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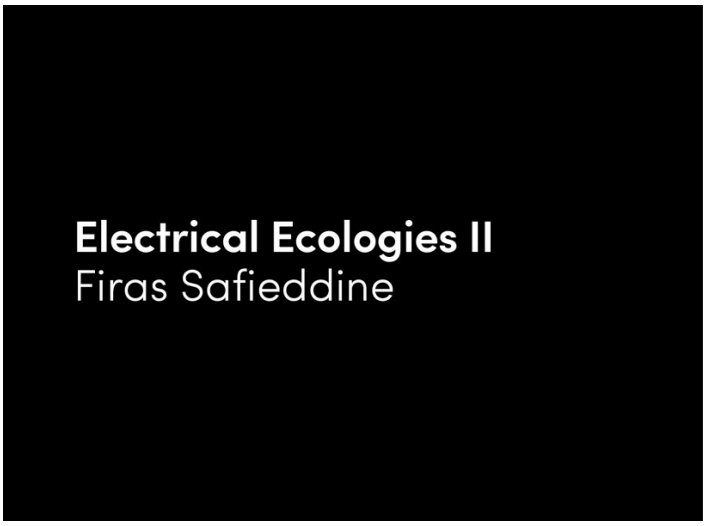

ELECTRICAL ECOLOGIES II

Posted on November 27, 2020 by martabuges

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This text aims to illustrate a multiscalar validity of the main umbrella term presented, Electrical Ecologies, by going through several fundamental ideas and introducing terms that are central to conceiving the topic. Electrical Ecologies (EE) operate at the smallest scale unit (the electric) to maintain a unified approach to understanding and operating at the scale of the planet. Due to that nature, and because it is a plural term, ecologies vary in size and structure, and hence form "sub-ecologies" and more general ones. The multiscalar validity is meant to demonstrate how this type of operation could happen at various scales, from the microscopic to the urban, and beyond.

The electrical is a manner of functionally and operationally flattening all electrical objects (from charged matter to human brains) in order to define a new design agenda and enable a conception of a planetary-scale nervous system. While a lot of other elements can be capitalized on as a common denominator, the electric is of interest not only as a common ground but, first, as a flexible limiting criterion (as it is also quantitative) and, second, as an operational driver that allows action.

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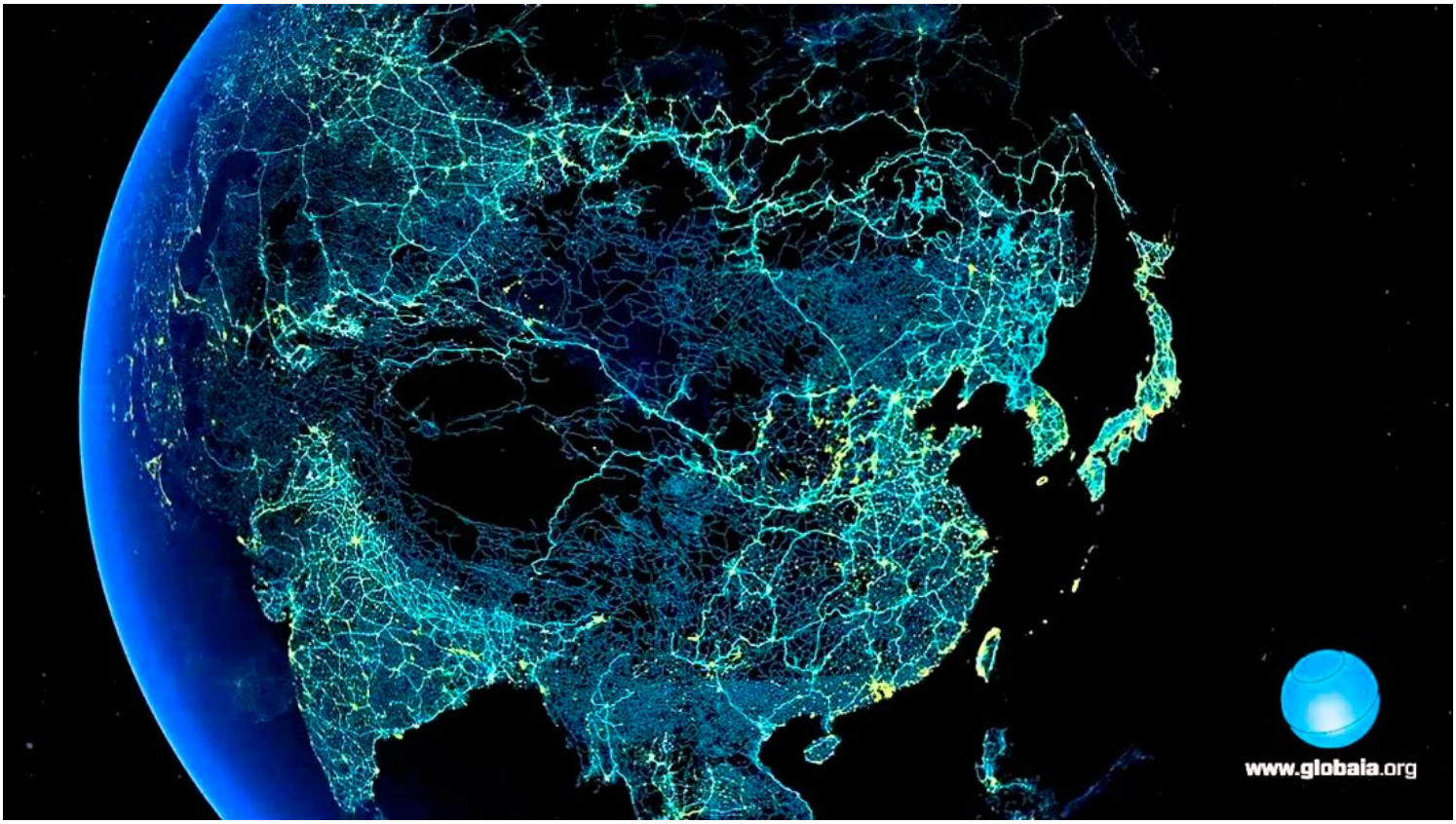

A Planetary-scale Nervous System

Nervous systems are devices that sense and then turn sensory inputs into behavioral outputs. With the growing capacity to compute now at the scale of the planet, with the number of sensing devices this planet has acquired, and with the current crises we are facing, it seems inevitable to think of planetary-scale action.

The context, i.e., the planet, as encompassing all sub-ecologies, is the full canvas, such that all extensions (rockets, satellites, etc.) are accounted for as well. Through reconstructing the context as mediated by those sensing devices, models of that immensity and complexity are important to produce behavioral actions on complementary scales. The challenges of today are bigger than ever, not only because they have become more alarming, but also because the planet is equipped with instruments that enable a certain level of conceiving those phenomena. Having the capacity to sense and perceive the context automatically generates a need for being responsive, which is

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equally dependent on the same perceptual system. Planetary-scale action can only be possible through planetary-scale perception (making sense) of planetary-scale input. This kind of mechanism suggests the notion of automation at the scale of the planet, which is conceptualized in this discourse as a planetary connectome(s), or a planetary-scale nervous system.

All Neuroecologies are electrical ecologies. Not all electrical ecologies are neuro-ecologies, yet.

EE is fundamentally a reduction in scale to achieve a common operational code to move forward in an all-inclusive all-equal methodology. The electrical is the common denominator and thus makes no distinction between things. The electrical, here, is brought in at the most basic level, at a literal depth, therefore dealing with an evolutionary prerequisite of intelligence and biology. Nervous systems are primarily biological, but only because they are electrical; biology happens only within this condition, and not the other way around. In addition, besides biology, our brains are chemical and electrical entities, and within the scope of this exploration, we will move forward focusing on the electrical aspect of systems, which gives rise to the other two. The electrical is a precondition for the biological to happen.

Consequently, mentioning nervous systems, ecologies, and the electrical, it might appear that the word electrical within the term Electrical Ecologies can be replaced by Neuro to form the term Neuro-ecologies. As proposed, and building upon two ideas, the two terms are not always interchangeable. The electrical is introduced as a grounding member of a basic structure of geology, biology, and intelligence; thus, the electrical is the most basic of all forms examined in this piece. The Neural is a consequence of the electrical, and thus Neuro-ecologies are advanced electrical ecologies. To revisit the geology, biology intelligence loop, where the electrical can be seen as analogous to the biological, the neuro would be analogous to the intelligent. Neuroecologies are higher-order complex electrical ecologies, and thus, are always sub-ecologies.

A “Pan-” Discourse

Working with the electrical broadens our vision from the “inter-” mindset (e.g., interdisciplinary, interplanetary) to a “pan-” mindset. The electrical is a pan-object approach. The inclusive aspect of the term does not deny a limiting criterion based on the level of complexity needed for exploration. At any given time, any degree of complexity within the system could be studied as a subculture. In other words, although all share the feature of being electrical, not all entities are equally complex, and thus selective exploration happens at that scale, given the quantifiable nature of the electrical.

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Peripheral vs Central

We currently comprehend our nervous system as two main camps, the PNS (peripheral nervous system) and the CNS (central nervous system). During formation, starting from a very basic structure – the neural plate, the CNS is formed progressively within the brain-spinal cord package. Since ecologies are distributed systems, the planet is a peripheral totality, where the central becomes an emergent quality of the ecology. In simple terms, brains are formed last. The peripheral occurs first; signaling starts as external communication, it then evolves into internal signaling, which creates a distributed model of centralities – or brains, if you will – which then converge into a single central system.

The function of things connected is not preset, and can always be altered, in reference to connectomics; genes come first, the structure, and finally function. Examples are all around us: one is our eyes, with a primary function to get in photons, that then evolved to become seeing. Eyes were not always for seeing. This topic will be contextually elaborated upon in the next part.

Within this configuration, the central is a late stage of the peripheral and not the reverse. The decentralized is a multi-center model; the pan-central is the distributed model. All sensing devices (microphones, satellites, etc.) form the sensory layer of the planet within the EE discourse. While all these devices are electrical, making sense of all this data requires large storing and computing capacities. This kind of computation, realized on a planetary scale, results in a genesis kind of starting point for a scalable system, which by growing quantitatively (having more input) creates a qualitative gain embodied in the new layer that might be described as a layer of linked planetary intelligence. This phenomenon will create epicenters of magnitude at first and will then start to get more and more distributed. Hence, by turning sensing objects into perceiving ones, and creating a comprehensive planetary perceptual system, a neuro-ecology would be formed. Decentralized artificial intelligence is another enabler, by providing the capacity for local AI. Information incapacity is a topic that will follow.

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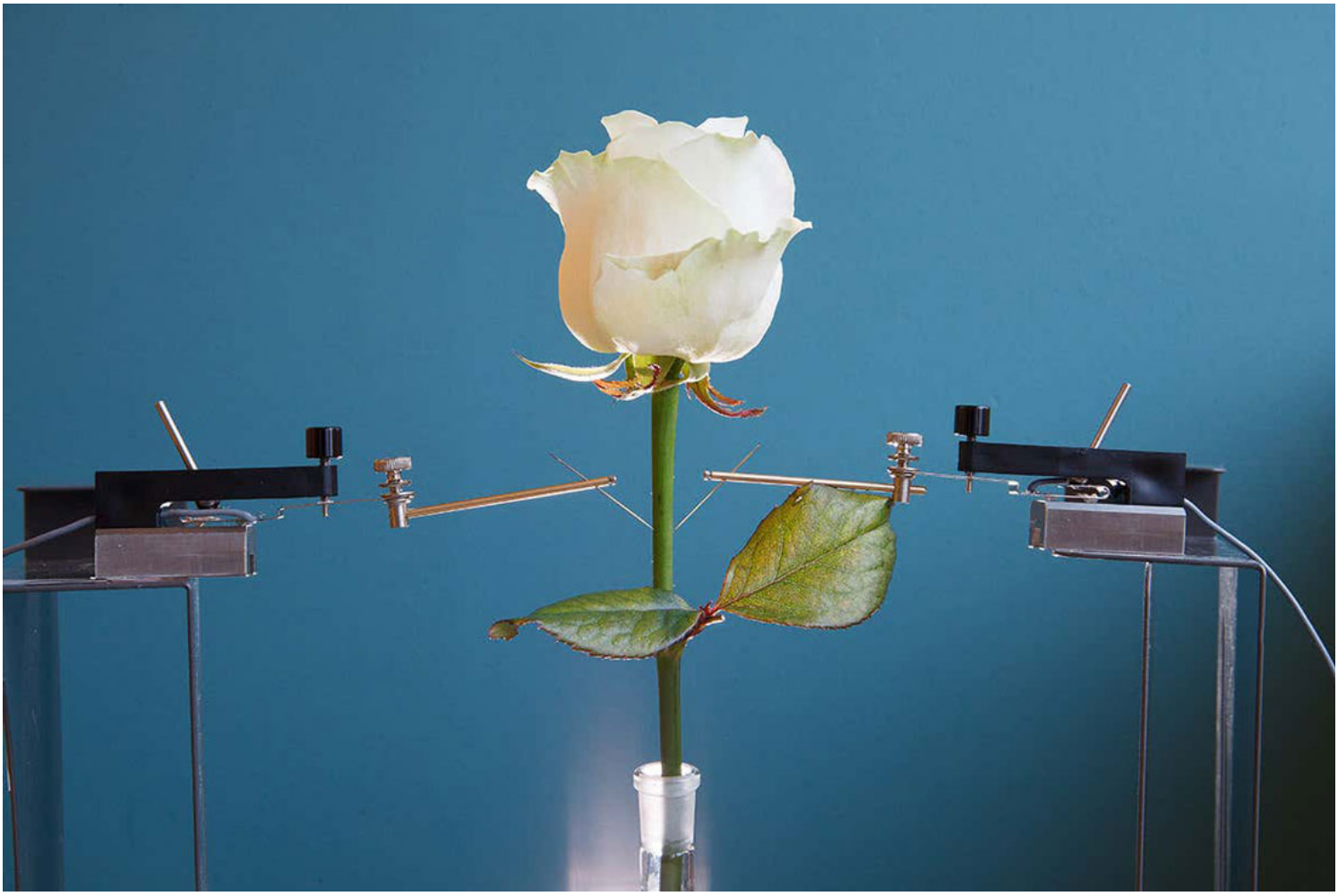

Neural-Exaptation

The concept put forward by paleontologists Elisabeth Vrba and Stephen Gould in 1982, “Exaptation”, is described by them as “a counterpart to the more familiar concept of adaptation.” Within this paper’s context, exaptation is understood as the process by which features acquire functions for which they were not originally adapted or selected.

A function that was not originally set implies an expected outcome of several functions that have not been exactly met. Evolutionary systems acquire functionality at a later stage of development. The sequence is gene-structure-function, which implies that function is what the process concludes in.

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So, what is really meant here is a shift in the function or trait during evolution within the two specified circumstances; the first is when things are co-opted for a new use after being evolved to a particular function (an adaptation) and the second case applies to characters whose evolutionary origin cannot be specified and are thus co-opted for a new use.

Neural Exaptation within EE requires a reappropriation or overtaking of objects at any entry scale to arrive at a neural object. Neural exaptation is the neuroticization of electrical objects. In this situation, Neural Exaptation is the process in which the environment, as referred to in the affordance section, is enriched by increasing the capacity of all the system layers.

Affordance

Coined by psychologist James J. Gibson, "affordance" in this context is “what the environment offers the individual”. Introduced in his 1966 book The Senses Considered as Perceptual Systems, the term is resurrected in his 1979 book The Ecological Approach to Visual Perception: “The verb to afford is found in the dictionary, the noun affordance is not. I have made it up. I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment” (Gibson 1979, p. 127).

Two aspects of the term are of interest to EE: the complementarity of animal and environment, forming a closed circle; and the potentiality within any environment, as it is not merely what it gives, or offers, but all the other possibilities that might emerge in other instances. The likelihood of probable phenomena becomes a more decisive aspect, which would be suggestive but not definitive. The environment is not nature. The environment is everything else: i.e., the environment is relative to each thing, in such a way that every other thing becomes the environment. Environments offer stimuli that are selectively sucked in and processed to make sense of. Affordance is a flexible and dynamic term that, so far, seems necessary for our brains to form and function.

Neural or Electrical affordance, then, is what becomes the environment within the electrical layer. The more objects involved, the bigger the environment, since everything that is not the object becomes the environment for that object.

The Naturalness of the Electrical

Subjects with brain implants, including motor action enablers, do not feel controlled by an external source. The brain has no nociceptors and thus never feels at threat, which implies that directed brain

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or targeted neural stimulation that can lead to movement in limbs, hormone secretion, etc. feels autogenerated. A nociceptor generally referred to as a "pain receptor" is a sensory neuron that signals back to the brain when confronted with possible damage stimuli. But the brain itself does not have that kind of receptors. Thus, while stimulated, subjects under examination do not feel controlled as the neural order is still sent from the brain, so it is perceived equally by the body. With electroceuticals regaining track, a higher resolution understanding of the human nervous system may be required, in addition to its being a very significant example of how the system itself can be functionally controlled.

The Walking Dead
Better known as “Human-centered design”

Human-centered design is pop for anthropocentric design, which is re-emerging in several fields but seems to be less and less capable as the scale of needed action escalates. In respect to the scale of necessary and possible action, human-centered actions for planetary-scale effect seems quite undermining and extraneous. What is needed is ecological thinking. While functional, and even necessary at a human level, obviously, human-centered thinking might very much be needed within medicine and other spaces. Yet it demonstrates a failure in challenging the world’s unprecedented pressures. The human can no longer be at the center – not because of anything related to the human, but because there is no center anymore.

In addition, human-centered design seeks to change all that is not human in favor of accommodating the human. At the core, this demonstrates a distinction between what is human and what is not. The two main issues here are that, first, EE suggests no necessary hierarchy based on being human and, second, we are not static. Our brains are plastic, and we are as manipulatable as the environment itself, if not more.

Our brains are what they are due to a bidirectional mutation between them and all other input signals. Brains are an evolutionary yield. They are plastic rather than a static object.; they continuously change. That established, EE calls for designing the human too, as just another part of the ecology.

Biocentric Design as a Constructive Soft Transition

Biocentric design is generally accepted as an antonym to anthropocentric design. While biocentrism

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might not be a fully operating antonym, it could function as a gradual transition that establishes the un-centrality of the human. The idea here is that there is no center. Negating anthropocentrism comes mainly against centrism, and not against humanity, and thus suggests the necessity for eliminating any object as a center: a distributed rather than a decentralized model.

The Internet of Neurons

> *"We are all now connected by the Internet, like neurons in a giant brain." Stephen Hawking*

We still make a distinction between things, as solid objects, and ourselves. Thus, the IoT (internet of things) happened by connecting objects directly to the internet. During the last five years, the term BrainNet has been surfacing, as the new internet which happens as our brains get interconnected and able to communicate through it. In this article, I will call the upgraded version of the IoT, "the IoN", the internet of neurons. In dealing with all things through the electrical layer, brains become just another member within the IoT, and thus it becomes an IoN.

The next claim here, going back to the Stephen Hawking quote, is that the interface matters. It is one thing to be connected through the internet (through an additional interface), and it is something else – and the other question focused on here – to be connected to the internet or part of the internet itself. The main difference here is the interface; how we interact with objects determines our relation to them. The minimal interface interaction protocol principle introduced in the first part of the article is oriented towards cutting down interfaces to arrive at a minimal interface interaction: no screens, no keyboards, etc. The communication happens directly.

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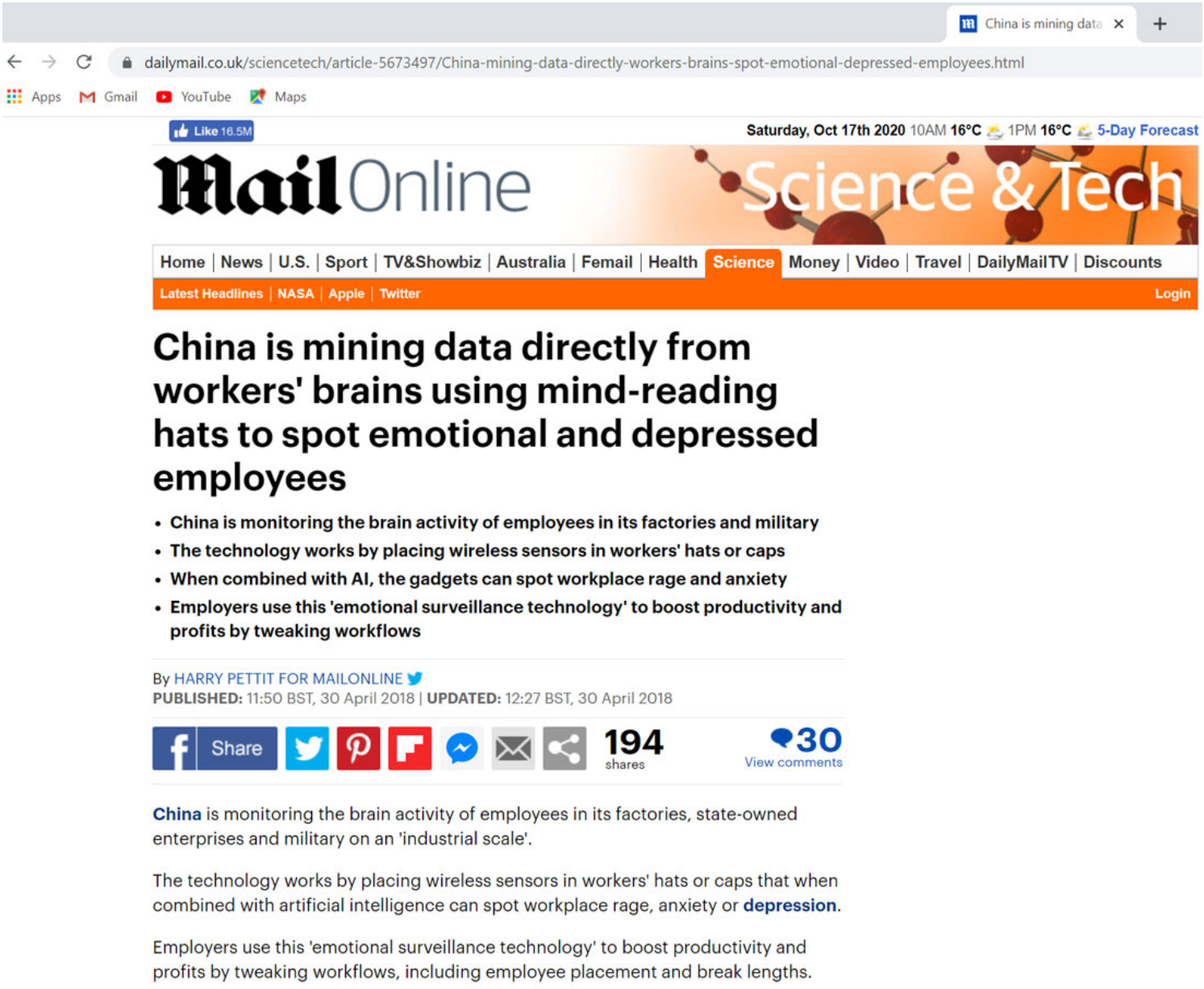

"espace* Becomes E-space"

Borrowing from Koolhaas's "Junkspace", E-Space expresses beautifully the shift from a homogeneous space of void (espace, from the French, representing the modern discourse) to a

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current space of information, mediated through various media, mainly the electrical. Space is no longer void as data is flattened into that space. Hybridity – contrasted with heterogeneity – is the new nature of space, where all actors – interactors – become space itself.

The Tech-to-Bio Shift

On the 28th of August, during the Neuralink presentation, a light came on at the end of the post-presentation conversation, when one Neuralink employee mentioned the main intent of moving towards making the work "look less like technology and more like biology". The movement towards a squishy, wet, fragile, and efficient technology is a promising direction towards communicating with the brain. Brains are very energy-efficient generalists, whereas technology is still energy consuming, chunky, specifist. We will gradually abandon the idea of plugging the brain into technology in favor of placing technology in the brain.

Hetero-augmentation

Organoids, as stated in a Harvard stem cell institute publication "are tiny, self-organized three-dimensional tissue cultures that are derived from stem cells. Such cultures can be crafted to replicate much of the complexity of an organ, or to express selected aspects of it like producing only certain types of cells."

Cerebral organoids are a type of organoids that are made to resemble a nervous system or a brain, thus known as brain organoids or, less precisely, artificially grown brains. They are lab-grown using a three-dimensional rotational bioreactor, where the culturing of human pluripotent stem cells happens. Still, at a very early stage, the research is promising and might open doors to create brain enhancements that are of the same nature. Besides being able to augment and communicate with the brain, these organoids are a resource for studying several brain subjects within the dish-grown culture.

The Everyday EEG

User data mining has been normalized through gadgets and wearables that have become part of our everyday life. On the neural-data front, there has been a boom in the number of consumer-grade wearables that are used to mine brain data and perceive it through algorithms. In parallel, three indicators mark a new way of dealing with this topic. First, the infiltration of monitoring brain

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data devices, such as the technology used in China since 2018 by Deayea Technology to monitor workers' emotional states and performances, at scale. Second, the advancements in neurotechnology in national-scale organizations such as DARPA. Third, the new trend of creating the everyday EEG device, which is worked on through embedding signal acquisition and processing units within devices we already use in our everyday lives, such as earphones, or through inventing totally new devices that get the job done. It is only a matter of time before these devices not only become everyday wearables, but transition from being external wearables to invasive parts.

Nerveillance. Neural Surveillance

Embodied in microchips, governments will soon exist under our skins. Unlike biosurveillance, nerveillance – an emerging subset of biosurveillance – includes data mining at the level of the nervous system, using several techniques: generally microchips on, or inside, our bodies. Data, living organisms, sensing, computation, addresses, the biological, and the cloud are all electricity, and thus, in addition to the chemical data that can be extracted, electrical data is of special interest as targeted nerve stimulation is possible. Neuro-surveillance or Nerveillance allows bidirectional communication: i.e., enabling direct control, rather than merely collecting and mining data.

Neuromarketing 2.0

Neuromarketing is a discipline that builds on enhancing marketing research by introducing neuropsychology research and techniques and studying consumers' sensorimotor, cognitive, and affective responses to marketing stimuli.

I would like to introduce Neuromarketing 2.0, an evolutionary potential practice and research field, where neuromarketing becomes an endocrine system control mechanism, creating the "literal user". What is meant by the "literal user" is the typical mainstream user who is driven to consume what media promotes. By having access to the endocrine system data, coupled with motion prediction applied at the scale of neural data, neuromarketing strategies can channel behavior when confronted with purchasing and other consumer-related activities. Major players include testosterone, estrogen, and progesterone, cortisol, dopamine, and oxytocin, which could be manipulated to majorly shape behavior.

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Prosopagnosia. Facial misrecognition

Facial recognition is a widely used technology that has become one of the cornerstones of modern citizen data systems. Prosopagnosia is the fall of facial recognition, due to its becoming obsolete. When direct access to the electrochemical circuitry is available, facial recognition data becomes unnecessary weight.

Creative Neuro-coding

We are approaching a new stage of what creative coding means. Creative coding has emerged as an interdisciplinary field, in which – through programming – authors create expressive (rather than functional) media content. In other words, creative coding has creativity in the author/programmer layer, and not in the program. With the introduction of artificial intelligence to the field, be it classical or generative, a basic form of "machine creativity" is expressed. While programming was considered an efficient, functional, and precise, way to augment human capabilities, neurotechnologies will become trivial, and just like creative AI, creative neurotechnologies are inevitable. Just like creative coding. Creative neuro-coding is programming to generate a code that exhibits internal creativity and has its interface with the nervous system. Creative coding is coding in a creative way, rather than generating a creative code.

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