

Lorraine Daston

Books

- Daston, L. (2019). *Against Nature*. MIT Press.
- Daston, L., & Vidal, F. (Eds.). (2010). *The Moral Authority of Nature*. University of Chicago Press.
- Daston, L., & Park, K. (2001). *Wonders and the Order of Nature 1150-1750*. Zone Books.

Talks

- Daston, L. (2009, October 16). Why Does Nature Have Moral Authority Even If It Shouldn't? Collège de France.
- Daston, L. (2007, April 26) The Origins of Norms: The Place of Value in a World of Nature. Columbia University.

A collection of Daston's research and views on the subject of normativity and its relationship to our experience and conceptualisation of various orders found within the natural and social world. Much of these resources are solely the work of Daston herself, but also include co-authored and co-edited publications. The book *Against Nature*, and the talks *Why Does Nature Have Moral Authority Even If It Shouldn't* and *The Origins of Norms: The Place of Value in a World of Nature*, are the most focused articulations of that amongst Daston's research which is relevant to this written project. Broadly speaking, each touches on the fundamental argument that the lion's share of human moral orders track commensurate conceptions of order drawn from our knowledge and experiences of nature. Additionally, and of particular focus in both *Against Nature* and the former of the two presentations listed above, Daston makes two specific arguments which will bear on the thrust of this thesis:

- 1) That "to appeal to natural order in order to support visions of the moral order is fundamentally about the link between order and normativity per se" (Daston, 2019)
- 2) That human cognition, and the sensorium that directly shapes it, has a forceful influence on our motivation to represent society using images of the durability of various orders discovered in the natural world.

These two claims are noticeably interrelated in the context of late modern societies, and the scientific worldview impinging on the epistemologies of this period for two reasons. Firstly, the late modern human experience of the natural world is deeply altered by the scientific and technological apparatuses that augment and extend our sensorium. This transformation in our perceptive faculties is correlated with a unique form of knowledge which dramatically augments our ability to intervene in the natural world which we observe.

Secondly, in a historically unprecedented environment where human artefacts wield increasingly more influence over naturally-occurring processes, if one takes Daston's argument seriously, certain societies may undergo a shift away from using the repository of natural orders to buttress human normativity, as their view of nature becomes increasingly impacted by techniques which undermine the durability, regularity, or authority of nature's purported order. As such, the link between order and normativity that nature often mediates, becomes troubled. Daston gestures towards this in a short passage in *Against Nature*, writing:

"In addition to the religious and metaphysical traditions already mentioned, there is the fact that the sheer scale and durability of nature have surpassed that of even the most

impressive human artifacts for most of human history. Natural orders are, in effect, more orderly than human orders, which may offer a clue as to why natural orders are invoked to buttress human orders and not vice versa. In an age of genetic engineering and anthropogenic climate change this imbalance of power may be shifting in the opposite direction.” (Daston, 2019)

iPSCs, and the associated scientific and technological practices which enable a dramatic refashioning of our relationship to reproduction, may be thought of as analogous to anthropogenic change and genetic modification with respect to their role in the above mentioned transference of power between our interactions with nature and our justifications and representations of moral orders.

Helena Siipi

Journal Articles

- Siipi, H. (2008). Dimensions of naturalness. *Ethics & the Environment*, 13(1), 71–103. <https://doi.org/10.2979/ete.2008.13.1.71>

An excellent survey of the distinctions made between natural and unnatural in the bioethics literature and its relevance to moral deliberation and ethical judgement.

The author uses her own classification scheme consisting of 3 forms:

- 1) history-based (un)naturalness
- 2) property-based (un)naturalness
- 3) relation-based (un)naturalness

All 3 of these classes could might be employed to illustrate the ways in which iPSCs, embryo models, and IVG, could be understood as having both natural and unnatural characteristics.

This framing is connected to the proposal that such reproductive science and technology troubles the convenience of simple natural/unnatural classifications. This effort to clarify the meaning of naturalness and unnaturalness also provides a sense of how such terms are used in variable and at times inconsistent ways in bioethical argumentation, and helps to frame discussions involving such terms, and their moral relevance, as being complex, vague, and possibly meaningless.

This framing is also reflected in Daston’s arguments concerning the diversity of ways in which human’s appeal to (un)naturalness as a model for ethical consideration, and helps to cast doubt on whether the task of refining our definitions of the spectrum of (un)naturalness is of any use to the broader implications for why this mode of moral reasoning is so pervasive.

Anna Smajdor

Journal Articles

- Smajdor, A., Cutas, D., & Takala, T. (2018). Artificial gametes, the unnatural and the Artefactual. *Journal of Medical Ethics*, 44(6), 404–408. <https://doi.org/10.1136/medethics-2017-104351>

- Smajdor, A. (2015). Naturalness and unnaturalness in contemporary bioethics. *Nuffield Council on Bioethics Background Paper*.
- Smajdor, A. (2019). An alternative to sexual reproduction: artificial gametes and their implications for society. *British Medical Bulletin*, 129(1), 5-11. <https://doi.org/10.1093/bmb/ldz001>

Similar to Siipi, bioethicist Anna Smajdor has written on how (un)naturalness operates within bioethics discourse, its roots in epistemological, theological, metaphysical, legal, and sociological problems, the role it plays in public perception and popular media, as well as broader social and ethical issues at stake (including demographic infertility trends).

Again, these texts are critical to illustrating the extensive, polarised, and complicated bioethical discourse surrounding the unresolved moral significance of (un)naturalness. It also demonstrates how deeply connected these issues are to a wide ranging set of conceptual, perceptual, and socio-cultural systems, and thus how deeply entrenched they are in the human experience. Moreover, in a similar vein as Daston, Smajdor too suggests that one should be “cautious about repudiating any relationship between nature and moral evaluation” (Smajdor, 2018), and advocates for understanding how it is that (in this case) IVG, or artificial gametes, transforms our moral responsibility to reproduction and the human organisms created by these scientific and technological interventions. In other words, one way in which iPSCs, etc., are implicated in the transformation of our normative relationship to human reproduction.

Maurizio Mori

Book Chapter

- Maurizio, M. (2012). Life, Concept of. In R. Chadwick (Ed.), *Encyclopedia of Applied Ethics* (second edition) (pp. 866–876). essay, Academic Press.

This book chapter includes a summarised discussion of empirical and scientific characterizations of life, three primary philosophical theories of life (Mechanism, Vitalism, and Organicism), and the effects of these views on contemporary issues in biomedical ethics. I’ve added this and the following reference because I’m beginning to explore ideas related to the naturalisation of normativity grounded in concepts of nature which include human agency. I don’t exactly know what the relevance of this position would be to this thesis, but I believe it’s connected to the questions I was raising towards the end of the chapter summary section. In the case of Mori, there is a suggestion that organicism aligns with a modern secularised scientific worldview and can act as a basis of contemporary ethical views related to (among other things) reproductive technology. Moreover, organicism characterises human life as a holistically causal process encompassing cellular, individual/multicellular, and collective/communal levels of organisation, placing both human agency and artefacts within the realm of the totality of nature.

Gregory E. Kaebnick

Book

- Kaebnick, G. (Ed.). (2011). *The Ideal of Nature: Debates about Biotechnology and the Environment*. Johns Hopkins University Press.

Another great resource for cataloguing the various ways in which the natural and unnatural can affect moral reasoning and ethical deliberation. It also appears to question whether concepts of (un)naturalness have the ability to effectively perform such ethical work at all. Again, it demonstrate how far-reaching the implications of such questions are, broaching the fields of bioethics, environmental philosophy, religious studies, sociology, public policy, and political theory.

Insoo Hyun

Book

- Hyun, I. (2013). *Bioethics and the Future of Stem Cell Research*. Cambridge University Press.

Talks

- Hyun, I. (2018, October 22) The Ethics of Creating Synthetic Embryos, Organoids, and Other New Models of Human Biology. University of Kansas.
- Hyun, I. & Clark, A. (2021, January 29) Gamete Generation from Induced Pluripotent Stem Cells: How Close Are We to Creating Sperm and Eggs in the Lab? Harvard University.
- Hyun, I. & Fu, J. (2020, February 13) Embryo Modeling and Embryo Cultivation. Harvard University.

Journal Articles

- Hyun, I. (2017). Engineering Ethics and Self-Organizing Models of Human Development: Opportunities and Challenges. *Cell Stem Cell*, 21(6), 718-720. <https://doi.org/10.1016/j.stem.2017.09.002>
- Hyun, I. et al. (2021) ISSCR guidelines for the transfer of human pluripotent stem cells and their direct derivatives into animal hosts. *Stem Cell Reports*, 16(6), 1409-1415. <https://doi.org/10.1016/j.stemcr.2021.05.005>

Insoo Hyun is an expert in the fields of bioethics, stem cell research, and biotechnology, whose perspectives are authoritative in the literature, especially as it relates to public policy. The texts and presentations selected here are only indirectly related to the topic of how concepts of (un)naturalness impact ethics. That being said, they nonetheless touch on interesting and related questions connected to iPSCs, embryoids, and IVG, such as how to consider the moral status and regulation of biological entities which retain naturally occurring characteristics, yet are also unprecedented (i.e. have not, to our knowledge, been observed in the “natural” world) in their composition, the history of their actualisation, and their potential future development.

Various bioethics resources related to iPSC, embryoids, and IVG, some of which use notions of naturalness and unnaturalness to advance moral arguments, some of which address that dimension indirectly, and some that are more general overviews of the landscape of bioethics discourse on these topics and the common issues they raise.

iPSC

- Sander Lee, T. & L. Sherley J., (2022). *Handbook of Nascent Human Beings: A Visual Aid for Understanding the Science and Experimentation*. (Issue 8). Charlotte Lozier Institute.
- Sharif M., et al. (2019) Research and therapy with induced pluripotent stem cells (iPSCs): social, legal, and ethical considerations. *Stem Cell Res Ther.*, 10(341), 1-13. <https://doi.org/10.1186/s13287-019-1455-y>
- Krimsky, S. (2015). *Stem Cell Dialogues : A Philosophical and Scientific Inquiry Into Medical Frontiers*. Columbia University Press.

Embryoids

- Clark, A. et al. (2021) Human embryo research, stem cell-derived embryo models and in vitro gametogenesis: considerations leading to the revised ISSCR guidelines. *Stem cell reports*, 16(6), 1416-1424. <https://doi.org/10.1016/j.stemcr.2021.05.008>
- Aach, J., Lunshof J., Iyer E., & Church G. (2017). Addressing the ethical issues raised by synthetic human entities with embryo-like features. *eLife*, 6(e20674). <https://doi.org/10.7554/eLife.20674>
- Nicolas P., Etoc F., & Brivanlou A. (2021). The ethics of human-embryoids model: a call for consistency. *J Mol Med (Berl)*., 99(4), 569–579. <https://doi.org/10.1007/s00109-021-02053-7>
- Hyun, I. (2020, January 1). Towards a new bioengineering ethics. Harvard Medical School Center for Bioethics. <https://bioethics.hms.harvard.edu/journal/stem-cell-ethics>
- Hyun, I. (2013). *Bioethics and the Future of Stem Cell Research*. Cambridge University Press.

IVG

- Notini, L., Gyngell C., & Savulescu J. (2020). Drawing the Line on in Vitro Gametogenesis. *Bioethics* 34(1), 123–34. <https://doi.org/10.1111/bioe.12679>
- Suter, S. (2015). In Vitro Gametogenesis: Just Another Way to Have a Baby? *Journal of Law and the Biosciences* 3(1), 87–119. <https://doi.org/10.1093/jlb/lsv057>
- Testa, G., & Harris J. (2004). Ethical Aspects of ES Cell-Derived Gametes. *Science* 305(5691), 1719–1719. <https://doi.org/10.1126/science.1103083>
- Testa, G., & Harris J. (2005). Ethics and Synthetic Gametes. *Bioethics* 19(2), 146–66. <https://doi.org/10.1111/j.1467-8519.2005.00431.x>
- Bredenoord, A., & Hyun I. (2017). Ethics of Stem Cell-derived Gametes Made in a Dish: Fertility for Everyone? *EMBO Molecular Medicine* 9(4), 396–98. <https://doi.org/10.15252/emmm.201607291>
- Murphy, Timothy F. 2014. “The Meaning of Synthetic Gametes for Gay and Lesbian People and Bioethics Too.” *Journal of Medical Ethics* 40(11):762–65. doi: 10.1136/medethics-2013-101699.
- Murphy, Timothy F. 2018. “Pathways to Genetic Parenthood for Same-Sex Couples.” *Journal of Medical Ethics* 44(12):823–24. doi: 10.1136/medethics-2017-104291
- Petropanagos, A. (2017). Pronatalism, Geneticism, and ART. *IJFAB: International Journal of Feminist Approaches to Bioethics* 10(1), 119–47. <https://doi.org/10.3138/ijfab.10.1.119>

- Richie, C. (2016). Lessons from Queer Bioethics: A Response to Timothy F. Murphy. *Bioethics* 30(5), 365–71. <https://doi.org/10.1111/bioe.12246>
- Baylis, F. (2017). The Ethics of In Vitro Gametogenesis. *Impact Ethics*. <https://impactethics.ca/2017/05/19/the-ethics-of-in-vitro-gametogenesis/>

Various resources related to the general, scientific mechanics of mammalian iPSCs, embryoids, and IVG, some of which touch on the history of their technical development, and speculate about further advances.

iPSC

- Takahashi K., & Yamanaka S. (2006) Induction of pluripotent stem cells from mouse embryonic and adult fibroblast cultures by defined factors. *Cell*, 126(4), 663–76. <https://doi.org/10.1016/j.cell.2006.07.024>
- Ebenezer Omole A., & Omotuyi John Fakoya A. (2018) Ten years of progress and promise of induced pluripotent stem cells: historical origins, characteristics, mechanisms, limitations, and potential applications. *PeerJ*. <https://doi.org/10.7717/peerj.4370>

Embryoids

- Shao Y., et al. (2016) Self-organized amniogenesis by human pluripotent stem cells in a biomimetic implantation-like niche. *Nature Materials* 16, 419–425. <https://doi.org/10.1038/nmat4829>
- el Azhar Y., & Sonnen K. (2021) Development in a Dish—In Vitro Models of Mammalian Embryonic Development. *Front. Cell Dev. Biol.* <https://doi.org/10.3389/fcell.2021.655993>
- Rivron N., Fu J. (2021) SnapShot: Embryo models. *Stem Cell Reports*, 16(5), 1142–1142.e1. <https://doi.org/10.1016/j.stemcr.2021.04.012>

IVG

- Hendriks, S., et al. (2015). Artificial Gametes: A Systematic Review of Biological Progress towards Clinical Application. *Human Reproduction Update*, 21(3), 285–96. <https://doi.org/10.1093/humupd/dmv001>
- Hikabe, O., et al. (2016). Reconstitution in Vitro of the Entire Cycle of the Mouse Female Germ Line. *Nature*, 539(7628), 299–303. <https://doi.org/10.1038/nature20104>
- Saitou, M. & Hayashi, K. (2021). Mammalian in vitro gametogenesis. *Science*, 347(6563), 1–9. <https://doi.org/10.1126/science.aaz6830>
- Clark A. (2018) Restoring fertility with human induced pluripotent stem cells: Are we there yet? *Cell Stem Cell* 16(6), 777–779. <https://doi.org/10.1016/j.stem.2018.11.003>