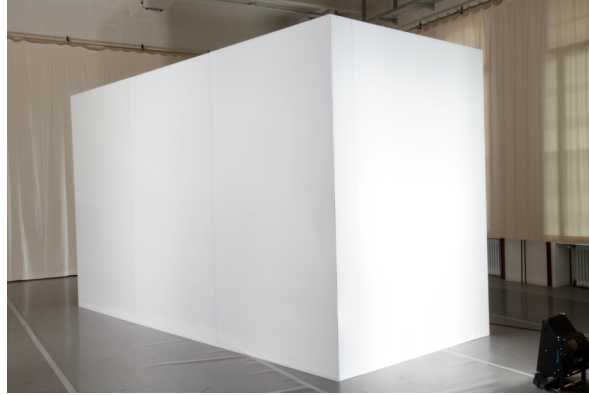

Just Noticeable Difference

Ontogenesis, Performativity and the Perceptual Gap

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What can Gilbert Simondon's philosophy of technical individuation offer contemporary artistic *practice* involving new technics? What spatio-temporal scales are at work in the evolution of technical objects used in art making? Finally, and perhaps more urgently, what are the perceptual/affective consequences of Simondon's ontogenetic understanding of technical, physical, vital and psychic-social individuation that increasingly plays itself out in contemporary artworks that blur the supposed boundaries between the living and the non-living?



Exegesis I

“The end was almost unbearable but in a really enjoyable way”; “With the intensity of vibration and the light, I suddenly realized there was space”; “When I first laid down, because it was so, so dark, my eyes were seeing flashes of light”; “I didn’t really feel the roundness of my body. It was sort, all laid out like a two dimensional shadow on the floor”; “It felt like my stomach was expanding ... it was more like an expansion or leaking of the boundaries of my body.” “At one point, because it was so dark, I felt my visual field collapse in, almost on top of me. I closed my eyes and opened them again, but there was no perceivable difference. Then I faintly saw light above and suddenly realized that my eyes were in fact, closed.”

JND is a sensory installation conceived and developed in 2009-2010 by the author in collaboration with Dr. Marije Baalman and Harry Smoak at LabXmodal, a studio-lab that is part of the Hexagram Centre for Research-Creation in Media Arts and Technology at Concordia University, Montréal. According to the 19th century psychologist Gustav Fechner who named it, the JND is a “quantifiable magnitude for *sensation*” that relates our perception of the onset of differences between stimuli at changing rates of magnitude. Yet, despite sharing Fechner’s name, *JND* seeks to understand and produce a different form of “sensation” that goes beyond Fechner’s quantitative, metric-based model – one closer to the manner in which a long lineage of thinkers, from Aristotle and Spinoza to Bergson and Deleuze and Guattari describe as “affect” – the manner in which “pre-personal” forces (whether physical-material, like the weather or psycho-

emotional, like language or passions) modify, operate on and transform bodies. If Henri Bergson describes affect as the manner in which external matter, “images” or perceptions in the world “influence the image that I call my body in that they “transmit movement to it,” Deleuze and Guattari later pick up this trajectory, modifying it in the sense that affects are not necessarily situated in a subject (like emotions or feelings are) but rather are pre-individual, non-subject centered forces – “blocs of percepts” or sensations. If, as Deleuze and Guattari write, that the artistic practice is about the production of such percepts and affects, then question we face here might be summarized as where is the locus of production and experience for these blocs of sensation in *JND* and how do they function. But where then does Simondon’s “phenomenology of technology” fit into this?



Exegesis II: Event

One at a time, the participants enter into the 2 m wide x 4.5 m long x 3 m high, box-like structure through a narrow, square door. Once inside the total darkness of the architectural shell, they lie back down on a custom developed floor whose underside is lined with twelve full frequency “tactile sound” actuators which are normally used in commercial or home cinema seats to deliver low frequency vibrations. The actuators produce both audible sound and vibrations that vary from the barely perceivable (the threshold of perception) to extremely intense. Ranging from fidgeting to larger body movements, individual movements from the participants are measured in real time by a 24 paper based pressure sensors Chris Salter. “Just Noticeable Difference.” *Inflexions* 5, “Simondon: 113 Milieu, Techniques, Aesthetics” (March 2012). 111-129. www.inflexions.org

(essentially cheap variable resistors that when pressure is applied, result in a change of resistance) connected to a series of three custom microcontroller boards (PCB's) that line the under surface of the floor.

This raw, real time motion data is sent by these wireless PCB's to a computer (a Macintosh Mini running the real time audio synthesis software SuperCollider), statistically conditioned for the variances in motion and then used to alter parameters in a partially scripted composition of vibration, sound and light output that takes place under and around the visitors' body. Since each of the actuators is individually addressable through the computer program, the pressure and motion data from the participants is used to not only affect the overall intensity of the sound and vibration but also to generate specific and distinct spatial patterns, for example, simple two channel pans (moving the sound between speakers) across groups of actuators to more complex, stochastically determined rhythms and motions. The visual, auditory and haptic perception of vibration, brightness, rate and rhythm of the flicker-based light, frequency and amplitude of the audio in the composition's three act dramatic structure is thus partially based on the visitors' bodily real time interaction with this sometimes "live," sensor-augmented floor.

From an engineering standpoint, the installation employs *sensors*: sets of transducers that convert one form of energy (e.g., sound vibration) into another (electrical pulses). These sensors continually pick up and transmit to computers the *changes* in pressure over time (not absolute pressure—which is why the statistical technique of variance is employed) produced by the visitors lying on their backs. The program essentially maps the variances into parameters that subsequently drive sound synthesis algorithms. Since there are 24 areas in a 6 by 4 grid of sensing and 12 speaker outputs, the sensor data is combined in order to map local movements of the body to local vibrations at specific areas, such as the head, feet or lower back. In certain parts, we use a sum of all the changes in pressure in order to shift the over-all amplitude of the vibration.

As an artistic experience, *JND* grapples with what it means to interact and individualize over different perceptual thresholds within a milieu. Interaction within the box takes place despite the fact that such thresholds of bodily initiated motions and their reciprocal responses create a gap in perception in which stimuli from inside the *JND* environment *may not actually be directly (that is, physically) felt by an individual body all of the time*. In fact, one of the chief reasons why sensing technologies are used to analyze movements (but not record them) from participants is in order to produce a set of intertwined relations between human and technical action. At times, the visitors feel in direct control of the environment. Consequently, they may be aware that hardly noticeable fidgeting and barely perceived movements result in some kind of response or action directly at the bodily level. At other times, however, the visitors' motion returns no direct feedback from the environment. Instead, one feels the apparatus performing for and with itself.

Using *JND*, I want here to explore the consequences of Simondon's concept of technical ontogenesis, the concretization of a technical object in relation to its associated milieu, as a way of confronting the specific material processes taking place between technologies and their environments. In taking *JND* as a complex, hybrid technical object, we may extend Simondon's understanding of the various scales of technical individuals in order to grasp how his radical attempt to establish a continuity between technical, biological and psycho-social processes of individuation makes sense in an era of contemporary artistic practice where pre-personal affects (i.e., forces) and agencies are increasingly distributed across different registers of "life" (biological and technical).



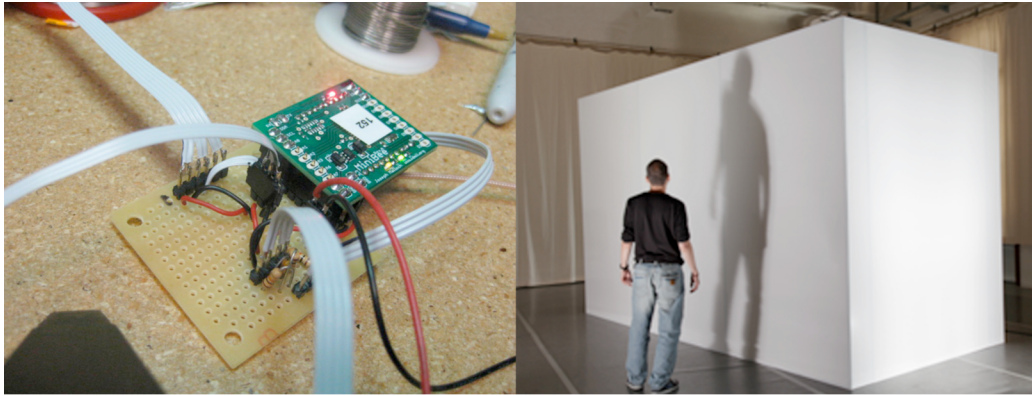
Exegesis III: Discussion

In a recent discussion with the author concerning the thresholds of perception as material for artistic work, philosopher Brian Massumi described his experience of *JND*. “*JND* deals with where we think we are in perceiving...in other words, to make the work about perception perceiving itself and its own limits is something that seems all encompassing but requires a minimalist approach, a kind of subtraction or reduction of perception towards its minimum thresholds and back out towards its maximum envelopment. When we are talking about a perception of a perception, it is interesting to often start from this point rather than talking about objects and how we perceive the subject from the object...framing it in terms of thresholds interrogates perception in a very different way.”

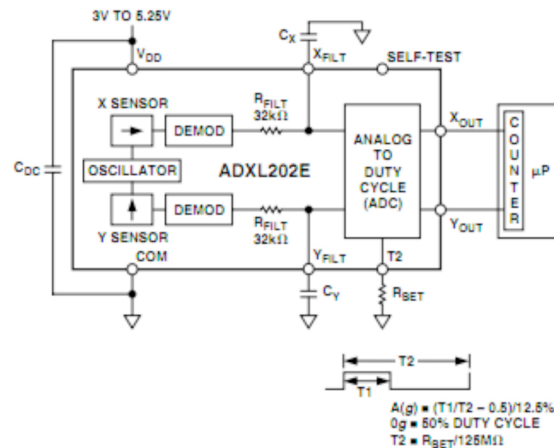
I. Technical Individuation: The Question of Scale

In the contemporary cultural *Zeitgeist*, artists, designers and architects are increasingly focused on the ecological, that is, the systemic dynamics of interaction in technical-vital systems and processes in order to achieve what Simondon labels “concretization.” Concretization describes how “abstract” technical schemas come to be operational: materially conditioned and realized into concrete technical objects in the world by way of their creation of “an environment that had merely virtual existence before the invention” (Simondon 1980: 58). The relationship between the object and the environment, what Simondon’s terms the “associated milieu,” is one of mutual or reciprocal dependence and interaction—“an environment which it influences and by which it is influenced” (61). The associated milieu is not pre-given as in an existing, *a priori* schema or representation, but arises in the operation or *performance* of an object and its environment in a dynamic relation with one another.

But how does this dynamic of technical individualization between technical object and milieu actually function? In order to answer this, we will closely examine Simondon’s crucial distinctions between the different scales of the technical object: element, individual and ensemble. Technical *elements* or what Simondon labels “infra-individual technical objects” (56). include individual components of machines (like resistors, oscillating crystals, voltage regulators and power supplies) that have no associated milieu in order to function. In other words, these components are more or less independent of each other in performing their specific functions. On the other hand, technical *individuals* are made up of technical elements and comprise more concretized machines or devices that are specified tied to an associated milieu. The final scale of technical *ensembles* connects large assemblies of technical individuals together, for instance, in the environment of a laboratory or factory. Simondon claims that technical individuals are produced inside larger technical ensembles, such as factories and are kept independent or isolated from each other (“non connected devices”). Thus, there is rarely the possibility of such individuals forming an associated milieu.

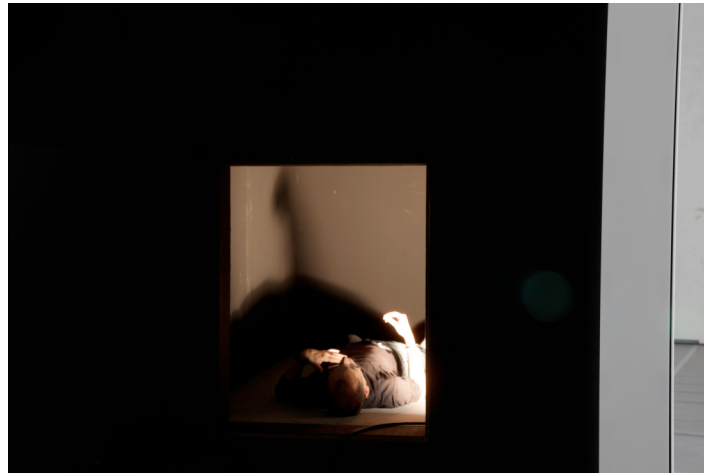


Does this schema of scales that Simondon suggests, however, provide a method to understand the recurrent loops of interaction that take place in a complex work like *JND*? In the installation, the technical “individuals” of paper sensors, wireless PCB’s, acoustic actuators, computers, audio I/O devices, LED’s and their power supplies and controllers and DMX protocol translators mutually establish what Simondon labels “recurrent causality” (essentially, a circular feedback process in a system in which individual elements are coupled to or “entrained” with each other) within a complex associated milieu comprised of architectural structures produced out of MDF, steel studs, rock wool, nails, hinges and screws and vital (that is, human) participants. Within this framework, two questions arise. The first is, at what perspective can we classify something as a technical individual within a complex system? In analyzing the components of the custom developed wireless sensor platform used in *JND*, we might say that at one scale an individual sensor (an accelerometer) attached to a wireless transmission board comprises a technical individual since the sensor itself is constructed of many *elements*, such as the capacitors, resistors, the suspended mass and the micro-sized spring supporting the mass that are all housed inside the IC (Integrated Circuit).



As a technical individual, the sensor needs an associated milieu comprised of forces to jar the mass and set the spring into motion in order to produce a change of electrical voltage. These forces in the milieu then may exhibit recurrent causality by acting back based on the response the sensor generates within the media in the environment. But, we could also change scale and say that the PCB's themselves should be considered as technical elements that depend on the individualization of other technical elements to form an associated milieu. Such is the structure of the technical objects that comprise *JND*.

This question of scale leads to a second quandary. Given Simondon's explicit analyses of established and concretized mechanical and analog component technologies such as cathode ray tubes and Guimbal turbines, can we consider more heterogeneous environments like *JND* as technical objects in and of themselves? The answer I would venture is yes, because like the associated milieu of water and pipes that the Guimbal turbine needs to operate in, the technical object of *JND* is concretized by means of its performance within its specified milieu - a milieu that may be more heterogeneous than Simondon at first allows for. What about in the case of *JND* in which the human participant or "operator" also becomes an integral part of the associated milieu's natural/technical makeup or what Bernard Stiegler labels "human geography"? Does the presence of such "human geography" as part of the milieu bring about a further complexifying of the dynamics of a technical object's evolution or what Simondon will later term in the biological sense of the word, ontogenesis?



Exegesis IV

Massumi/author concerning *JND* continued: "In a reduced environment, we start with a very impoverished field of perception...there isn't really very much to focus on and then very, very slowly, you start feeling indistinct perceptions. You are not quite sure where it comes from but it hits you first as an affective feeling-a kind of pulsation and a sense of anxiety or fear knowing that there really is no object of anxiety or fear. So, I found myself perceiving fear in the lack of any actual object."

II. The Milieu: Technical Objects and Human Acts

In early tests of the installation, semi-structured interviews with participants reveal powerful "blocs of sensation," from descriptions of bodies being physically compressed by the darkness of the space to sensations of suspension or falling through a void. These feelings most likely are the result of the first moments in the installation, where extremely short pulses of vibration under the feet and low levels of light emerging in a line on the ceiling above the reclining visitors blur sensory modalities. After three minutes, however, the sound gradually gives way to the first direct tactile vibrations-vibrations that change their intensity based on the visitors' smallest movements and adjustments while lying on their backs. The sense of a rolling stone under the body that emerges

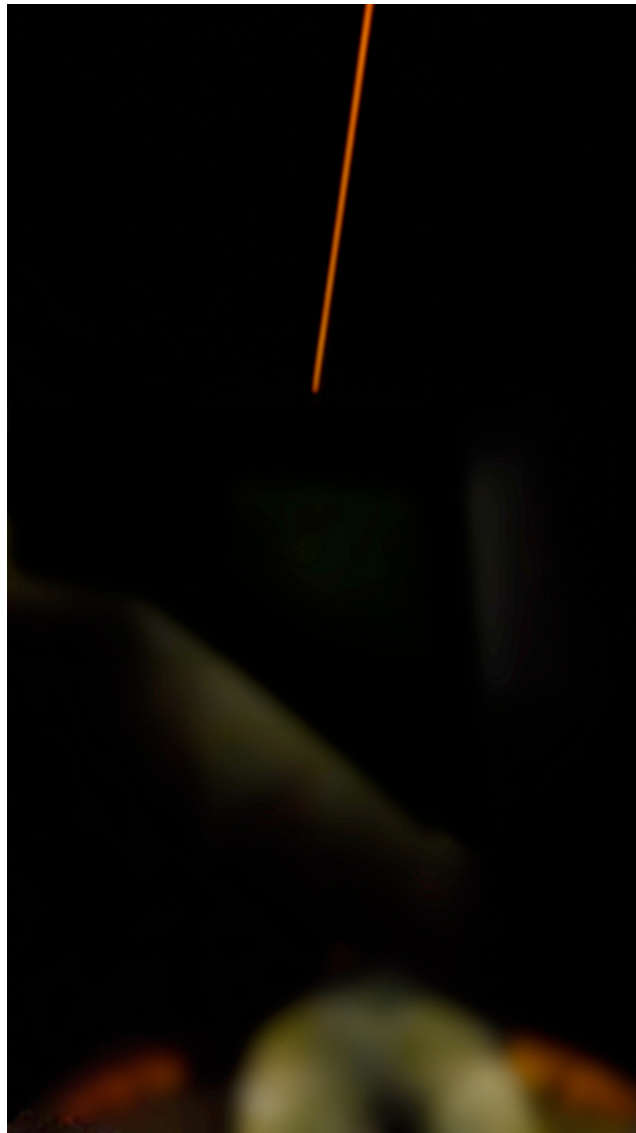
Chris Salter. "Just Noticeable Difference." *Inflexions* 5, "Simondon: 120
Milieu, Techniques, Aesthetics" (March 2012). 111-129. www.inflexions.org

and disappears accompanies this section of the composition. The visitors feel that they can actually steer the intensity of the vibrations based on where they move. For example, if they shift their feet back and forth, they suddenly feel an intense but moving vibration that snakes from the feet up the back of their body. This feeling of direct, local control and influence over the vibration soon gives way to oscillations which feel uniform across the entire surface of the floor—a sense of breathing sounds that rise and fall in volume, making the visitors’ entire bodies tingle and vibrate and which is made possible by the recurrent causality between the human and technical.

Examining the effects of Simondon’s concept of technical ontogenesis forces us to think through the very specific material processes entailed in the installation. But just what is ontogenesis? Psychologist and developmental systems theory (DST) proponent Susan Oyama defines ontogenesis as “the inherently orderly yet contingent coming to being” (Oyama 2000: 3). In Oyama’s sense, ontogenesis is deeply historical, signifying a “conditional transformation of prior structure.” “Depending on the level of analysis, such transformation can be described as resulting from interactions *among* entities, such as cells or organisms, or from interactions within an entity, such as an embryo or family” (3). For Simondon, however, ontogenesis is described as the general development of a being or its becoming. “In other words, that which makes the being develop or become, insofar as it is, as being ... ontogenesis would be the theory of the *phases* of being, prior to objective knowledge, which is a relation to be individuated in the milieu, after individuation” (Simondon 1992: 300-301).

In describing the ontogenesis of the technical individual in *Du Mode d’existence des objets techniques*, Simondon resorts to an analogy between the dynamics of life and thought. “In reality, there is a strong kinship between life and thought. In a living organism all living matter cooperates with life” (Simondon 1980: 52). He then articulates the connection between what is termed the *background* (*fond*), a swirling, undefined “reservoir” of primordial, dynamic virtualities and how this background gives form to dynamic entities. Living matter itself acts as a background by which specific forms (in the biological body’s case, the organs)

are regulated and connected such that they form a greater whole—namely, an organism. This living matter is not a blank slate, nor is it purely contingent but rather “that which is alive can invent, because whatever is alive is an individual being that brings with it its own associated milieu” (51). Here, Simondon analogously describes a notion of “liveness” as a dynamic coming to be between the organic and technical within a set of processes that I describe as “performative”: that is, temporally bound due to recurrent causality or coupling, self-conditioning, in-formation or the active “giving” of form.



III. Technical and Human Individuation: Performativity and the Allagmatic

Finally, we come to the question of what Simondon's ontogenetic framework could provide to artists who are crossing, breeding and mixing different concepts of technical and human "performativity." In some ways, there are faint but salient resonances between the concept of performativity as a temporal unfolding of being and Simondon's overall framework of *allagmatics*, an invented word describing a "theory of operations" which articulates the change, exchange of energy and transformations possible within a particular physico-material-biological system. I should be explicit in stating that by using this term "performativity," I do not mean linguistic or discursive notions, for instance, like Austin's notion of speech acts or Judith Butler's gender performativity which involves a temporally bound system of repetitive iterations and citations regulated by discursive practices. Instead, performativity here describes a time variant process by which different behaviors, actions and patterns of human and non-human expressions are materially constituted in the world and in so doing, produce specific and tangible material processes and changes.

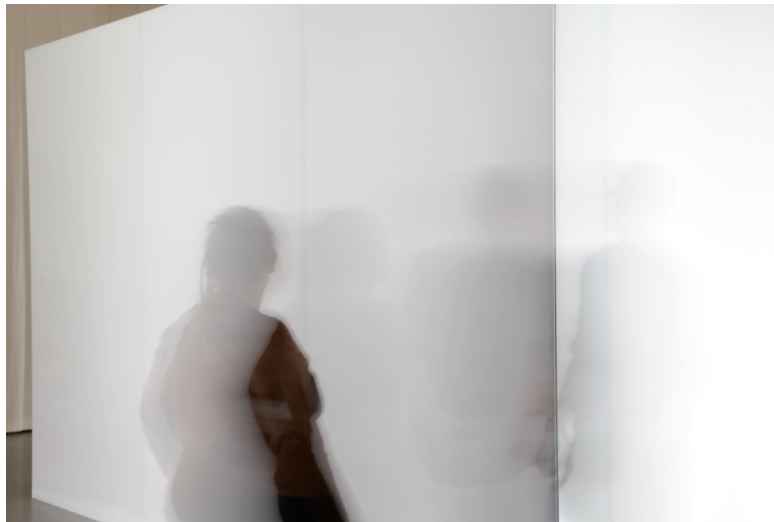
In *Psychic and Collective Individuation*, Simondon argues that the very concept of an individual and the process of individuation operates over different registers: *physical*, as in the formation of a crystal from a supersaturated solution and *vital*, as in the formation of life. Such individuation is only made possible through what is described as *metastable* states. Individuation thus articulates a process by which the individual is formed over a series of states or, using the specific term from physics, *phases*, starting from a pre-individual state and individuating itself through a continual process of metastability. As Simondon argues, "this division of being into phases is becoming" (Simondon 1980: 301). Ontogenesis proper constitutes the process by which being, in its becoming, "divides and dephases itself." In other words, the process of individuation is marked by a break or *rupture* in the process of becoming.

In appropriating the term metastable, Simondon appears to be directly referring to its usage in physics to describe a system that resides in a precarious, apparently unchanging (i.e., time invariant) equilibrium. Metastable systems can remain in such states for indefinite periods of time until some kind of potentially stochastic shift changes the system's dynamics, causing it to immediately change state. Indeed, such stochasticity is a key factor in metastable behaviors in electronic, chemical, biological and geophysical systems. For example, an avalanche can be considered to exhibit metastable dynamics in that the formation of ice and snow on the top of a mountain may appear to be stable but can immediately change state if it is perturbed by outside forces, like a skier or loud vibration.

Simondon points out that one cannot understand the processes of being from the point of view of a system of stable equilibrium. "Stable equilibrium excludes becoming, because it corresponds to the lowest possible level of potential energy; it is the equilibrium that is reached in a system when all of the possible transformations have been realized and no more force exists" (Simondon 1980: 302). Because all potential has been actualized in the system, the system can no longer enter new states or transformations. In other words, the potential or "virtuality" that Simondon describes is drained from the system because it has settled down into a steady state. Similarly, the same principles of metastability operate in living systems (*domaine du vivant*). A living system does not only modify its relations based on the environment (as in the case of a homeostatic system), but more importantly, also modifies itself "through the invention of new internal structures and its complete self-insertion into the axiomatic of vital problems" (305). Simondon's use of the word *transduction* therefore announces how the processes of physical, technical, vital and psycho-social ontogenesis rely on metastability (or "fictional stability") as the mode by which and through which the operation of individuation takes place. Propagating through phases, each being carries with it the metastable potential to suddenly have ruptures in its phases of individuation; to "dephase itself in relation to itself" by breaking its fictionally stable equilibrium and engaging in processes that are carried with and

driven by the energy potential remaining from its not completely unexhausted pre-individual state. This would be akin to a kind of excess “residue” from its pre-individual magma that is never totally exhausted.

Yet, what is perhaps even more interesting about Simondon’s description of transductive processes is that they can cross different scales and modalities of human and technical performances, not privileging one over the other. “Logically, it can be used as the foundation of a new species of analogical paradigms so as to enable us to pass from physical individuation to organic individuation, from organic individuation to psychic individuation and from psychic individuation to the subjective and objective level of the transindividual that forms our level of investigation” (314).



Exegesis V

Moment by moment the meditator also sees the mind pulling away from its sense of impermanence and lack of self, sees it grasping experiences as though they were permanent, commenting on experiences as though there were a constant perceiver to comment, seeking any mental entertainment that will disrupt mindfulness and restlessly fleeing to the next preoccupation, all with a sense of constant struggle. This undercurrent of restlessness, grasping,

anxiety and unsatisfactoriness that pervades experience is called *Dukkha*, usually translated as suffering (Varela, Thompson and Rosch 1991: 61).

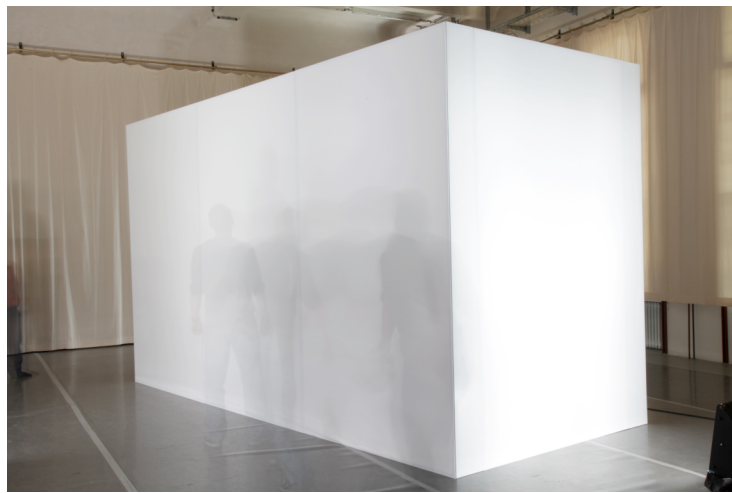
IV. The Metastability of Selfhood

I return to *JND* in order to ask what the consequences might be for the forms of experience that arise based on such a formation of metastability in the joint performativity of human (i.e., vital) and technical individuation? The aim of an artistic project like *JND* is to make possible and experiential certain liminal or threshold states within the media-technical and vital-living-human environment. These liminal states produce different affects between the technical object and the associated milieu that oscillate between, on the one hand, continuity and on the other, sudden ruptures or gaps in the process of dephasing/individuation where human perception becomes, perhaps for only moments, inaccessible to direct, "felt experience" (to use Eugene Gendlin's term). This kind of break or gap describes the ways in which an individual's self conscious access to their own processes of individuation is destabilized and, simultaneously, how a *pre-individual reality* bursts forth – that is, a reality that exposes the individual, if only briefly, to a moment in which the self slips away. Simondon is not particularly clear on what the pre-individual is. Is this pre-individual state one of a primordial consciousness, a limit experience (as Foucault described it) or simply the experience of losing what one is? The body is still present but the self that is part of that body is placed in question. In other words, in the moment of dephasing, a break occurs that sends the individual across the threshold in which suddenly the pre-individual state emerges, even within the reduced time frame of an artistic event. Despite enabling conditions (in both code as well as through the bodies of individual participants), the emergence of such threshold states can never be truly planned in advance by the designer. Rather, the conditions temporally emerge as the result of the very recurrent causality or coupling that Simondon ascribes between the technical object and the associated milieu.

The key to this somewhat opaque process is the threshold within the continuum when these different systems couple with each other to produce something that overrides a notion of individual, already completed being. As Brian Massumi states in a recent interview entitled “Technical Mentality Revisited,” the moment of *invention* within Simondon’s example of the Guimbal turbine is when sets of different matter *in potentia* (to use a phrase from Aristotle) suddenly couple with each other, producing “a single continuous system.” “A synergy clicks in. A new “regime of functioning” has suddenly leapt into existence. A “threshold” has been crossed, like a quantum leap to a qualitatively new plane of operation. The operation of the turbine is now “self-maintaining.” It has achieved a certain operational autonomy, because the potentials in the water and in the oil have interlinked in such a way as to automatically regulate the transfer of energy into the turbine and of heat out of it, allowing the turbine to continue functioning independently without the intervention of an outside operator to run or repair it” (Massumi 2009: 39).

With the coupling between disparate systems, something fundamentally new takes place where different processes of individuation blur into a continuum. Within these thresholds, a coupling between human and technical actions reciprocally produces the phase changes that Simondon articulates. What is more, these gaps provide the key to ontogenesis. Continually and over time, the process of phasing and dephasing enable the pre-individual reservoir’s excess to leak out. If aspects of the pre-individual always are ever present in these dephased breaks that are just noticeable, then we are brought back to a fundamental question that arises due to Simondon’s conceptualization of technical-vital individuation: what does it mean for our experience of the world to have perceptions that consist of continuities only to be broken by gaps? What does it signify for perception as part of the process of individuation to not ‘know’ or recognize these moments of “falling out of phase” - these pre-individual eruptions in the intertwined process of individuation?

The implications of Simondon's model are profound since we now have to grasp life as ontogenesis: a process rather than a pre-given substance, form or object. "Instead of understanding individuation starting from the individuated being, the individuated being must be understood starting from individuation, and individuation from pre-individual being, each operating at different orders of magnitude" (Simondon 1980: 311). The individual continues to carry with them the traces of potential and transformation. *JND* thus brings this process into the realm of the aesthetic, magnifying the individual as event comprised of more than one kind of life.



Exegesis VI

We cannot *know individuation* in the common sense of the phrase; we can only individuate, individuate ourselves and in ourselves. On the margins of knowledge proper, this comprehension is an analogy between two processes, which is a specific mode of communication. Individuation of the reality beyond the subject as grasped by the subject thanks to the analogous individuation of knowledge within the subject. But it is *by means of the individuation of knowledge* and not knowledge along that the individuation of beings that are not subjects is grasped. Beings can be known by means of the knowledge of the subject, but the individuation of beings cannot be understood except by the individuation of the knowledge of the subject (Simondon 1980: 317).

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