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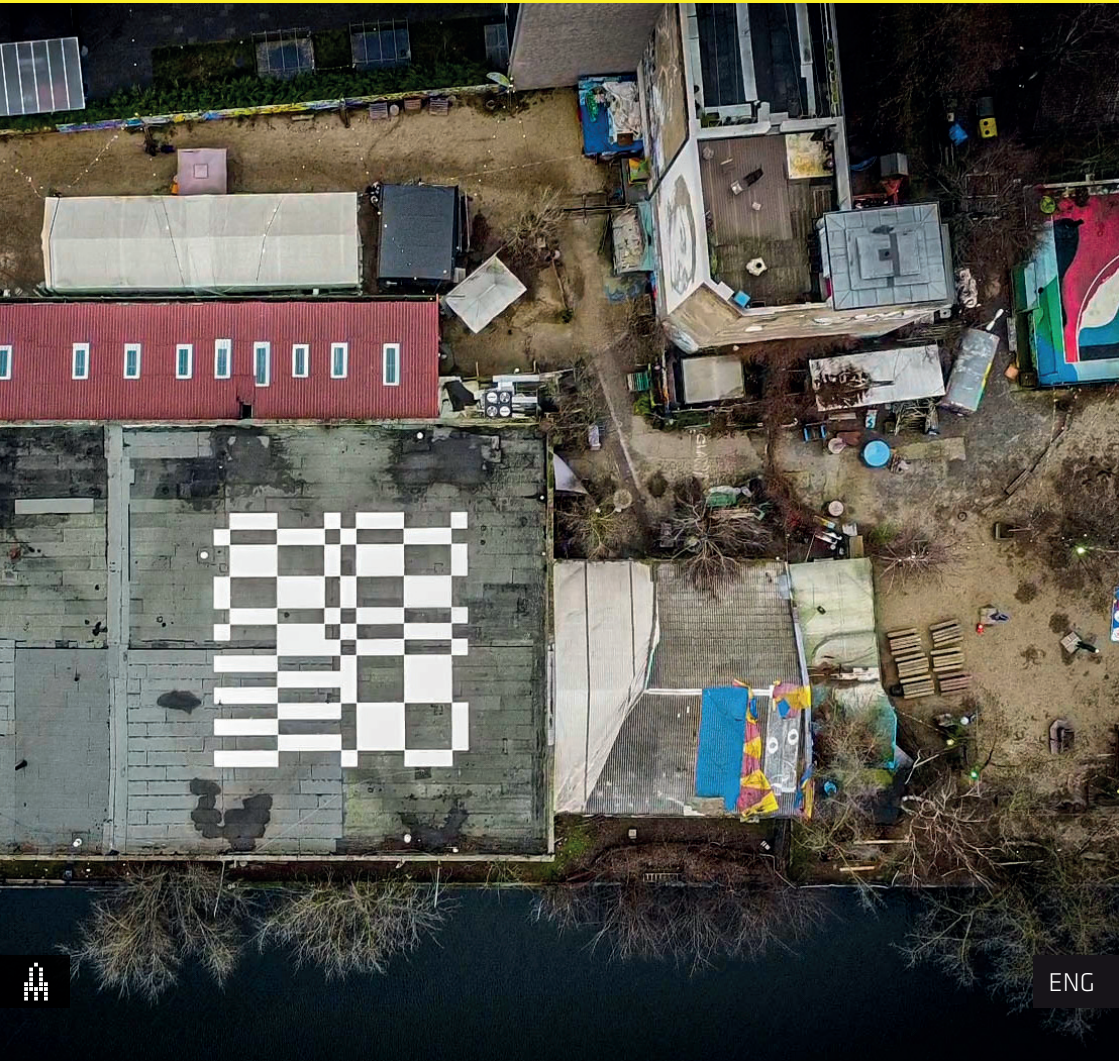

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This essay discusses four entry points to scale. Scale is unfolded as an infrastructural hinge, one emphatically intensified in digital media but irreducible to digital technologies. Scale becomes a generative notion: both because it is embedded in the logic of simulation – reality is a scalar effect – and because it must link to progressive politics of *other* scales of feminist and queer politics.

Misplaced Concreteness

Is there actually anything that works on the 1:1 scale – a scale that is assumed to be the standard view of "this is reality as it is"? Let's start by assuming it is not. Things are pushed and pulled in and through a variety of competing scales that image, measure and imagine them as located across alternating axes of reference. One version of this would be to claim that nothing is really self-identical. All is mediation. All is radically about scales, relations and friction.

In addition to philosophy, a history of cartography and the Earth would tell us as much:[1] cartography is a history of conflict (and colonialism) through operational knowledge about the territories we inhabit or imagine. Maps are, after all, a hell of a drug, as they operate at the back of property claims, military operations as well as the mundane shopping experience. What they

1 Cosgrove, D. (2001). *The Apollo's Eye: A Cartographic Genealogy of the Earth in the Western Imagination*. Johns Hopkins University Press.

do, as operations of scaling, is that they perform operations of addressing,[2] which in itself is fundamentally about invention: this belongs there, where both sides of this little operation (both the "this" and the "there") are conjured in the process of their mapping. It is not only that such a pointing and addressing is innocently helpful, it is also often underscored by the implied power in question: this *should* belong there. This is forced to belong here. Objects are located not only in space, as imaging systems would first seem to tell us, but in the very systems of scaling that seem to "find" them. In the words of Bernhard Siegert,[3] the map *is* the territory: such cultural techniques establish "epistemic orders and their struggles for dominance over other epistemic orders".

Digital culture has exploded the multiple meanings and practices of scales which consist both of the *how many* question (a billion sensors, a million images, a thousand clicks at a click farm, infinite loops of automated software decisions) and of the *what now* question. The latter takes on a more qualitative angle to the issue at hand, as it is not merely about eccentric numbering beyond imagination[4] but the fundamental question of why such exploded scales come to matter. There are many competing answers to the latter: due to political economy, power, aesthetics and such. That is because such out-of-scaleness comes to haunt not only the objects but also their organising logic as databases that increasingly need to deal with various imaginaries of scale.

So be it: digital culture is fundamentally about the mass-scale that shifts the focus of this and there, of cognitive and territorial maps, and of our sense of where they belong, as cultural categories give way to operational data categories. Subjects are morphed and stretched, as are categories. Objects are bounced off other objects, some more ephemeral or informational than others. Infinite scalability is only one of the imaginaries invented in the midst

2 Dhaliwal, R. S. (2022). On Addressability, or What Even Is Computation? *Critical Inquiry 49*(1), 1–27. https://doi.org/10.1086/721167

3 Siegert, B. (2011). The Map is the Territory. *Radical Philosophy 169*(5), 13–16.

4 See: Dvořák, T. (2021). Beyond Human Measure: Eccentric Metrics in Visual Culture. *Photography Off the Scale* (T. Dvořák & J. Parikka, Eds.). Edinburgh University Press.

of the digital culture of past decades. Some of the other imaginaries concern the intensive circulation of affects, data and value. Affects circulate around planetary data networks; shitposting is perhaps the truly global mood of digital culture. A 50-second Tik Tok video triggers a geopolitical escalation; the famous butterfly effect of chaos theory seems a modest proposal compared to the looping information-action-misinformation circuits where microscopic particles halt global supply chains, an algorithmic malfunction stops a city, and weaponisation of data ranges from local neighbourhood hate crimes to a geopolitical strategy. Military operations have their own Twitter accounts; images of invisible methane bursting from the seabed do not capture the causality or scale of events, yet proxies are what we hold on to as temporary anchors for a particular reality effect. Philosopher A. N. Whitehead's quip about "misplaced concreteness"[5] is just the normal state of things; *this* is not where the game is at, it is already somewhere else, an abstraction of n dimensions that can trigger a conspiratory mode of paranoia or something slightly more progressive and useful.

Beyond Large or Small

Scale has been instrumental for cartography, climate sciences and multiple other fields which have had to negotiate how to inscribe abstraction in a communicable, tangible form. As such, any discussion of scale includes a media history of instruments of scale: ones that measure and put things into a measure, while hinting at possible alternative universes of scale where things could be rearranged. As such, scale could slip into a subfield of data sciences and basically anything to do with ordering and structuring. Things hold together due to the scales that are standardised, for the time being. This is why science and technology studies have a head start on many of the insights on scales as they concern the fundamental infrastructure and logistics of knowledge.

5 See: Fuller, M. (2005). *Media Ecologies*. MIT Press.

Much of our imagery and models about scale come from the heart of the Cold War period: the Eames' film *Powers of Ten*,[6] discourses on megastructures such as the Dyson sphere,[7] Mandelbrot's fractal objects,[8] and work on nanoscales that became a go-to for what scale meant as an imaginary and as engineering. In the 1980s Baudrillard wrote on scales of simulations, and in the 1990s we saw discourses such as the "S, M, L, XL" in architecture.[9]

A bit earlier, Richard Feynman's classic and eminently readable piece on nanoscale "There's Plenty of Room at the Bottom" introduced an inventory of techniques and thought experiments on how small things can go. His 1960 "invitation to enter a new field of physics" features techniques of miniaturisation in questions such as "Why can't we write the entire 24 columns of the Encyclopedia Brittanica [sic] on the head of a pin?" to "What would happen if we could arrange the atoms one by one the way we want them?", shifting from the popular science imagination of *what is small* to the fundamental cultural techniques of operating at different scales. Feynman's account is thoroughly embedded in the question of mediation and technics, as far as it also asks how do we write – and read – small and how do we engineer small to extend the 200-year period of industrialisation to this new regime of labour: "So I want to build a billion tiny factories, models of each other, which are manufacturing simultaneously, drilling holes, stamping parts and so on."[10] Considering the piece was written when computer industries were starting to emerge, it also reflects a shift to post-industrial regimes of knowledge: nanoscale electric circuits, gradual disappearance of massive computing equipment and the emerging realm of ubiquitous computing yet is barely visible. It took a couple of decades for this theme to become more pronounced, though.

6 https://en.wikipedia.org/wiki/Powers_of_Ten_(film)
7 https://en.wikipedia.org/wiki/Dyson_sphere
8 https://en.wikipedia.org/wiki/Mandelbrot_set
9 Koolhaas, R. & Mau, B. (1998). *S, M, L, XL*. The Monacelli Press.
10 Feynman, R. (1960), There's Plenty of Room at the Bottom. *Engineering and Science 23*(5), 22–36.

"There's Plenty of Room at the Bottom" is to be read as part of a long history of experiments with scale that gradually turned to be the backbone of scientific imaging and their impact on wider publics. Scientific imaging, microcinematography and emerging techniques of animation as ways of seeing show the early-20th-century fascination with capacities of insight into a different scale than merely the "natural one". The often-quoted "unconscious optics" by Walter Benjamin is part of this rescaling by way of technical images.[11]

In microcinematography, this question of scale was even more pronounced, as it meant the capacity not only to "zoom in", so to speak, but to work across temporal scales, dynamic visibility of change and the possibilities of comparison that ensued.[12] Such characteristics were echoed in early film theory, such as Siegfried Kracauer's writing, too: the new technical images gave access to a "reality of another dimension".[13] Consider animation: scales explode, impossible worlds are conjured, things bend in unlikely ways when lines twist and tangle. The fascination with lines in modern art was followed up by Felix the Cat, where "the funny pages were full of moments when elements of the line demonstrate their autonomy by transforming themselves as Felix's tail becomes a fishing rod, a question mark, as occasion demands".[14] It didn't take long, however, for the wildly oscillating line to become domesticated into early cultural industries (Disney's industrial animals).

Across media and aesthetics, scale becomes mobilised inside and into the techniques of knowing: How does this compare to that, how is this a proxy of that? What then, how fast, how slow, at what rate of variation? The seeming simplicity of measurement cascades into a series of scalar loops that reveal something essential about scale itself: it is the middle of a meddling bundle

11 Benjamin, W. (1969). *Illuminations: Essays and Reflections*. Shocken books.
12 Landecker, H. (2006). Microcinematography and the History of Science and Film. *Isis 97*(1), 121–132.
13 As quoted in: Landecker, H. (2005). Cellular Features: Microcinematography and Film Theory. *Critical Inquiry 31*(4), 903–937.
14 Cubitt, S. (2014). *The Practice of Light*. MIT Press.

of forces. As Zachary Horton puts it, "all media mediate scale – that is, they stand in the middle of at least two scales, producing effects across a scalar boundary";[15] however, this is not merely a scale model, but an altering process of mediation: scales standardise and potentially destabilise, as does any media technique with similar powers.

Feynman was thoroughly aware that small is not just small on a linear scale. It concerns a different realm of physics; scale is not only about measurement according to a fixed scale of quantified points but about qualitative differences. In this spirit of qualitative, differing, alternative, changing, switching, resisting and alternating measures, the question of scale becomes the main operator in question: it is no longer a notion of measurement, but instead becomes a notion of generative production that catalyses a different epistemic and aesthetic consideration. Things don't simply scale without friction, labour and change,[16] which is not an argument against scale, but evidence that we don't need to be simplistic about scale.

As a generative operation with a qualitative impact, scale itself becomes an operation of simulation and modelling. It starts to generate worlds that do not merely reproduce the existing realities but play their own game with a peculiar set of rules.

Plenty of Room

Cinema, animation and photography are no longer our primary optics, as far as images that we have or that have us are about calculating a different realm of statistical realities. Such calculation might happen on the surface of the image cut into constituent parts (as machine reading) or as part of massive databases as financialised potentials of exchange; these are the enclosures

15 Horton, Z. (2021). *The Cosmic Zoom: Scale, Knowledge, and Mediation*. University of Chicago Press, p. 29.
16 Tsing, A. L. (2015). *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*. Princeton University Press.

that also concern the labour producing them.[17] There are of course specific techniques in computational photography which have for the past decade been building a different sensing-computation nexus inside the apparatus we used to call a camera and which produce a very different picture of the world than a subject perceiving their outside.[18] No wonder that the current image culture sparks notions such as "discorrelated images"[19] to refer to the confusing state of images moving fundamentally on such (microtemporal) scales that do not correspond to perceptual capacities as 1:1 worlds. But it also works the other way around: our models for understanding the digital realm of sensing, calculation and modelling might be discorrelated from the actuality of what is happening in, for example, AI – instead, we proceed with a worn-out anthropomorphic projection that misses the beef in the simulation.[20]

In the midst of all sorts of simulations, scale functions as an operational element that is central to creating its own conditions of coherence. Scale exists as fiducial markers[21] in machine vision, augmented reality and different fields that need to map a multitude of scales into coherent knowledge. What is at the centre of struggles for power here are not only objects and subjects, but fiducial markers themselves. A lighter, an apple, a banana for scale. Science and technology studies would call this the struggle for standards. We have arrived at a situation where scale is not merely about representing reality – was it ever – but engineering it. In short, scales have been merged inside simulations, technical creations of realities, and they operate therein as they construct subject positions in the most material ways as they modulate perceptual directions, content and affect.

17 Cubitt, S. (2021). The Mass Image, the Anthropocene Image, the Image Commons. *Photography Off the Scale* (T. Dvořák & J. Parikka, Eds.). Edinburgh University Press.
18 Ehrenberg, R. (2012, January 13). The Digital Camera Revolution. *Science News*. Retrieved May 17, 2023, from https://www.sciencenews.org/article/digital-camera-revolution
19 Denson, S. (2020). *Discorrelated Images*. Duke University Press.
20 Bratton, B. & Agüera y Arcas, B. (2022, July 12). *The Model is the Message*. Noema. Retrieved May 16, 2023, from https://www.noemamag.com/the-model-is-the-message/
21 Young, L. (2015). *An Atlas of Fiducial Architecture*. After Us. Retrieved May 17, 2023, from http://www.aft3r.us/an-atlas-of-fiducial-architecture/2015/10/9/an-atlas-of-fiducial-architecture

A riot control agent projectile with a banana for scale. Source: Wikipedia

With or without subjects at the centre of the picture, there are complex recursive chains of operations at play. The images that measure also measure measuring. Some measure the measuring subject, others measure the relations in that measuring. Multiple techniques and feeds of data and computing are in a cascading loop and mix into the broader traffic of images (Sekula) of networks.[22] The everyday of such scales of digital images pulls us away from the need for reality and makes sure we stick to the affective glue that comes in the form of a queen morphed into a hologram and other Pepper's

22 Dewdney, A. & Sluis, K. (2022). *The Networked Image in Post-Digital Culture*. Routledge.

ghosts[23] that make spectral reappearances in contemporary spectacles. Deep fakes, GANs and diffusion models become the model of how visual reality is constructed along a pipeline of data–computation–prediction–modelling. None of this falls into the usual register of visuality but is more accurately part of what Adrian Mackenzie and Anna Munster coin as the invisual: "While visual techniques and practices continue to proliferate – from data visualisation through to LIDAR technologies for capturing nonoptical images – the visual itself as a paradigm for how to see and observe is being evacuated, and that space is now occupied by a different kind of perception."[24] They introduce the concept of platform seeing, which I wish to expand so that it concerns the broader logic of scaling. This notion of scale encompasses digital aesthetics as both a particular simulated sphere of conflicting notions of scale as well as infrastructure, logistics and elemental reformatting that takes place through combinations of warfare, ecocide[25] and other operations that take their aim at both the ground and the atmosphere.

A generative notion of scale includes splintered realities, affective investments, infrastructural power games, weaponisation of doubt and doubts about weaponisation ("it was all fake news, opposition propaganda") as part of psy-ops of scales that have become the generalised condition of contemporary media culture. There really is plenty of room in generating worlds inside the geopolitical stacks[26] that are not resolved as part of simple evil master plans but coalesce into jumbled assemblages of confusion, too. Such simulations are not *just* mindgames, they are actual designed worlds with a material impact. Pluriverses are both the critical goal that counters

23 Dhaliwal, R. S. (2022). On Addressability, or What Even Is Computation? *Critical Inquiry 49*(1), 1–27. https://doi.org/10.1086/721167

24 MacKenzie, A. & Munster, A. (2019). Platform Seeing: Image Ensembles and Their Invisualities. *Theory, Culture & Society, 36*(5), 3–22. https://doi.org/10.1177/0263276419847508

25 Ahmed, N. (2018). Proof of Ecocide: Towards a Forensic Practice for the Proposed International Crime Against the Environment. *Archaeological and Environmental Forensic Science 1*(2), 139–147.

26 Bratton, B. (2015). *The Stack: On Software and Sovereignty*. MIT Press.

hegemonic standardisation[27] and the strategy of regressive, violent and harmful bubbles of isolation, such as covid-deniers and neo-nazis. The title of this piece, then, refers not only to the sort of shifts in how we view the planetary and the nanoscale as S, M, L or XL. After all, imagined communities[28] are about all sorts of techniques of scale which create fabricated illusions of coherent unity; nation states are still quite the intoxicating hallucinations, as a glimpse into some of European, Russian or US politics demonstrates in all the violence that ensues.

While nation states are hallucinated into power, scale comes to matter as logistics of movement too, whether this traffic concerns epistemic categories or actual goods, simulation or material circulation. What you don't see is what you get: as an interface for other scales does not exist, we need to invent ways to tap into the scales that we need. If Baudrillard's notion of simulation was par excellence a product of the Cold War period – as Ryan Bishop[29] convincingly argues – what would be the equivalent in the multiscalar infrastructural politics of our age?

Ways of Scaling

Scales are both media techniques and collective imaginaries that act as the fundamental design traps of our age: to capture something in a particular scale is to be able to control it. The aesthetic, political, even ethical question of our age then concerns the scales on which we exist, sense and alter our own (conditioning) scales of existence.[30] Such scales also premise actions and imaginaries of empowerment, for good and ill. What sort of magic do you feel is invested in a piece of software that manages immense databases, or what sort of conjuring does it take to imagine that all things scale without friction?

27 Escobar, A. (2018). *Designs for the Pluriverse Radical Interdependence, Autonomy, and the Making of Worlds*. Duke University Press; Zielinski, S. (2006). *Deep Time of the Media: Toward an Archaeology of Hearing and Seeing by Technical Means*. MIT Press.
28 Anderson, B. (2006). *Imagined Communities: Reflections on the Origin and Spread of Nationalism*. Verso.
29 Bishop, R. (Ed.). (2009). *Baudrillard Now: Current Perspectives in Baudrillard Studies*. Polity.
30 Cf. Horton, 2021, p. 27.

Much of my interest concerns how to navigate the landscape of shifting fiducial markers in simulated enclosures that are located in the real of planetary and inter-planetary energies. While "scaling" has become a buzzword in the digital economy, I am more invested in the search for an ethico-aesthetic stance.[31] Let's call it *ways of scaling* – a variation on John Berger's *Ways of Seeing*, the book and TV documentary series from the 1970s which was then updated to *Ways of Machine Seeing* and functions as a project that investigates modes of labour, alienation and visuality in the context of big data and machine vision.[32] Ways of scaling attend to shared concerns as to the production, distribution, labour and political ecology of scales. It is, by necessity, conditioned by two or more intersecting themes: a critique of scalability through a continuing development of what Anna Tsing has coined as theoretical (and practice-based) insights into non-scalability. "Scalability is possible only if project elements do not form transformative relationships that might change the project as elements are added."[33] In addition to critique, this notion of generative scaling must also be put to somewhat more progressive uses than in the frictionless imaginaries. In other words, to create methods for *other scales* upon which agency, resources and different temporal dimensions (pasts to futures) are distributed. Such design and testing of scales can be seen as a careful ethical practice that deals with our involvement with the multiple scales of the world. It is related to Joanna Zylinska's call for minimal ethics for the Anthropocene. Such an ethics of scales and scaling is stretched between the universal and the situated: "As a horizon of our enquiry can therefore actually act as a reminder to us of the partiality of a story we can tell, or of an intervention we can make – but also of the locatedness of the many concepts and values we humans have developed across all kinds of constrained historical scales."[34] Here, Zylinska comes close

31 Guattari, F. (1995). *Chaosmosis: An Ethico-Aesthetic Paradigm* (P. Bains & J. Pefanis, Trans.). Indiana University Press.

32 Azar, M., Cox, G. & Impett, L. (2021). Introduction: Ways of Machine Seeing. *AI & Soc 36*, 1093–1104. https://doi.org/10.1007/s00146-020-01124-6

33 Tsing, A. L. (2012). On Nonscalability: The Living World Is Not Amenable to Precision-Nested Scales. *Common Knowledge 18*(3), 507. https://doi.org/10.1215/0961754X-1630424

34 Zylinska, J. (2014). *Minimal Ethics for the Anthropocene*. Open Humanities Press, p. 28.

to Rosi Braidotti's[35] posthuman ethics that recognises the situatedness of our positions and is also aware of other scales of existence, other modes of being, hence the title "'We' Are In *This* Together, But We Are Not One and the Same". Furthermore, the history of alterity and minotarian subject positions implies what in contemporary terms becomes part of politics of scales as it attends to "the less-than-human others, dehumanised", who have historically been "the sexualised others (women, LGBTQ+); the racialised others (non-Europeans, indigenous); and the naturalised others (animals, plants, the Earth)".

Ways of scaling therefore proceed as an awareness of the capacities to change through reading such histories that are not already positioned within and never fitted the 1:1 standards that were imposed upon a variety of bodies.[36] Thus, politics of scale is this production of friction and capacities of other scales to animate relations. To quote Max Liboiron: "Knowledge systems such as political ecology, cultural geography and environmental justice are just some of the ways to look at how systems of value and knowledge animate relations. Scale is another."[37]

35 Braidotti, R. (2020). "We" Are In *This* Together, But We Are Not One and the Same. *Bioethical Inquiry 17*, 465–469. https://doi.org/10.1007/s11673-020-10017-8

36 See also: Rocha, J. & Snelting, F. (Eds.). (2022). *Volumetric Regimes: Material Cultures of Quantified Presence*. Open humanities Press.

37 Liboiron, M. (2021). *Pollution is Colonialism*. Duke University Press.

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