Shannon entropy and *das Ge-Stell*

Ich bin ein Ge-Steller!
(Maxwell's Demon)

"We've been told, again and again, that thermodynamics is a resource theory."[1]

One heuristic for thinking about *Ge-Stell* is Shannon entropy,[2] a notion which indexes "variability of the elements within a distribution, how diverse the objects are from each other within the collection . . . [with respect to] a property or a set of properties we want to use to characterize the elements."[3] The diffuser the variability, the greater the Shannon entropy. In his writings on technology Heidegger claimed, albeit not in these terms, that the Shannon entropy of beings is **decreasing**. He intimates that *das Ge-Stell* is some uncanny operator effecting this decrease, in thermodynamic terms an avatar of Maxwell's Demon.[4]

"All distances in time and space," Heidegger says, "are shrinking," *schrumpfen ein*.[5] This is a phenomenological claim about distances, *Entfernungen*, as meaningful presences, *Anwesen.* The collection of interest to Heidegger is always the one comprising all *Anwesen*: "Everything we talk about, everything we have in view, everything towards which we comport ourselves in any way, is being; what we are is being, and so is how we are. Being lies in the fact that something is, and in its Being as it is; in Reality; in presence-at-hand; in subsistence; in validity; in Dasein; in the 'there is'."[6]

Distances, members of a subset of the Ω-set of all beings-*qua*-meaningful-presence, are shrinking. Which means this subset is becoming less diverse, its members becoming more and

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[1] Sean Carroll, "Complexogenesis," Philosophy of Physics Workshop: Foundations of Thermodynamics (June 18, 2024), Rotman Institute of Philosophy: https://www.youtube.com/watch?v=WOW_hEfMimI&t=3458s at 37:39.
[2] "We shall call $H = -\sum p_i \log p_i$ the entropy of the set of probabilities $p_1, \ldots, p_n$." C. E. Shannon, "A Mathematical Theory of Communication," 27 *Bell System Technical Journal* 379-423, 623-656 (1948); https://people.math.harvard.edu/~ctm/home/text/others/shannon/entropy/entropy.pdf p. 11.
[3] Gabriele Carcassi, Christine A. Aidala, and Julian Barbour, "Variability as a better characterization of Shannon entropy" (2021); https://arxiv.org/abs/1912.02012 , pdf 1, 2.
[4] Andrew Mitchell explains that "The spread of positionality is thus not a framework that surrounds from without, but, in part, a process of conscription [*Gestellung*] that adopts and compels whatever it encounters into the order of standing reserve." Translator's Foreword to Martin Heidegger, *Bremen and Freiburg Lectures:* Insight into That Which Is *and* Basic Principles of Thinking (tr. Andrew J. Mitchell 2012) xi. For the earliest account of the demon's process of assortative conscription see Maxwell's 1867 letter to Tait here: https://archive.org/details/lifescientificwo00knotuoft/page/212/mode/2up?view=theater 213-214.
[5] *Bremen and Freiburg Lectures* 3; *Gesamtausgabe Band* 79: 3.
[6] *Being and Time* (tr. Macquarrie and Robinson 1962) 26. *Sein und Zeit* 6-7: https://www.beyng.com/pages/de/SeinUndZeit/SeinUndZeit.006.html .

more like one another as they converge to identity—undistance, *Abstandlosigkeit*. And Heidegger is alarmed:

> "What is happening when, through the removal of great distances, everything stands equally [*alles gleich steht*] near and far? What is this uniformity [*Gleichförmige*] wherein everything is neither far nor near and, as it were, without distance? Everything washes together into the uniformly distanceless [g*leichförmig Abstandlose*]. How? Is not this moving together [*Zusammenrücken*] into the distanceless even more uncanny than everything being out of place [*Auseinanderplatzen*, deranged]?"[7]

So how does Shannon entropy formalize Heidegger's anxious vision? Consider three sets of geometrical shapes. In the first the members are 10 circles, 1 star, and 1 triangle. In this set almost all the elements (10 of 12) are similar to each other. In the second set there are 6 circles, 2 stars, 1 triangle, and 1 square. More variability, yet more than half the elements are similar to each other. In the third set there are 2 circles, 2 stars, 2 triangles, and 2 squares, no predominating species. "The Shannon entropy of the first set would be lower than the second set, which would be lower than the third."[8] The calculation is done in the footnote,[9] while up here our intuition tells us that intra-set variety is clumped in the first set and fully smoothed-out in the third set; entropy as diffuseness of intra-set variety **increases** from the first to the second to the third set (from 0.41 to 1 when calculated in base-4 logarithms). Whereas Heidegger claims that *Ge-Stell*, the Manic Assimilator, is moving (*rücken*) everything in the **opposite** direction, toward sameness and away from variety, disfavoring d*v*rs*t*. In terms of the geometric-shapes example, *Ge-Stell* is assimilating, Borglike, different distances—stars, triangles, squares—to circles.

The decrease in Shannon entropy of the set of distances is merely one case within *Ge-Stell*'s wide reach. Concluding his first Bremen lecture '*Das Ding,*' Heidegger contrasts the high entropy set of 'things' with ubiquitous low entropy *Bestand.*

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[7] GA 79: 4; *BFL* 4. *Cf.* "physical entropy is derangement or, as Boltzmann modeled it, disorder." S. N. Salthe, "The Natural Philosophy of Entropy": https://www.nbi.dk/~natphil/salthe/NatPhil_of_entropy.pdf 8. *Der Hinweis* of the Bremen Lectures elaborates § 274 of *Contributions*, where we read that capacities to be controlled "are for their part unified among themselves [*ihrerseits unter sich einigen*]", that "beings as a whole start to shrink [*beginnt zu schrumpfen*]. The 'world' becomes ever smaller [*immer kleiner*]," and that "The metaphysical diminution [*Verkleinerung*] of the 'world' produces an eroding [*Aushöhlung*] of the human being." Martin Heidegger, *Contributions to Philosophy (Of the Event)* (tr. Richard Rojcewicz and Daniela Vallega-Neu 2012) 389; GA 65: 494-495: https://www.beyng.com/gaselis/?vol=65&pg=494 .

[8] Carcassi's example, here: https://www.youtube.com/watch?v=-Rb868HKCo8 1:25-2:02.

[9] Set 1: $-[(10/12 \times \log_4 10/12) + 2\,(1/12 \times \log_4 1/12)] = -[-0.11 + 2(1/12 \times -1.8)] \approx 0.41$.
Set 2: $-[(6/10 \times \log_4 6/10) + (2/10 \times \log_4 2/10) + 2\,(1/10 \times \log_4 1/10)] \approx 0.79$.
Set 3: $-[4\,(2/8 \times \log_4 2/8)] = -[4\,(¼ \times -1)] = 1$.
Worked example with bi-variate chickens here: https://www.youtube.com/watch?v=YtebGVx-Fxw .

> "The thing is nimble [*Ring ist das Ding*]: jug and bench, footbridge and plow. But a thing is also, after its manner [*nach seiner Weise*], tree and pond, stream and mountain. Things are, each abiding thing-like in its way [*je weilig in ihrer Weise dingend*], heron and deer, horse and bull. Things are, each abiding thing-like after their manner [*je weilig nach ihrer Weise dingend*] mirror and clasp, book and picture, crown and cross. Yet scant and slight are things even in number, as measured against the innumerable objects everywhere of equal value [*der Unzahl der überall gleich giltigen Gegenstände* (i.e., *Bestand*)], as measured against the immeasurable masses of humans as living beings."[10]

Humans *qua* living beings—hollowed out, *ausgehöhlten*, by *Ge-Stell*—are fungible and thus *en masse* are, like *Bestand*, a low Shannon-entropy set.

Now, in light of the notion of decreasing Shannon entropy as decreasing variability/increasing likeness, consider Heidegger's concluding generalization of *Ge-Stell's* impact. Just in case we hadn't quite got the point Heidegger hammers it in to close his lecture '*Das Ge-Stell*':

> "The constancy [*das Beständige*] of the piece of standing reserve [*Bestand*] is characterized by uniformity [*das Gleichförmige*]. In positionality [*Ge-Stell*], everything [*alles*] is imposed upon for the constant replaceability of the equivalent by the equivalent [*des Gleichen durch Gleiches gestellt*]. . . . Positionality reaps everything orderable in advance into the equivalence [*das Gleiche*] of the unrestricted orderability of the complete standing reserve. A constantly exchangeable equivalence [*Gleiche*] holds equally [*gilt gleich*] in everything constant. The equivalence of value [*das Gleich-Giltige*] in everything constant secures for this its constancy through a replaceability that is orderable and in place. The standing reserve consists of the requisitioning of positionality [*Bestellen des Ge-Stells*]. In the standing reserve everything stands in equal value [*im Gleich-Giltigen*]. The standing reserve orders the distanceless."[11]

So what's the problem? The essence of *Ge-Stell,* Heidegger says, is "*the danger*," *Das Wesen des Ge-Stells aber ist* ***die Gefahr***.[12] Danger of what? Evidently loss of diversity. Diversity of what? Nietzsche's 'many kinds of eyes.' When many kinds of seeing, of knowing, of being are assimilated and thereby reduced to one, then, as Heidegger says elsewhere, "We board the tram, talk to other people, call the dog, look up at the stars, all in the same way [*in einem Stil*]—humans, vehicles, human beings, animals, heavenly bodies, everything in the same uniformity [*alles in einer Gleichmäßigkeit*] of what is present at hand." The vice being described

[10] *BFL* 20; GA 79: https://www.beyng.com/gaselis/?vol=79.00&pg=21 .
[11] *BFL* 42; GA 79: 44: https://www.beyng.com/gaselis/?vol=79.00&pg=44 .
[12] *BFL* 59; GA 79: 62: https://www.beyng.com/gaselis/?vol=79.00&pg=62 .

here in 1929 to students at Freiburg U. bears a strong resemblance to the phenomenon he will call 'the danger' in 1949 at the commerce club in Bremen. He tells the students, "It is the fact that beings can be manifest in this leveled out uniformity [*eingeebneten Gleichmäßigkeit*] of the present at hand which gives to human everydayness its peculiar security, dependency, and almost inevitability, and which facilitates the ease with which we necessarily turn from one being to another in everydayness, and yet the specific manner of being that is in each case [*die jeweilige Seinsart*] entirely essential to beings is never acknowledged in its importance."[13]

Importance for what? For that we turn to the exegesis of Iain Thomson. In his latest book Thomson emphasizes the failure of the project of *Being and Time* as a failure which opened Heidegger's eyes to the Ur-phenomenon, the truth of being. Thomson writes,

> "The answer Heidegger was looking for changed dramatically in his later thinking, so much so that he came to reject *Being and Time*'s quest for a fundamental ontology as itself metaphysics. (To put it in Heidegger's own terms, *Being and Time*'s search for a fundamental ontology was an attempt to understand 'the being of entities'; like all metaphysics, it thus effaced the *truth* of 'being as such,' that is, the temporally dynamic 'presencing' of that apparently inexhaustible Ur-phenomenon that informs and makes possible but is never completely captured by any metaphysical understanding of 'the being of entities.')"[14]

Any prevailing metaphysical understanding of the being of entities—a univisual eye; e.g., *Ge-Stell*'s eye—occludes vision of, inhibits sensitivity to, the Ur-phenomenon. Is that bad? Heidegger and following him Thomson suggest that it stifles variability, what Thomson calls 'ontological pluralism.' Thomson extols

> "what it means to use technologies against nihilistic technologization of enframing [*Ge-Stell*]: Learning to use technologies in ways that creatively and responsibly *disclose* the inexhaustible meanings of, rather than *impose* preexisting meanings on, things, each other, and ourselves. . . . This is what it means to become (post-metaphysical) 'thinkers,' ontologically-disclosive beings whose sensitive thinking (*Besinnung*) creatively composes being's polysemic hints into meaningful compositions, and because we can never do so finally, we instead *learn* to do so repeatedly, in ways that also creatively disclose and coherently (re)constitute the meaning of our unfolding existences in time."[15]

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[13] *The Fundamental Concepts of Metaphysics: World, Finitude, Solitude* (tr. William McNeill and Nicholas Walker 1995) 275; GA 29/30: 399: https://www.beyng.com/gaselis/?vol=29.30&pg=399 .
[14] Iain D. Thomson, *Rethinking Death in and after Heidegger* (2024) 80.
[15] *Id.* 265-266 and 266 fn. 48.

For later Heidegger 'being as such' is the source of intelligibility, "an irreducibly polysemic Ur-phenomenon that 'gives' both being and time by informing and also exceeding our best way of understanding them and, indeed, all else."[16] One of Heidegger's names for it is 'earth,' and "the secret of the earth is 'an inexhaustible abundance of simple modes and shapes' (*Poetry Language Thought* 47/GA5 34) – an apparently inexhaustible source of all that is not-yet, a rich texture of phenomenological hints 'in which all emergent happening trembles and remains held' (*Hölderlin's Hymns 'Germania' and 'The Rhine'* 199/GA39 107)."[17] And so on. The point is the Ur-phenomenon is the Ur-resource.

And that identification suggests that, disparity of their idioms notwithstanding, Sean Carroll and the later Heidegger are phenomenologically adjacent. To begin to see this, we return to Carcassi's geometric-shapes example. We calculated the Shannon entropy's increase from 0.41 for the first set, to 0.79 for the second, to 1 for the third. What about the sets' complexity? Instead of applying (because I don't know how to) Kolmogorov's test for algorithmic complexity ('What's the least algorithm that will output the string of interest?') we'll have to eyeball it. Thus:

Set 1: 10(○) + ☆ + △
Set 2: 6(○) + 2(☆) + △ + □
Set 3: 2(○ + ☆ + △+ □)

It vaguely appears (throw me a bone here) that, in this example as Shannon entropy continues to increase, complexity goes from lower to higher to lower. One's hope for the veridicality of this appearance gets a boost from the fact that it mimics the evolution of the physical universe: (***BANG!***) low entropy/simple structure→(our era) medium entropy/complex structure→(heat death) high entropy/simple structure.

When Carroll was lecturing on complexogenesis last year he displayed a graph showing this rise-peak-fall trajectory of apparent complexity as physical entropy continuously increases.[18] Regarding the research program to understand the universe's generation of complex structure, he said, "My personal belief, which I have not yet made very quantitative and rigorous, is that we can make progress by thinking of information as a resource. You know we've been told, again and again, that thermodynamics is a resource theory. Here is the sort of Ur-resource the

[16] *Id.* 85 fn. 20.
[17] *Id.* 128. https://www.beyng.com/gaselis/?vol=5.00&pg=34 ; https://www.beyng.com/gaselis/?vol=39.00&pg=107 .
[18] "Complexogenesis" at 17:58. Essentially the same graph appears on page 231 of Carroll, *The Big Picture: On the Origins of Life, Meaning, and the Universe Itself* (2016).

universe gives us—being low entropy at early times."[19] He goes on to the example of a star: "A star settles down and it starts burning its fuel. That's only possible because the fuel is very very low entropy. . . . [The star] has this resource to use. It's not really information in any sense that we'd recognize it but mathematically it's sort of the same thing, and because of that you can have this configuration that is not mechanically stable but is in local thermodynamic equilibrium and it will last billions of years."[20]

Now in Heidegger's terms *Ge-Stell* is hogging the Ur-resource—the Ur-phenomenon—in order to compose *Bestand*; and its voracity crowds out other ways of tapping the resource, other ways of making structure. (Is not the phenomenology of 'being as such' itself a resource theory, at least as Thomson characterizes it?) *Bestand*, in turn, is a resource in virtue of its low Shannon entropy. Resource for whom, or what? For us, for sure, for a while. Later in the Sun's lifetime, after we're extinct, our *Bestand* may turn out to be, lignin-like, the future ones' coal.

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[19] "Complexogenesis" at 37:23.
[20] *Id.* at 40:18.