvisational practice, to the digital architectures and sound. Amorphogenesis is also a philosophical concept that signifies the ongoing emergence of the amorphous which never actualizes in a form and connects to another concept and project focusing on undoing anatomy and form: microsexes.

Microsexes[20] is a metaformance[21] project in which the body perceives itself through surveillance cameras placed on the skin and electronically processed voice. The cameras in close-up enact a tactile and amorphous vision that is not grounded on perspective and its parameters of distance, fixity and framing. The microcameras become an anti-perspectival machine for a formless and post-anatomical body, exposing the way in which dualistic categorizations of the body and sex have historically relied on perspectival vision. Here, instead, infinite potential sexes proliferate in the mobile and tactile vision that recomposes multimodal integration and proprioception. A tiny movement in the hand becomes a gigantic alien landscape.

The body should not attempt to hold onto the usual proprioception, rather it should let control go and enter this new scale and relation until it stops knowing what it is looking at (perhaps its hand, or back, or neck, or genital). The body suspends in this alien intimacy until it reconnects with its proprioception through that indeterminate otherness.

The project has happened as outdoor interventions projected on buildings, as immersive indoor installation, as one-to-one encounters with the audiences or even in homes, as a sort of private consultation where the performer enacts or mediates the devisualization of the participant's body, enacting a disalignment from centuries-long apparatuses of perceptual reduction. Thus, an alien intimacy and sex are generated that renegotiates the boundaries of intelligibility of the body, opening them up to indeterminacy.

All of the above constitute layers of *Metatopia*: intra-active metaformative environments for indoors or outdoors that have been developed in the Metabody EU project.[22] Metatopias are nomadic spaces of illegible behaviors that may infuse indeterminacy in smart control ecologies of big

data culture. The experiential is crucial in these projects. The performer and the installation facilitate a deeply transformative perceptual experience of the audience participants who stop being spectators and become the very substrate of the process of perceptual opening. Metatopia works against the spectacular regime of perceptual separations. The ambiguity of sensory perception is the characteristic aspect of these environments, and their focus on proprioception, on plastic multisensory integration, amorphous affordances, and the entangled co-emergence of perception and non-linear space.

Metatopia is a laboratory for hacking our most basic ontological presumptions about the world, space-time, movement, the body or perception, proposing a blurry, amorphous and plastic sensory environment of which one is part, an autistic world of infinite plasticity that sustains its degrees of indeterminacy by avoiding to establish sensory hierarchies. This implies mobilising a sort of microsingularity in times of Technological Singularity black holes of total control. Singularities are events that create their own space-time or other conditions, but some have a dominant will to impose themselves, while others are open to reconfiguration (Fig. 2).

One of the recent experiences with the Metatopia environments was in the Pikpa Refugee camp in Lesvos, the hotspot for arrival of refugees

Fig. 2 METATOPIA—Metaformance in Toulouse 2016, Metabody Forum (© Jaime del Val. Photo: Reverso)

into the EU over the past years. I proposed the Metatopia environments (including in this occasion the Flexinamics modules and the Amorphogenesis metagaming environments) as tools for co-creating a dynamic playground with the refugees, building new modules with bamboo canes and other materials from the camp, and moving with them collectively, which ended up happening mostly with the children. A fragile and uncertain space for coming together emerged in which the outcomes were not foreseen, there was no method at play, it was a space *beyond error*, a *borderscape* where openings could happen if one would let them happen.

I call *minor ecologies* such fragile spaces of encounter, where perceptions can be opened up beyond the dominance of the Cartesian grid and indeterminacy reigns with full positive value. *Minor Ecologies in the Algoricene* is a project for experimenting and valuing the plurality of perceptual worlds that do not impose dominant ratios and exceed algorithmic reduction: plural spaces for perceptual generosity. Minor ecologies or micro-singularities are neuroplastic environments for neurodiverse futures.

The projects are ongoing and have multiple lines of development that continue in the frame of the International Metabody Forum (IMF), including environments with neurodiverse people, indigenous cultures, refugees, prisoners, in rural areas, as well as diverse technical and artistic lines of research. IMF takes place in up to twelve different countries every year with activities that include workshops (Ontohacklab/Metamedialab), metaformances and creation processes (Metatopia environments) and conferences, symposiums or talks (Multiplicity University).[23]

(In)Conclusions

I have proposed a double reversal of error and ambiguity, from being the collateral damages within an established causal field, through seeing how their status has already changed in hypercontrol systems capable of anticipating error and capturing ambiguity, to proposing movement ecologies where indeterminacy reigns as positive value. This in turn leads to the importance of redefining and highlighting the positive force of indeterminacy, toward a radical inversion of the western metaphysical equation of indeterminacy = lack of form, to the equation form = lack of movement. This implies redefining movement as positively indeterminate, as power to increase the indeterminate capacities to affect and be affected

of a body, its sensibility and sensitivity.[24] In turn, this places the will to control and dominate as essentially a nihilistic tendency, where violence is associated with domination, and freedom to the capacities of an ecology to maximize its indeterminacy.

Generating conditions for relational ecologies whose multisensory movement is not following a reductive logic, but where the multisensory perception may constantly reconfigure, means generating conditions for a plural (neurodiverse) culture. Neurodiverse subjects/bodies are those who cannot perform functionally within given causal fields of relations and its movement scales and trajectories, its reductive rationales and logics. Meanwhile, neurotypical subjects are those considered capable of aligning themselves with the reductive perceptual logic of the Algoricene, which will imply the reduction of the perceptual spectrum. This idea builds upon Erin Manning's notion of autistic perception (Manning 2016) as a richer kind of perception that does not assume an already formatted world. Neurodiversity is thus transformed from a pathological condition of limitation, into a crucial feature for a perceptually richer ecology not assuming perceptual homogenization and reduction.

My proposal for enhancing neuroplasticity is thus directly opposed to the neuroflexibility of smart control environments, which operates by narrowing down the sensory spectrum. Where 'smart' culture foregrounds prediction, immobility and control, I propose anti-smart architectures that embrace a positive sense of indeterminacy and movement as crucially constituent for livable lives and sustainable ecologies.

Returning to the questions I previously posed: Why is it that in some circumstances, movement's potentials are highly foreclosed leaving little or no room for other potentials, as in power relations or in performances of social normativity? Likewise, how is it that in other situations there is a greater indeterminacy at stake? Also, how should we deal with the extremely dynamic and opaque modes of control of current algorithmic systems in big data culture and their attempt to make dynamic patterns out of noise? My reply to these problems has been in terms of analyzing the degree of plasticity of perception, in terms of multisensory integration, and of proposing practices and concepts that account for possibilities to move and perceive in ways that sustain high levels of indeterminacy, as a measure of aliveness and freedom in our ecologies, and which may also resist smart ecologies of control by continually mobilizing the complexity within our proprioceptions.

NOTES

1. Neurodiverse refers to the person who does not align with dominant modes of movement, cognition and perception, but who moves along different motor-cognitive-perceptual ratios. Neurotypical is the person able to align with established modes of movement, cognition and perception that define the parameters of functionality and ability in industrial, mechanical and information societies.

2. The Technological Singularity is the questionable theory of the upcoming super-artificial intelligence, which according to some experts, like chief engineer of Google, Ray Kurzweil, will come in 2045.

3. As described by philosopher Michel Foucault (2003) in reference to biopolitical systems of governance of life, that consolidated in Industrial societies since the eighteenth century based on the establishment of more or less static (or slowly changing) patterns of behavior and function of the social body, regulating the rhythms of life and the movements of bodies in geometries which found in the Panopticon its paradigmatic model of visual and centralized control.

4. Ontopower operates not on things as already defined but in the process of their emergence, by constantly projecting dynamic patterns that capture and choreograph the new movements emerging in the world's dynamism.

5. As N. Katherine Hayles points out in *Chaos Bound*, Hayles (1990: 59).

6. Wiener's algorithm for movement prediction is still grounding contemporary predictive algorithms, increasingly configuring our landscapes today, as in video codecs. For instance, video codec algorithms such as H264 of MPEG4 which conform much of our visual ecologies today are largely based on Wiener's algorithm and derivations thereof. See Cedeño Montaña (2017) for an extensive account of movement prediction algorithms in moving images.

7. Movement's undefined nature was a fundamental philosophical problem since the birth of philosophy, clearly outlined in Aristotle's Physics.

8. See de Lahunta (2004) for an extended genealogy of movement analysis in the nineteenth and twentieth centuries.

9. Whereby justice may equate (following some interpretations of the only surviving fragment of Anaximander) to the restoration of indeterminacy.

10. Such as Taoism.

11. See Jaeger (1977) for the etymology of Chaos.

12. See *De RerumNaturam* (Lucrecio 2012).

13. Proprioception is strictly speaking the internal sense of movement of the body, related to internal muscle sensors, but eventual connects to all sensing modalities and allows a question about the inside-outside divide, yet starting from within. Its diffuse molecular character, difficult to locate, inspired me to speak about a *proprioceptive swarm* as foundational of experience.

14. For an extended account of enactive cognition, see *The Embodied Mind*, Varela et al. (1993).
15. http://metabody.eu/disalignments/.
16. www.metatopia.eu.
17. Intra-action is a term proposed by Karen Barad (2007). Whereas inter-action refers to preexisting entities relating in a predefined space (relative to perspectival-euclidean-cartesian space perceptions based on the artificial construction of external observers), intra-action refers to the co-emergence of the agencies that enter a relation, (relative to accounts of quantum mechanics and diffraction, based on the impossibility of external observers, but grounded on internal observation acts that generate cuts and ontological separability, as dynamic form generation from within, signaling the inseparability of ontology, epistemology and ethics), thus questioning the predefined status of things, entities, spaces or external observers, and pointing to a relational ontology of becoming.
18. http://metabody.eu/amorphogenesis/.
19. *Metagaming* is not about affording control, rather it is about inviting unpredictable gestures to happen, while constituting an open (neurodiverse) cognitive landscape of amorphous and indeterminate affordances.
20. www.microsex.org.
21. *Metaformance* is a neologism proposed by Claudia Giannetti in 1994, to describe the preponderance of the interface in media culture. I use it to describe the ongoing reinvention and opening up of perception toward greater indeterminacy, focusing not on content but on the disalignments from any fixed perceptual frames.
22. Extensive documentation is available in www.metatopia.eu and www.metabody.eu.
23. http://metabody.eu/forum/.
24. In resonance with Gilles Deleuze's readings of Nietzsche and Spinoza. See Deleuze (1986).

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