

CRISPR critters – *Ereignis* as deconstraint

The notion that human existence embodies experimentation *per se* got boosted in 2020 by the award of the Nobel Prize for Chemistry to Emmanuelle Charpentier and Jennifer Doudna for the development of a method of genome editing. “Using the CRISPR/Cas9 genetic scissors,” the presser tells us, “it is now possible to change the code of life over the course of a few weeks.”¹ More accurately maybe ‘to speak in the code of life’ since the DNA code is, like language, doubly articulated by segmentation and integration. Because of this double articulation of DNA the CRISPR technique can cut out a segment here and paste it there to make a different ‘utterance’ – *Insmurfingcroyable*; a signal instance of Foucault’s *le savoir n’est pas fait pour comprendre, il est fait pour trancher*.

On a number of occasions after the Second World War Heidegger spoke publicly of the dangers of technology. He informs an audience of Messkirch townspeople that

“The international meeting of Nobel Prize winners took place again in the summer of this year of 1955 in Lindau. There the American chemist, Stanley, had this to say: ‘The hour is near when life will be placed in the hands of the chemist who will be able to synthesize, split and change living substance at will.’”

Heidegger then comments, “We do not stop to consider that an attack [*ein Angriff*] with technological means is being prepared upon the life and nature [*das Wesen*] of man compared with which the explosion of the hydrogen bomb means little. For precisely if the hydrogen bombs do *not* explode and human life on earth is preserved, an uncanny change in the world moves upon us.”² Stanley perhaps **had** considered that prospect: the chemist, he predicted at Lindau, “should be able eventually to weld or to determine the nature of the germ plasm of the world. And this of course should give the chemist a type of power which currently seems to rest only in the hands of the atom physicists.”³

¹ <https://www.nobelprize.org/prizes/chemistry/2020/press-release/> . The acronym stands for Clustered Regularly Interspaced Short Palindromic Repeats.

² Martin Heidegger, “Memorial Address” in *Discourse on Thinking* (tr. John M. Anderson and E. Hans Freund 1966) 52.

³ Wendell Meredith Stanley verbatim: “And I believe that with time that the chemist should be able to synthesize the building-blocks which go to make up a virus – such as for example tobacco mosaic virus – with the ultimate building-blocks being protein units of only seventeen thousand molecular weight. Already synthetic approaches in connection with insulin and some of the other hormones are well on the way, and I believe that within the next few years the biochemist should be able to synthesize these small building-blocks, the structural units of a virus. And then through a special technique cause these to assemble around the nucleic acid component and regain their activity. This may be a little bit on the utopian side but I believe that it is a real possibility within the next few years. And with this of course you see, because of the genetic characteristic of viruses, one can then gaze just a bit further towards the horizon and see that the chemist should be able eventually to weld [*sic*] or to determine the

Heidegger was right about the enormity of the change. The culmination of genetic modification technology in the CRISPR technique is the Ninth Gate, a major transition in evolution⁴ for the reason set forth by two evolutionists in 2005:

“Is genetic variation purely random, or is it in fact biased to *facilitate* evolutionary change? By *facilitated genetic variation*, we mean genetic variation that would be (1) biased to be viable (only nonlethal variation is heritable, the rest from the point of view of evolution is useless); (2) biased to give functional outcomes; and (3) biased to be relevant to the environmental conditions.⁵ A few biologists tried to invent theories about how the environment might alter the parents’ genetic endowment to their offspring. As attractive as it would be to discover a process for loading the genetic dice, thereby improving the rate and course of evolution, there is in fact no evidence for facilitated *genetic* variation and there is conclusive evidence that it does not exist. The process of evolution receives no help from this quarter, and within our modern understanding of the organism it would be hard to imagine how such a process could work.”⁶

Such was the *status quo ante*. The invention of the CRISPR technique has now brought facilitated genetic variation to life after more than three billion years of evolution without it. A process for loading the genetic dice has been laid out in a sheaf of published technical papers. How facilitated genetic variation could come about through natural selection is hard to imagine so long as technology as a product of natural selection is left out of consideration. “Nothing in biology makes sense,” including biotechnology, “except in the light of evolution.”⁷

Of artificial selection Darwin wrote, “It is an error to speak of man ‘tampering with nature’ and causing variability. If organic beings had not possessed an inherent tendency to vary, man could have done nothing. . . . man selects varying individuals, sows their seeds, and again selects

nature of the germ plasms of the world. And this of course should give the chemist a type of power which currently seems to rest only in the hands of the atom physicists.” Uneasy laughter from the audience. <https://www.mediatheque.lindau-nobel.org/videos/31538/viruses-1955> beginning at 25:35.

⁴ By one count only eight heretofore; see John Maynard Smith and Eörs Szathmary, *The Major Transitions in Evolution* (1995).

⁵ With CRISPR “scientists are now able to make precise single-base-pair changes or larger insertions. Coupled with the availability of genome sequences for a growing number of organisms, the technology allows researchers to explore these genomes to find out what genes do, move mutations that are identified as associated with disease into systems where they can be studied and tested for treatment, or where they can be tested in combinations with other mutations. The technology has enabled efficient targeted modification of crops and is currently being developed to treat and cure genetic diseases, for instance by modifying hematopoietic stem cells to treat sickle cell disease and β -thalassemia.” <https://www.nobelprize.org/uploads/2020/10/advanced-chemistryprize2020.pdf> 10.

⁶ Marc W. Kirschner and John C. Gerhart, *The Plausibility of Life: Resolving Darwin’s Dilemma* (2005) 13; their italics.

⁷ Theodosius Dobzhansky, 35 *American Biology Teacher* 125 (1973).

their varying offspring. But the initial variation on which man works, and without which he can do nothing, is caused by slight changes in the conditions of life, which must often have occurred under nature. Man, therefore, may be said to have been trying an experiment on a gigantic scale; and it is an experiment which nature during the long lapse of time has incessantly tried.”⁸ All selection was accomplished heretofore only through *phenotypic* variants. Now, with the invention of CRISPR, one species can effect bespoke *genetic* variants, and nature’s experiment in experimentation *schlechthin* – human being – takes a giant plunge *au fond du gouffre pour trouver du nouveau*.

CRISPR is a technology for directly ‘deconstraining’ variation. Gerhart and Kirschner have long argued that “the conservation of these core processes [certain eukaryotic cell mechanisms] for the past 530 million years is related less to the processes’ own constraint, embedment, or optimization than to the deconstraint they provide for phenotypic variation of other processes, on the basis of which they are continually coselected.”⁹ Deconstraint is the key notion in their theory of facilitated variation: “The existing organism constrains and deconstrains variation of its phenotype, both the kind and amount. Some components and processes are constrained in the change they can undergo, but deconstrain the change of other components and processes of the phenotype. The overall trade-off is such that phenotypic variation is accelerated over what would occur if deconstraint were absent.”¹⁰

Deconstraint is also the key notion in Heidegger’s analysis of the concepts ‘poor in world’ and ‘world-forming.’ Deconstraint (his word is *Entthemmung*, ‘disinhibition’) is particular and local in the former and general and global in the latter. Radical deconstraint in the dimension of ‘taking-as’ distinguishes human being from the rest of the biota.

Heidegger provisionally defines ‘world’ as “those beings which are in each case accessible and may be dealt with, accessible in such a way that dealing with such beings is possible or necessary for the kind of being pertaining to a particular being.” With world so defined, the animal “somehow possesses less. But less of what? Less as against more, namely as the richness of all those relationships [to beings] that Dasein has at its disposal.”¹¹

Heidegger (and many others) criticized Darwinism for its rigid separation of organism and environment, its “fundamentally misconceived idea that the animal is present at hand, and then subsequently adapts itself to a world that is present at hand, that it then comports itself

⁸ Charles Darwin, *The Variation of Animals and Plants Under Domestication* (1868) Vol. I; 2, 3.

⁹ Marc Kirschner and John Gerhart, “Evolvability,” 95 *Proc. Nat’l Acad. Sci. USA* 8420, 8421 (1998).

¹⁰ *The Plausibility of Life* 220-221.

¹¹ Martin Heidegger, *The Fundamental Concepts of Metaphysics: World, Finitude, Solitude* (tr. William McNeill and Nicholas Walker 1995) 196, 193.

accordingly and that the fittest individual gets selected.” Heidegger insisted that “The organism is not something independent in its own right which then adapts itself.” Therefore the task is “to acquire insight into the *relational structure between the animal and its environment*.” For it is the organism which “adapts a particular environment *into* it in each case, so to speak.”¹²

To characterize the relational structure between the animal and its environment Heidegger used the metaphor of ‘captivation.’ This manner of being, *Benommenheit*, emerges from all the animal’s organic processes acting in unity:

“It is not as if the beating of the animal’s heart were a process different from the animal’s seizing and seeing, the one analogous to the case of human beings, the other to a chemical process. Rather, the entirety of its being, the being as a whole in its unity, must be comprehended as behaviour.”

Benommenheit is “the inner possibility of behavior as such;” “the animal’s *relationality* [*Bezogenheit*] to other things consists in a kind of *being taken* [*Hingenommenheit*];” such that “Instinctual activity is not a recognitive self-directing toward objectively present things, but a *behaving*. Driven activity is a behaving.”¹³

To characterize driven activity Heidegger used the metaphor of ‘encircling ring’: “each instinctual drive is intrinsically determined by its *being driven with respect to* the other drives. Instinctual drivenness as being driven from one drive to another holds and drives the animal within a ring which it cannot escape and within which something is open for the animal. . . . The animal is *encircled* [*umringt*] by this ring [*Ring*] constituted by the reciprocal drivenness of its drives.”¹⁴

¹² *Id.* 263, 264. The critique is now generally accepted. Cf. Lewontin: “To create such a theory of evolution Darwin had to take a revolutionary step in thinking about organisms and environment. Previously there had been no clear demarcation between internal processes and external ones. . . . In Darwin’s theory variation among organisms results from an internal process, what is now known as gene mutation and recombination, that is not responsive to the demands of the environment. The variants that are produced are then tested for acceptability in an environment which has come into being independent of that variation. The process of variation is causally independent of the conditions of selection. . . . The organism and the environment then interact only through the selective process. . . . Darwin’s alienation of the outside from the inside was an absolutely essential step in the development of modern biology. Without it, we would still be wallowing in the mire of an obscurantist holism that merged the organic and inorganic into an unanalyzable whole. But the conditions that are necessary for progress at one stage in history become bars to further progress at another. The time has come when further progress in our understanding of nature requires that we reconsider the relationship between the outside and the inside, between organism and environment.” Richard Lewontin, *The Triple Helix: Gene, Organism, and Environment* (2000) 42-43, 47.

¹³ *The Fundamental Concepts of Metaphysics* 239, 249, 243.

¹⁴ *Id.* 249.

The “reciprocal drivenness of its drives” is a web of disinhibitions enacting the local and particular openness of the animal:

“Capability for . . . and thus behaviour itself is open for such occasions, for stimuli, for that which initiates, i.e., disinhibits the capability for . . . in such and such a way in each case. That which the animal’s behaviour relates to is such that this behaviour is open to it. This other is taken up into the openness of the animal in a manner that we shall describe as *disinhibition* [*Enthemmung*]. . . . That which behaviour as instinctual capability comes upon is always disinhibiting in some way.”¹⁵

Heidegger then asks “why should the instinctual drive have to be disinhibited in the first place?” He claims that “the instinctual drive precisely possesses an inner tension and charge, a containment and inhibitedness that essentially must be disinhibited.”¹⁶ How accurate this Aristotelian hunch¹⁷ could prove in certain contexts emerged only much later in the century once the mechanism of ‘embryonic induction’ was better understood.

Heidegger praises Spemann, his senior colleague at Freiburg, three times in *The Fundamental Concepts of Metaphysics*.¹⁸ In Kirschner and Gerhart’s account the “greatest accomplishment” of “the golden age of embryology” came “with Hans Spemann and Hilde Mangold’s discovery of ‘embryonic induction.’” They recount that Mangold and Spemann

“isolated a small piece of tissue from a newt embryo at an early stage well before cells were differentiated. From that region the embryo would later develop its trunk and back. When they transplanted this small region into a recipient of the same age, at a site that would have normally developed into the embryo’s belly, the transplanted piece ‘induced’ the nearby cells to forgo belly development and instead to form virtually a whole new embryo at the site. The host embryo with its graft developed as conjoined twins with two complete heads (the original and the induced one), two spinal cords, and two blocks of skeletal muscle. Since little of the grafted tissue was incorporated into the new embryonic structures, the researchers concluded that the grafted tissue had

¹⁵ *Id.* 254.

¹⁶ *Ibid.*

¹⁷ “the agent has the capability in so far as it is a capability of acting; and this is not in all, but in certain circumstances, in which external hindrances will be excluded.” τὴν γὰρ δύναμιν ἔχει ὡς ἔστι δύναμις τοῦ ποιεῖν, ἔστι δ’ οὐ πάντως ἀλλ’ ἐχόντων πῶς, ἐν οἷς ἀφορισθήσεται καὶ τὰ ἔξω κωλύοντα. *Metaphysics* 1048a (tr. Hugh Tredennick 1989).

¹⁸ “a researcher of the stature of Spemann,” whose “outstanding investigations . . . have turned the problem of animal development and the unity of the organism in a quite new direction” and which have “set the problem of the *particular kind of occurrence* involved in the organization of the organism upon a more comprehensive and more profoundly conceived basis.” *The Fundamental Concepts of Metaphysics* 190, 262, 266.

induced the new embryonic parts from the host tissue, which on its own would have made the belly.”¹⁹

Mangold’s dissertation (Freiburg 1923) named the transplanted tissue *Organisator*;²⁰ which term, as Gerhart and Kirschner say, “implied instruction, maybe even micromanagement.” Not until the late 1990s “To everyone’s surprise, embryonic induction turned out to be a permissive process; the organizer provides a signal of little complexity.” The embryonic organizer does not organize, it disinhibits potential:

“In the newt, all regions of the embryo are initially capable of developing into almost anything: the nervous system, vertebral column, or muscles of the head, trunk, or tail. This potentiality is *globally repressed* by a signaling protein and other factors, which all cells secrete and communally receive. . . . [the embryonic inducer] is simply a collection of secreted proteins that locally bind up and antagonize the ubiquitous repressor signal. In the vicinity of these antagonists, the embryonic cells are released from their self-imposed repression, and develop the nervous system, vertebrae, and musculature of the back side of the body. . . . The inducers merely release the innate but self-inhibited capacity to develop these structures.”²¹

Newts, like us, are metazoans. Kirschner and Gerhart point out that

“Metazoa [eukaryotes all] have undergone rapid and diverse phenotypic change, particularly in morphology, tissue organization, development, and physiology, that has entailed an extensive elaboration of cell-cell communication. By contrast, eubacteria [prokaryotes that are not archaeobacteria] have undergone limited morphological change but have achieved extensive biochemical diversification. Bacteria are microscopic, asexual, ubiquitous, and slowly changing generalists, whereas metazoans are macroscopic, sexual, ecologically restricted, and morphologically diverse specialists with a history of repeated radiations.”²²

All eubacteria are single-celled, with a rigid cell wall and no nucleus, and yet “are extremely versatile in their capacity to make and destroy chemical compounds.”²³ Heidegger claimed that “History is, in itself, the pre-articulated conversation of the essential with itself.” If we think of evolution as life’s ‘conversation with itself,’ then we can ask with Heidegger “whether and how

¹⁹ *The Plausibility of Life* 122, 124.

²⁰ <https://embryo.asu.edu/pages/hilde-mangold-1898-1924> .

²¹ *The Plausibility of Life* 126, 127; their italics.

²² “Evolvability” 8420-8421.

²³ *The Plausibility of Life* 51.

the human enters into this conversation.”²⁴ There is evidently a role in this conversation for a metazoan specialist in extreme versatility at synthesis and diaeresis, a species which ‘goes about itself’ through an extensive and increasing diversification of technological means.²⁵

As compared to human being the animal has a more constrained range of what can be relevant to it, what it can ‘care about’: “Throughout the course of its life the animal is confined to its environmental world, immured as it were within a fixed sphere that is incapable of further expansion or contraction.” Yet the animal’s *Benommenheit* is “not a static condition, not a structure in the sense of a rigid framework inserted within the animal, but rather an intrinsically determinate motility [*eine bestimmte Bewegtheit*] which continually unfolds or atrophies as the case may be. Captivation is at the same time motility [*Benommenheit ist zugleich Bewegtheit*], and this belongs to the essence of the organism.”²⁶

The principal aspects of facilitated variation include weak linkage, compartmentation, and exploratory behavior. Exploratory behavior, percolating up from microtubules forming in the individual cell to individual ants foraging for food,²⁷ manifests *Bewegtheit* most obviously.

Bewegtheit in all organisms is for the sake of preservation of self (or conspecific) and reproduction of self (or conspecific);²⁸ that is, all have an inchoate care-structure; even a protist has its *Befindlichkeit*,²⁹ even a vegetable its *Wozu*.³⁰ A living thing is for the sake of more living things. The whole conversation aims at more life.³¹

²⁴ Martin Heidegger, *Heraclitus: The Inception of Occidental Thinking and Logic: Heraclitus’s Doctrine of the Logos* (tr. Julia Goesser Assaiante and S. Montgomery Ewegen 2018) 211.

²⁵ “the world of man is a rich one, greater in range, far more extensive in its penetrability, constantly extendable not only in its range . . . but also in respect to the manner in which we can penetrate ever more deeply in this penetrability.” *The Fundamental Concepts of Metaphysics* 193. “[W]e can always bring more and more beings into consideration” because constraint on the capacity to do so is disinhibited. On the capacity of organisms to use organisms of other species as technological means see Richard Dawkins, *The Extended Phenotype: The Long Reach of the Gene* (rev. ed. 1999); on the capacity of organisms to use the physical environment as technological means see J. Scott Turner, *The Extended Organism: The Physiology of Animal-Built Structures* (2000). Both capacities are deconstrained in human being.

²⁶ *The Fundamental Concepts of Metaphysics* 198, 265.

²⁷ *The Plausibility of Life* ch. 5.

²⁸ The disinhibiting ring is “self-preservation and maintenance of the species, but grasped now in its structural belonging to the essence of captivation, to animality as such.” *The Fundamental Concepts of Metaphysics* 259.

²⁹ Martin Heidegger, *History of the Concept of Time: Prolegomena* (tr. Theodore Kisiel 1985) 255.

³⁰ Martin Heidegger, *Logic: The Question of Truth* (tr. Thomas Sheehan 2010) 129.

³¹ And life is for the sake of what? Life facilitates production of entropy: “It appears that living communities serve to augment the rate of entropy production over what it would be in the absence of biota.” R. E. Ulanowicz and B. M. Hannon, “Life and the production of entropy,” 232 *Proc. R. Soc. Lond. B* 181 (1987); <https://royalsocietypublishing.org/doi/pdf/10.1098/rspb.1987.0067>; see also Axel Kleidon, Yadvinder Malhi, and Peter M. Cox, compilers and editors of “Maximum entropy production in ecological and environmental systems: applications and implications,” Theme Issue: 365 *Phil. Trans. R. Soc. B* issue 1545 (2010);

What human being adds to this conversation is caught by Heidegger's dominant thought: "Humans as the mortals are the first to dwell in the world as world;"³² "The human is the essence that is alone open to the open."³³ In other words we are the first and so far only organism sufficiently deconstrained to have deconstraint – *Welt, das Offene, die Lichtung, Ereignis, ἀλήθεια, λόγος, Seyn*, etc. – as our ground.

So Heidegger valorizes deconstraint itself as the to-be-preserved and envisions our role in the conversation as deconstraint's protector: "The great essence of the human lies in its belonging to the essence of being. It is needed by the essence of being so as to guard it in its truth. . . . Only when the human as the shepherd of being waits for the truth of being can he at all expect—and without deteriorating into a mere wanting to know—the arrival of another dispensation of being;"³⁴ i.e., another development in the history of deconstraint.

But shepherds are not only reactive watchers, they also take an active hand in the welfare of their charge. "Only when man, in the disclosing coming-to-pass of the insight by which he himself is beheld, renounces human self-will and projects himself toward that insight, away from himself, does he correspond in his essence to the claim of that insight."³⁵ The claim of the open for preservation by human being implies, to update the figure, the obligation to back it up on another platform; in the phrase of the Kantian systems analyst: to save the condition of the possibility of the work.

Just as Darwin's alienation of the inside from the outside was "an absolutely essential step," so also was Heidegger's alienation of the human, *der Mensch*, from its essence, *das Wesen* ('deconstraint' in the idiom we're using here). *Dieses Wesen ist nichts Menschliches.*³⁶ The proximal ancestor of this move is Brentano's alienation of *Psychognosie* from genetic psychology:

"Psychognosy . . . teaches nothing about the causes that give rise to human consciousness and which are responsible for the fact that a specific phenomenon

<https://royalsocietypublishing.org/toc/rstb/2010/365/1545> . In the light of the thermodynamic paradigm Aristotle was right: all is *κίνησις*. He just got the sense wrong way around: 'Everything that rises must *diverge*.'

³² Martin Heidegger, "The Thing," in *Bremen and Freiburg Lectures: Insight Into That Which Is and Basic Principles of Thinking* (tr. Andrew J. Mitchell 2012) 20.

³³ *Heraclitus* 188. The one thought is expressed in a profusion of idioms and aspects: *r*-selection strategy in action.

³⁴ "The Turn," in *Bremen and Freiburg Lectures* 66, 67.

³⁵ Martin Heidegger, "The Turning" in *The Question Concerning Technology and Other Essays* (tr. William Lovitt 1977) 47.

³⁶ Martin Heidegger, *Nietzsche. Volume IV: Nihilism* (ed. David Farrell Krell, tr. Frank A. Capuzzi 1982) 232-233; and "On the Question of Being," in *Pathmarks* (ed. tr. William McNeill 1998) 300.

does occur now, or does not occur now or disappears. Its aim is nothing other than to provide us with a general conception of the entire realm of human consciousness. It does this by listing fully the basic components out of which everything internally perceived by humans is composed, and by enumerating the ways in which these components can be connected. Psychognosy will therefore, even in its highest state of perfection, never mention a physico-chemical process in any of its doctrines.”³⁷

The concern of genetic psychology, by contrast, is “to acquaint us with the conditions under which specific [psychic] phenomena occur;” which it can never do “without mentioning physico-chemical processes and without reference to anatomical structures.” Which processes it is correct to say, according to Brentano, “are preconditions for consciousness.”³⁸

Heidegger makes the same alienation-move again in his analysis of technology. Although technology is instrumentality, ends and means, it is not *merely* that; “no mere product of culture and no mere manifestation of civilization.”³⁹ “The essence of technology is itself nothing technological;” rather, “Technology is a way of revealing [*eine Weise des Entbergens*].” The essence of technology is “the realm of revealing, i.e., of truth.”⁴⁰ “[T]he human does not decide about his essence on his own terms, and never by himself, for this reason the requisitioning of the standing reserve, for this reason positionality, the essence of technology, cannot be anything merely human [*nichts nur Menschliches sein*].”⁴¹ Technology “is held to be some being among many other beings, while indeed being itself essences in and as technology;” “the essence of technology is nothing less than beyng itself.”⁴²

And again the essence – beyng, deconstraint – makes a claim: “the essence of the human is now ordered [*bestellt*] to give a hand to the essence of technology.”⁴³ I.e.:

“since the human *essence* belongs to the essence of beyng insofar as the essence of beyng needs the human essence, in accordance with its own essence, in order to remain guarded in the midst of beings as being, and thus needs it in order to essence as beyng, then for this reason the essence of technology cannot be led to a transformation of its destiny [*in den Wandel seines Geschickes*] without the

³⁷ Franz Brentano, *Descriptive Psychology* (ed. tr. Benito Müller 1995) 4. Cf. Heidegger: “Apprehending cannot be detected anatomically, nor can it be proven physiologically, or even grasped biologically.” *Heraclitus* 198.

³⁸ *Descriptive Psychology* 4.

³⁹ “The Danger” in *Bremen and Freiburg Lectures* 63.

⁴⁰ “The Question Concerning Technology” 12.

⁴¹ “Positionality” in *Bremen and Freiburg Lectures* 37.

⁴² “The Danger” 57, 59.

⁴³ “The Turn” in *Bremen and Freiburg Lectures* 64.

human essence. Thereby technology is not humanly overcome; much to the contrary, the essence of technology is converted into its still-concealed truth.”⁴⁴

And again Heidegger’s analysis provokes the thought that this transformation/conversion (*Verwinden*) may be accomplished by cultivating ‘deconstraint’ from physical preconditions in another medium, a non-human vector; whether biological or electronic or some combination only emerging through further experimentation.⁴⁵ And this accomplishment would be a work of art: “art breaks-open in the midst of beings an open place, in the openness of which all is other than formerly. . . . The working of the work does not consist in a working-of-effects. It rests in a transformation [*Wandel*], happening out of the work, of the unconcealedness [*Unverborgenheit*] of beings, and that is to say: being.”⁴⁶

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⁴⁴ *Id.* 65.

⁴⁵ A lot of it, given the abyss of our ignorance. E.g., how does an ant know how to perform a task? “We don’t know the answer, for ants or, really, for any other animal. We refer to ‘instinct’ or, more recently, ‘hard-wiring’ or ‘programming,’ but this metaphorical language cushions almost complete ignorance. There is a pervasive fantasy that genes are little packages of instructions that tell us and other animals how to behave. However, we know that in fact what genes do is determine the production of proteins. The expression of genes, which determines which proteins are currently being produced, is transient and context-dependent. Most important, even when we can track which proteins are manufactured by which genes, we still do not know how to explain behavior as a function of these gene products.” Deborah M. Gordon, *Ant Encounters: Interaction Networks and Colony Behavior* (2010) 32-33.

⁴⁶ Martin Heidegger, *The Origin of the Work of Art* (tr. Roger Berkowitz and Philippe Nonet 2006) 55.