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Book review

The macroecology of macroeconomics in human evolution

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The Ages of Globalization: Geography, Technology, and Institutions
Jeffrey D. Sachs
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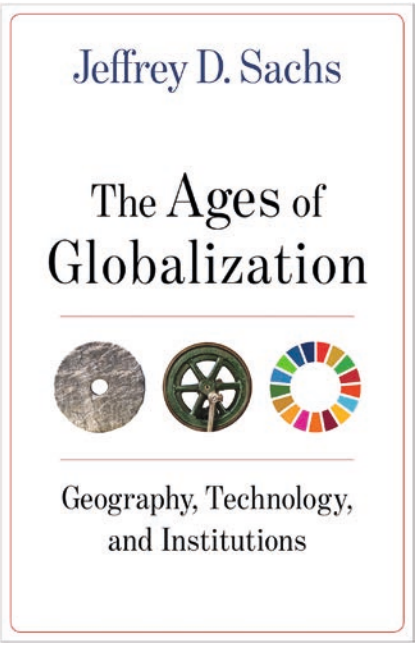
Understanding the drivers and trajectories of human evolution is a uniquely profound endeavour, not only because it elucidates the biological history behind ourselves as a species (*Homo sapiens*) but also because it is critical to guide predictions (and therefore decisions) about our future and the future of nature as a whole. In no more than 200,000 years — a blink of an eye evolutionarily speaking — we evolved from being a regular hunter–gatherer African ape to become a truly global species [1,2] with an influence on the course of nature that cannot be matched by any other species in the history of life on Earth. Some 70,000–60,000 years ago groups of humans successfully migrated out of Africa [1] while a range of other close relative hominin lineages — Neanderthals [3], Denisovans [4] and the intriguing *Homo floresiensis* from Indonesia [5] among others — already dwelled across Eurasia. Gifted with unique intellectual faculties and a sophisticated taste for cooperation and language, anatomically modern humans drove our relative hominin lineages to extinction [3], successfully spread to settle all over the planet [1] and achieved technological and scientific breakthroughs that even we ourselves struggled to imagine a few centuries or even decades ago. Our latest slip ups: the alteration of the global climate and the declines of biodiversity worldwide. We are just one species hanging from the tree of life but certainly a very special one.

Darwin's theory of natural selection placed reproductive success ('fitness') as the key currency for evolution — individuals that spread more copies of their genes through higher numbers of offspring than others in their populations led the way of adaptations to their environments. And having a plentiful stock of genetic variation in the species' gene pool helps too. It turns out that humans defied these evolutionary paradigms but still outperformed everyone else in nature. A dominant syndrome of our staggering population growth of over six billion people in the last two centuries is the gradual reduction in birth rates overall [6]. Not only that, in our quest to conquer the world, humans seem to have made it through a population bottleneck that drastically eroded our genetic diversity between 65,000–50,000 years ago [1,7]. How did we do it?

Many circumstances have converged to pave the way of humans to global dominance, so many that braiding them coherently feels like an overwhelming task to make sense of modern humanity. This is where Jeffrey Sachs's book *The Ages of Globalization* comes on stage to confront (and succeed at) such a formidable challenge but from a pretty unique perspective. Sachs is a leading economist and his book a human macroecology masterpiece, except that the story that unfolds in its nine chapters is not about macroecology but about the opportunities and constraints that shaped the distribution of political and economic powers throughout history. Yet, the ambition that Sachs displays does, whether he intended it or not, present a remarkable synthesis of the evolutionary macroecology of our species — the ecological processes that shaped the global-scale patterns of distribution, demography and networks of cooperation and competition in humans over time.

With a combination of evidence, scholarship and insight, Sachs distils the past 70,000 years of the world's history — that is, starting before the first successful emigration of anatomically modern humans from Africa [1] — into what he calls the seven 'ages of globalization': the Paleolithic age (70,000–10,000 BCE), the Neolithic age (10,000–3000 BCE), the Equestrian age (3000–1000 BCE), the Classical age (1000 BCE–1500 CE), the Ocean age (1500–1800), the Industrial age (1800–2000) and the Digital age (21st century). The name of each age roughly speaks for itself. Just as it can be expected, Sachs guides the reader through the sequence of historical events that defined the boundaries



of each period and their transitions to the next age based on how cultural and 'technological' breakthroughs — widely defined, e.g. he equates the domestication of the horse with other 'disruptive technologies', such as the impacts brought about with the invention of the steam engine — determined the geographical distribution of clusters of power across the world. That is what a rigorous book on the history of human geopolitical development offers. Let the historians judge the history and the economists the economics.

But for those who relish the logic of biological organisation evolving through the synergy between multiple ecological processes at play — the same processes that shape biodiversity patterns in nature — this is where the magic happens. With the obvious advantage of reviewing the evolution of the best-known species in nature, Sachs's account about the progression of human history is meticulously explained as a pure macroecological process shaped by the environmental constraints and the ecological opportunities that determined the geographical boundaries of human populations, their densities and their access to resources over time, just as macroecological research aspires to do [8].

At a fundamental level, this macroecological account shows how human civilisations have consistently and predictably succeeded at temperate

latitudes within which climates are benign enough, where seasonality provides the right balance between hot conditions for agriculture and wet winters for irrigation, where the winter breaks the transmission of vector-borne diseases — such as malaria — that thrive in the climatic stability of the tropics, where plenty of transport routes are available and supported by ideal conditions to breed horses and where food stocks do not decompose as quickly as in tropical weathers. That is why Morris called them the 'lucky latitudes' [9]. As if they were not lucky enough, the lucky latitudes also contain major reserves of coal that made industrialisation possible. Towards the extreme climates of the tropics and the poles, environmental pressures have been much tougher for human life. At age-specific levels, Sachs shows how the transition of each age to the next was consistently characterised by the progression in the same ecological processes. Firstly, the evolution of increasingly larger social networks that elicited increasingly more organised cooperation — from bands to global empires. Secondly, how these instances for social evolution have been facilitated throughout history by the opportunities for spatial dispersal — from the simplest stage where humans walked through to the development of longer-distance travel across land and oceans. Thirdly, Sachs doesn't overlook the conflictual component of nature: transitions in ages have all been marked by the outbreak of wars, each of which has shown increasingly more destructive power. Collectively, Sachs lets us see that economics is not a human achievement but simply a social adaptation shaped by natural selection for the effective management of resources. We have only mastered it.

The book is illustrated with global maps that depict how geographical variations in environmental conditions have offered humans the opportunities to succeed, and how environmental constraints have dragged others to 'struggle for survival'.

Sachs concludes with serious reflections about one final critical biological process that has guided the agenda of macroecology: extinctions. This risk is lurking around us, whether caused by the global scale of human-induced environmental degradation or by wars of unprecedented destructive scales triggered by our competitive instincts for access to resources. The final chapter is a transition from the rigorous scholar to the logical dreamer of a better future. Sachs appeals to our cooperative nature as the means to approach sustainable development, equality for human diversity and the eradication of extreme poverty, as well as for peace.

A 'big bang' that inevitably unleashes in the background of the sequence of historical events in Sachs's book is that modern humans have displaced Darwinian reproductive success to instate our own version of currency for success: wealth. Fitness in humans is not exactly weighted by the genetic footprint left by an individual's reproductive success but rather by a form of social footprint built on their relative financial success. Sachs's account defogs the window's glass to reveal a form of 'financial selection' whereby differential wealth leads the way of modern human evolution instead.

REFERENCES

1. Henn, B.M., Cavalli-Sforza, L.L., and Feldman, M.W. (2012). The great human expansion. Proc. Natl. Acad. Sci. USA *109*, 17758–17764.
2. Hershkovitz, I., Weber, G.W., Quam, R., Duval, M., Grün, R., Kinsley, L., Ayalon, A., Bar-Matthews, M., Valladas, H., Mercier, N., *et al.* (2018). The earliest modern humans outside Africa. Science *359*, 456–459.
3. Hajdinjak, M., Fu, Q., Hübner, A., Petr, M., Mafessoni, F., Grote. S., Skoglund, P., Narasimham, V., Rougier, H., Crevecoeur, I., *et al.* (2018). Reconstructing the genetic history of late Neanderthals. Nature *555*, 652–656.
4. Reich, D., Green, R.E., Kircher, M., Krause, J., Patterson, N., Durand, E.Y., Viola, B., Briggs, A.W., Stenzel, U., Johnson, P.L.F., *et al.* (2010). Genetic history of an archaic hominin group from Denisova Cave in Siberia. Nature *468*, 1053–1060.
5. Brown, P., Sutikna, T., Morwood, M.J., Soejono, R.P., Jatmiko, Wayhu Saptomo, E., and Awe Due, R. (2004). A new small-bodied hominin from the Late Pleistocene of Flores, Indonesia. Nature *431*, 1055–1061.
6. Rosling, H., Rosling, O., and Rönnlund, A.R. (2018). Factfulness: Ten Reasons We're Wrong About the World — And Why Things Are Better Than You Think (London: Sceptre).
7. Amos, W., and Hoffman, J.I. (2009). Evidence that two main bottleneck events shaped modern human genetic diversity. Proc. R. Soc. London B Biol. Sci. *277*, 131–137.
8. Roll, U., Feldman, A., Novosolov, M., Allison, A., Bauer, A.M., Bernard, R., Böhm, M., Castro-Herrera, F., Chirio, L., Collen, B., *et al.* (2017). The global distribution of tetrapods reveals a need for targeted reptile conservation. Nat. Ecol. Evol. *1*, 1677–1682.
9. Morris, I. (2011). Why the West Rules — For Now: The Patterns of History and What They Reveal about the Future (London: Picador).

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