UNIVERSITY OF TARTU
Institute of Philosophy
and Semiotics

The AI as an envirotechnical system

BALTEHUMS III

23 October 2024, Poznań, Poland

Auli Viidalepp
Research Fellow in Semiotics @UniTartu +
Visiting Researcher @UniTo

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A Proposal for the

DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE

June 17 - Aug. 16

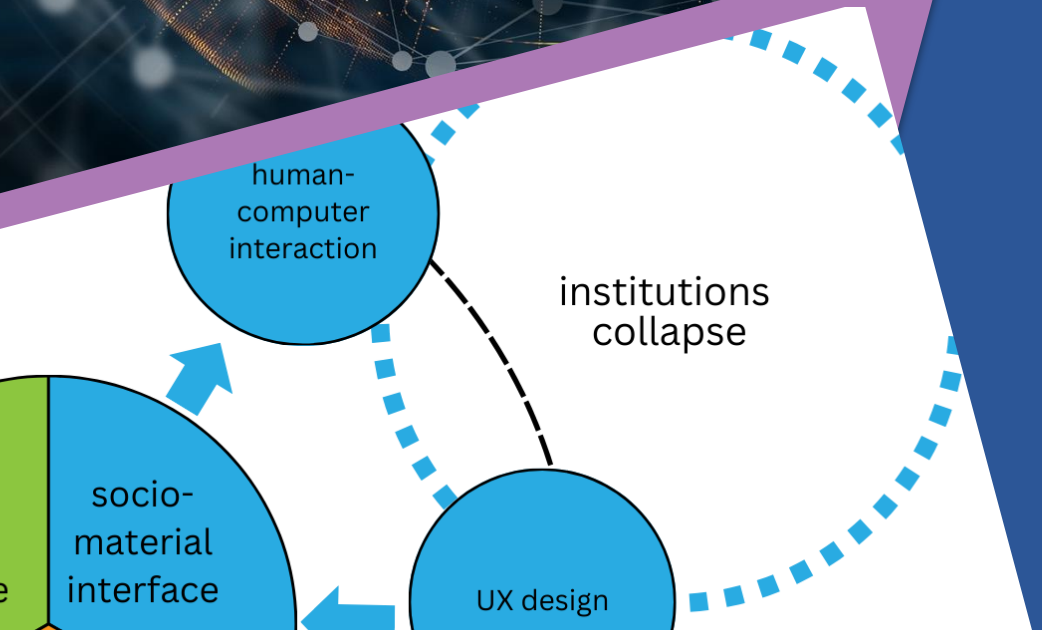
We propose that a 2 month, 10 man study of artificial intelligence be carried out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire. The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be

Problem: defining AI

(original) definition:

"making a machine behave in ways that would be called intelligent if a human were so behaving" (McCarthy et al. 1955; 2006).

"The classic definition enables one to conceptualise AI as a growing resource of interactive, autonomous, and often self-learning […] **agency**" (Floridi 2019)



Some alternative ontologies of AI: „agent“ → „environment“

“Recall that we are building autonomous vehicles not by putting robots in the driving seat, but by rethinking the whole ecosystem of vehicles plus environments, that is, removing the driving seat altogether.” (Floridi 2019)

- ✓ Large Technical System (Vannuccini & Prytkova)
- ✓ General Purpose Technology
- ✓ Sociotechnical systems/ensembles (Johnson & Verdicchio)
- ✓ Critical theory of technology (Feenberg)
- ✓ Technology-as-environment
- ✓ Technological systems (TP Hughes)

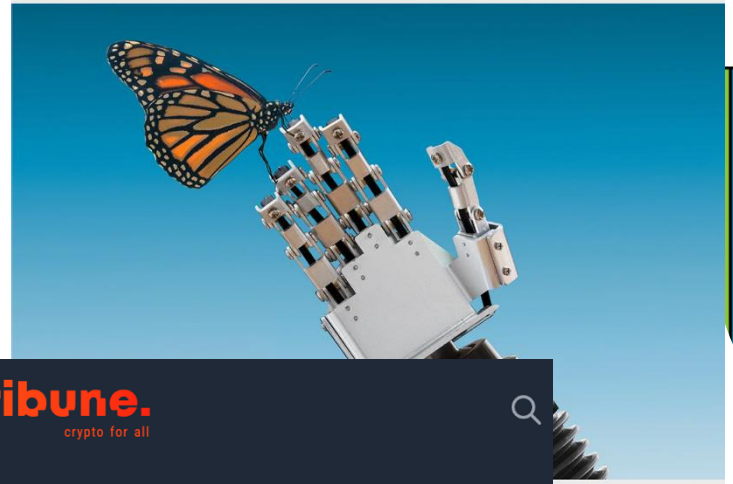
SCI AM

DECEMBER 7, 2023 | 5 MIN READ

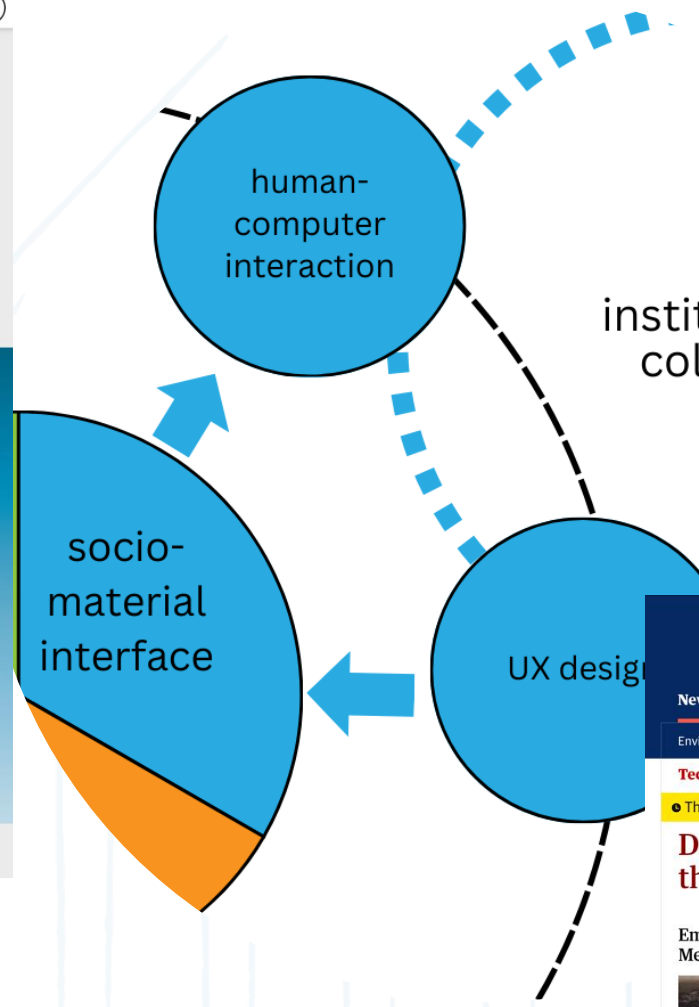
AI's Climate Impact Goes beyond Its Emissions

To understand how AI is contributing to climate change, look at the way it's being used

BY JUDE COLEMAN



Lund/Getty Images



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HOME » BLOCKCHAIN ECOSYSTEMS » DAO

Eco-DAOs: Uniting Technology and Environment

8 min read ▪ by La Rédaction C.

Learn ▪ Blockchain Technology and Innovation

The intersection between blockchain technology and ecology is taking shape through ecological DAOs, a revolutionary initiative for a sustainable future. These organizations are redefining the use of technology not only for innovation but also for environmental protection. In the face of current environmental challenges, they offer a new perspective on the use of technology for the good of the planet. This article explores the revolution of DAOs in digital governance, the impact of blockchain on the environment, and the pioneering role of ecological DAOs in green technology.

The Guardian

News | Opinion | Sport | Culture | Lifestyle

Environment | Climate crisis | Wildlife | Energy | Pollution

Technology

This article is more than 1 month old

Data center emissions probably 662% higher than big tech claims. Can it keep up the ruse?

Emissions from in-house data centers of Google, Microsoft, Meta and Apple may be 7.62 times higher than official tally

An Amazon Web Services data center in Ashburn, Virginia, on 28 July 2024. Photograph: Nathan Howard/Bloomberg via Getty Images

Sara Pritchard: envirotechnical systems

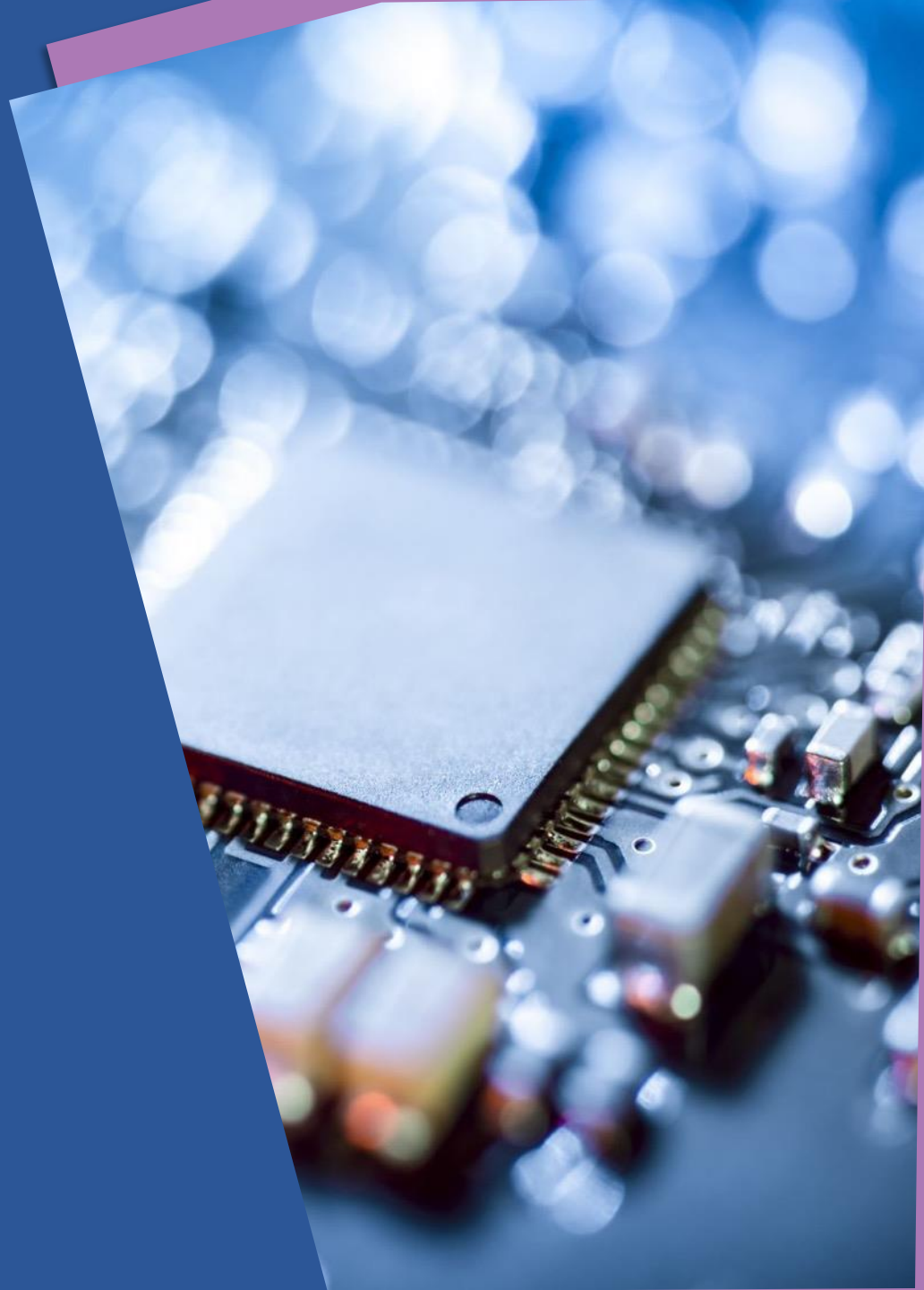
"envirotechnical systems therefore encompass not only 'nature' and 'technology' but also all of the social, cultural, and political dimensions of 'technology' that historians and sociologists of technology have ably explored over the past three decades." (p. 19)

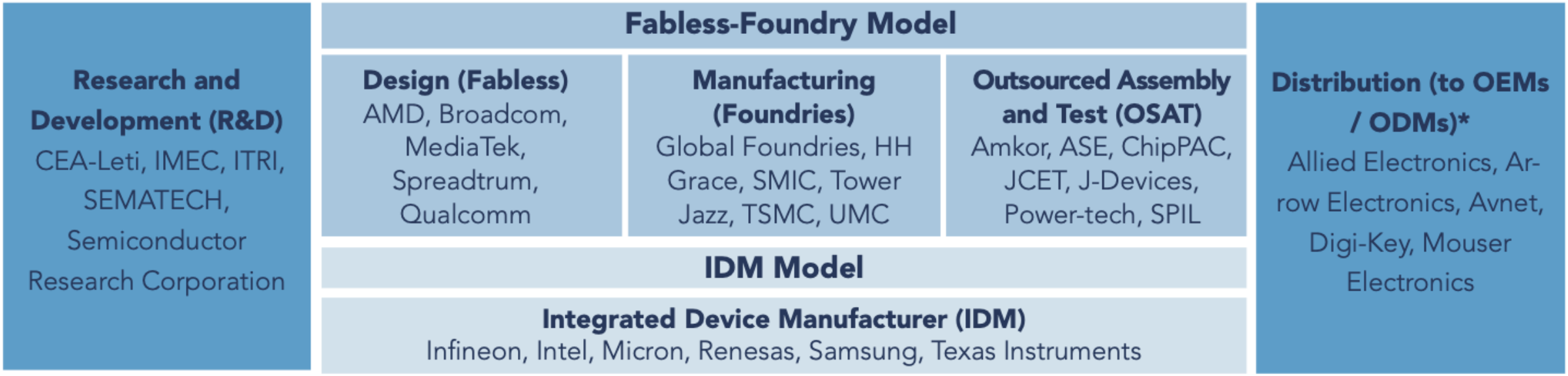
"I have consciously chosen envirotechnical systems over alternatives such as 'technoenvironmental' because the term acknowledges that nonhuman nature, however altered physically and mediated discursively, did come first." (p. 19)

Pritchard, Sara B. (2011). Confluence: The nature of technology and the remaking of the Rhône. Harvard University Press.

Example: semiconductors

...where do we even start...?

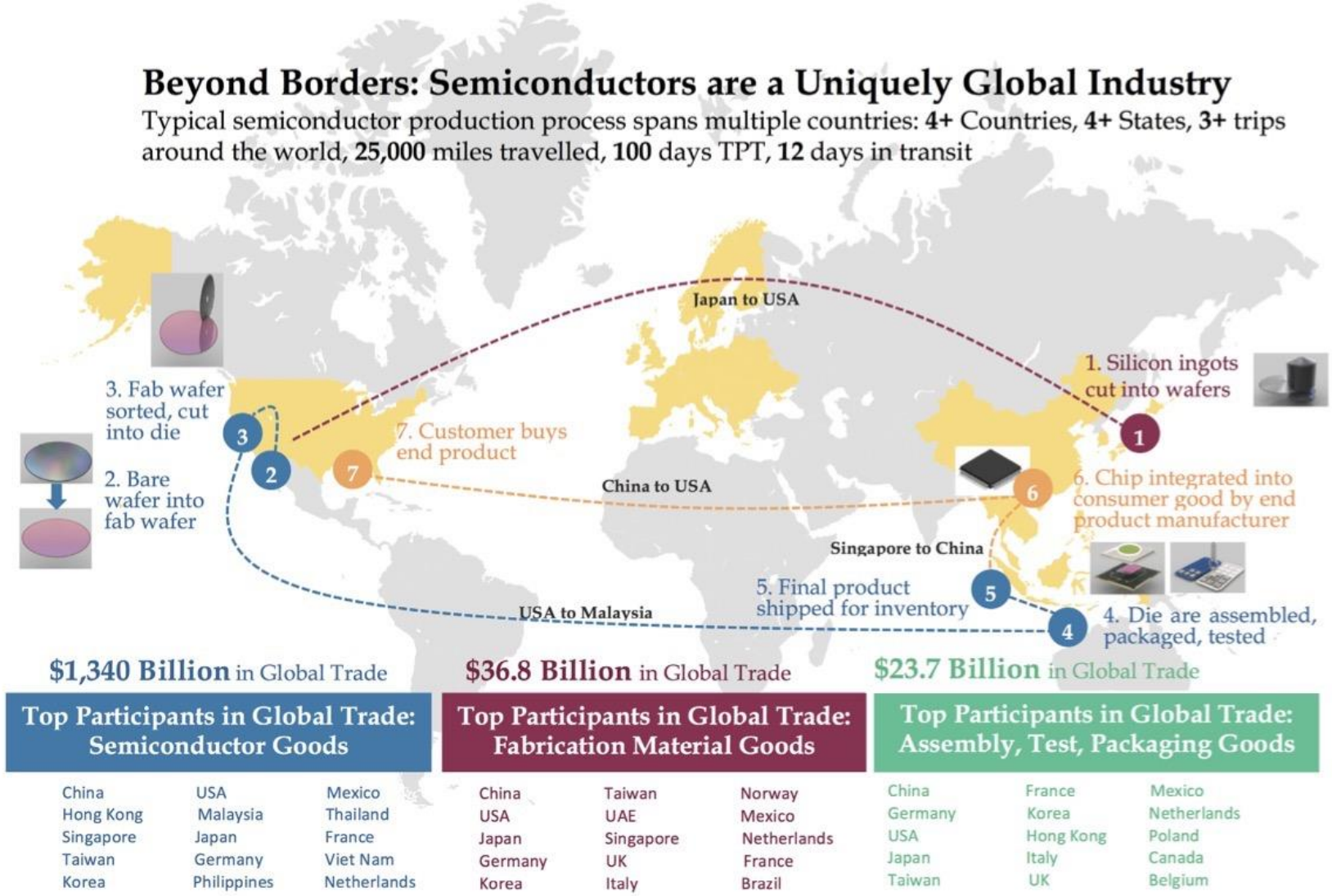




** Original Equipment Manufacturers (OEMs)/Original Design Manufacturers (ODMs) buy semiconductors to integrate into consumer end-products*

SIA. (2016). Beyond Borders: The Global Semiconductor Value Chain. How an Interconnected Industry Promotes Innovation and Growth. Semiconductor Industry Association; Nathan Associates.
https://www.semiconductors.org/wp-content/uploads/2018/06/SIA-Beyond-Borders-Report-FINAL-May-6-1.pdf

Figure 7
Example of the Global Nature of the Semiconducor Value Chain



SIA. (2016). Beyond Borders: The Global Semiconductor Value Chain. How an Interconnected Industry Promotes Innovation and Growth. Semiconductor Industry Association; Nathan Associates. ure)); 280469 (Silicon (<99.99% pure));
https://www.semiconductors.org/wp-content/uploads/2018/06/SIA-Beyond-Borders-Report-FINAL-May-6-1.pdf

Assembly, test, packaging goods defined by HS Codes: 3506 (Glues and Adhesives); 854710 (Ceramic Packaging)

„Green“ tech: how do we know?

Resources, institutions, relationships, ecosystems, cultures, communities, social practices...

The full becoming (‘product chain’) of a technological system is not apparent, and it is not easy to find out

Bloomberg

Park Min-sook at home with her daughter Ju-hyun in Danyang, South Korea. Park, 44, worked at a Samsung semiconductor factory for seven years. She later suffered from breast cancer, infertility, and a miscarriage. *Photographer: Anastasia Taylor-Lind for Bloomberg Businessweek*

Businessweek | Features

American Chipmakers Had a Toxic Problem. Then They Outsourced It

Twenty-five years ago, U.S. tech companies pledged to stop using chemicals that caused miscarriages and birth defects. They failed to ensure that their Asian suppliers did the same.

By Cam Simpson
June 15, 2017 at 11:00 AM GMT+2

KBS WORLD

News Topics Entertainment Learn Korean

Domestic

Three Semiconductor Factory Workers Recognized as Having Suffered Fetal Industrial Accident for 1st Time

Written: 2024-03-22 16:01:01 Updated: 2024-03-22 17:00:33

Photo : KBS News

For the first time, congenital diseases afflicting children of semiconductor factory workers who were exposed to hazardous environments during pregnancy were recognized as industrial accidents.

The Korea Workers' Compensation and Welfare Service under the Ministry of Employment and Labor recognized work-related accidents for congenital diseases that occurred in children of three female workers who worked at Samsung Electronics' chip plant.

Process Safety and Environmental Protection
Volume 87, Issue 6, November 2009, Pages 353-360

Emergency response study for chemical releases in the high-tech industry in Taiwan—A semiconductor plant example

C.P. Lin [a], H.K. Chang [b], Y.M. Chang [a], S.W. Chen [c], C.M. Shu [a b]

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Journal of Loss Prevention in the Process Industries
Volume 17, Issue 1, January 2004, Pages 29-34

Accidental explosions of semiconductor manufacturing gases in Japan ☆

Toshisuke Hirano

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Journal of Loss Prevention in the Process Industries
Volume 19, Issue 6, November 2006, Pages 743-753

Wet bench reactive hazards of cleaning stages in semiconductor manufacturing processes

Deng-Jr Peng [a], Yih-Shing Duh [b], Chi-Min Shu [a]

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https://doi.org/10.1016/j.jlp.2006.06.002 Get rights and content

Journals & Magazines > IEEE Transactions on Nuclear ... > Volume: 59 Issue: 4

Determining the Impact of Alpha-Particle-Emitting Contamination From the Fukushima-Daiichi Disaster on Japanese Semiconductor Manufacturing Sites

Publisher: IEEE Cite This PDF

Robert C. Baumann All Authors

9 Cites in Papers 309 Full Text Views

Abstract

Document Sections

I. Introduction

II. Background

III. Results and Discussion

Abstract:
We review the major radioactive isotopes formed in nuclear reactors and consider how these were released and dispersed in the days following the Fukushima-Daiichi accident. The risk of contamination from uranium and plutonium isotopes at semiconductor manufacturing sites in Japan is discussed, and the first report of alpha-counting measurements is presented demonstrating that no alpha-emitting contamination was found in either of the two manufacturing facilities.

Published in: IEEE Transactions on Nuclear Science (Volume: 59 , Issue: 4, August 2012)

Fortune

Intel goes on a €33 billion European spending spree to solve the chips crisis

TECH

Why there's a chip shortage that's hurting everything from the PlayStation 5 to the Chevy Malibu

PUBLISHED WED, FEB 10 2021•4:35 PM EST | UPDATED WED, FEB 10 2021•9:34 PM EST

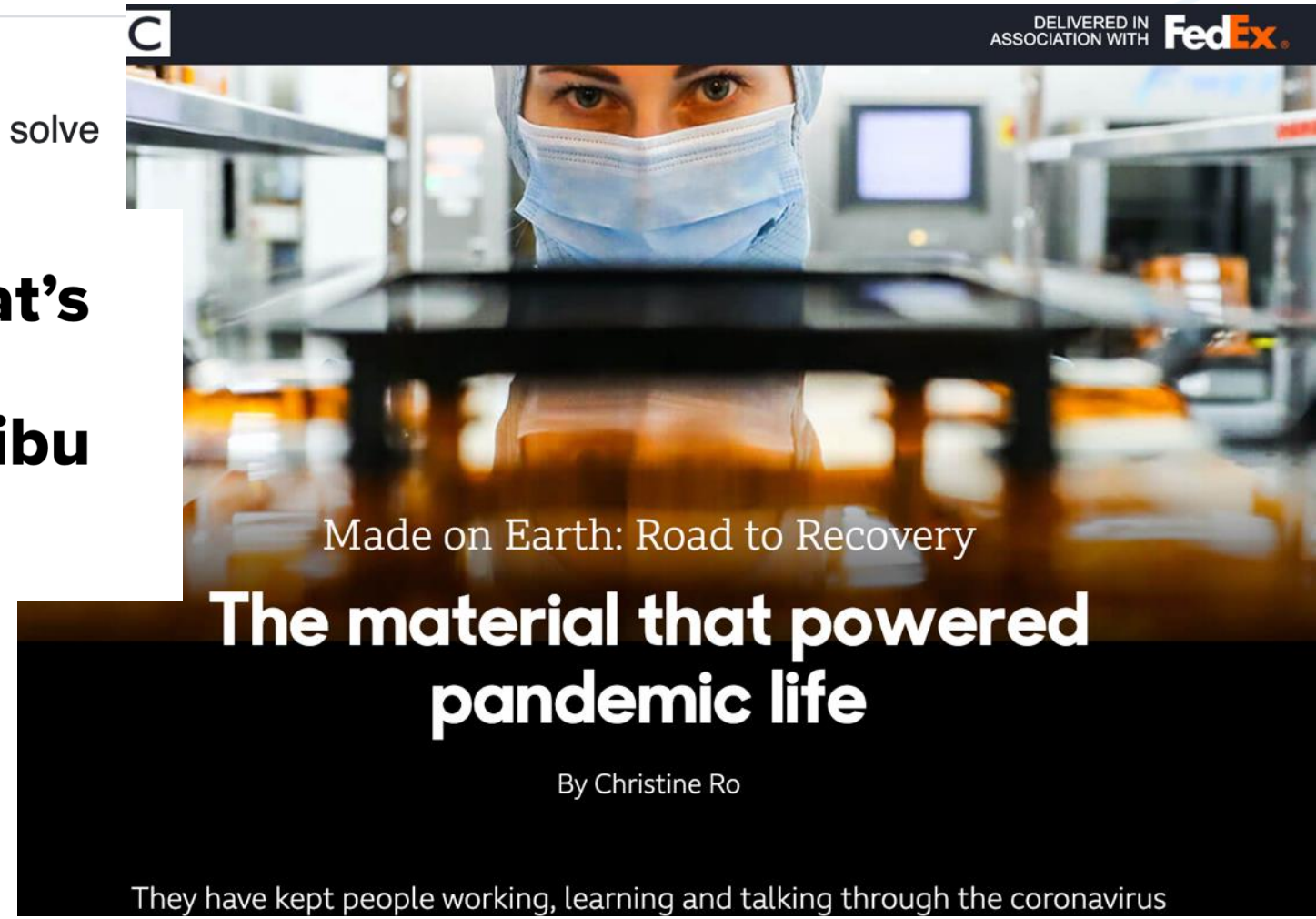
Kif Leswing
@KIFLESWING

SHARE

Why is there a chip shortage? Global semiconductor supply crisis explained – and impact on car manufacturers

Shortage of vital electronic components is affecting everyth car manufacturing to smartphones and TVs

By Matt Allan
Tuesday, 1st February 2022, 12:00 pm



The Economic Times

Supply chain crisis, war, making chip situation worse

The current squeeze in chip supply has led to the proposed Chips for America Act, European Chips Act, China's subsidies for chip manufacture and...

3 weeks ago

3 Framework for the Green AI Index

3.1 Data Centers

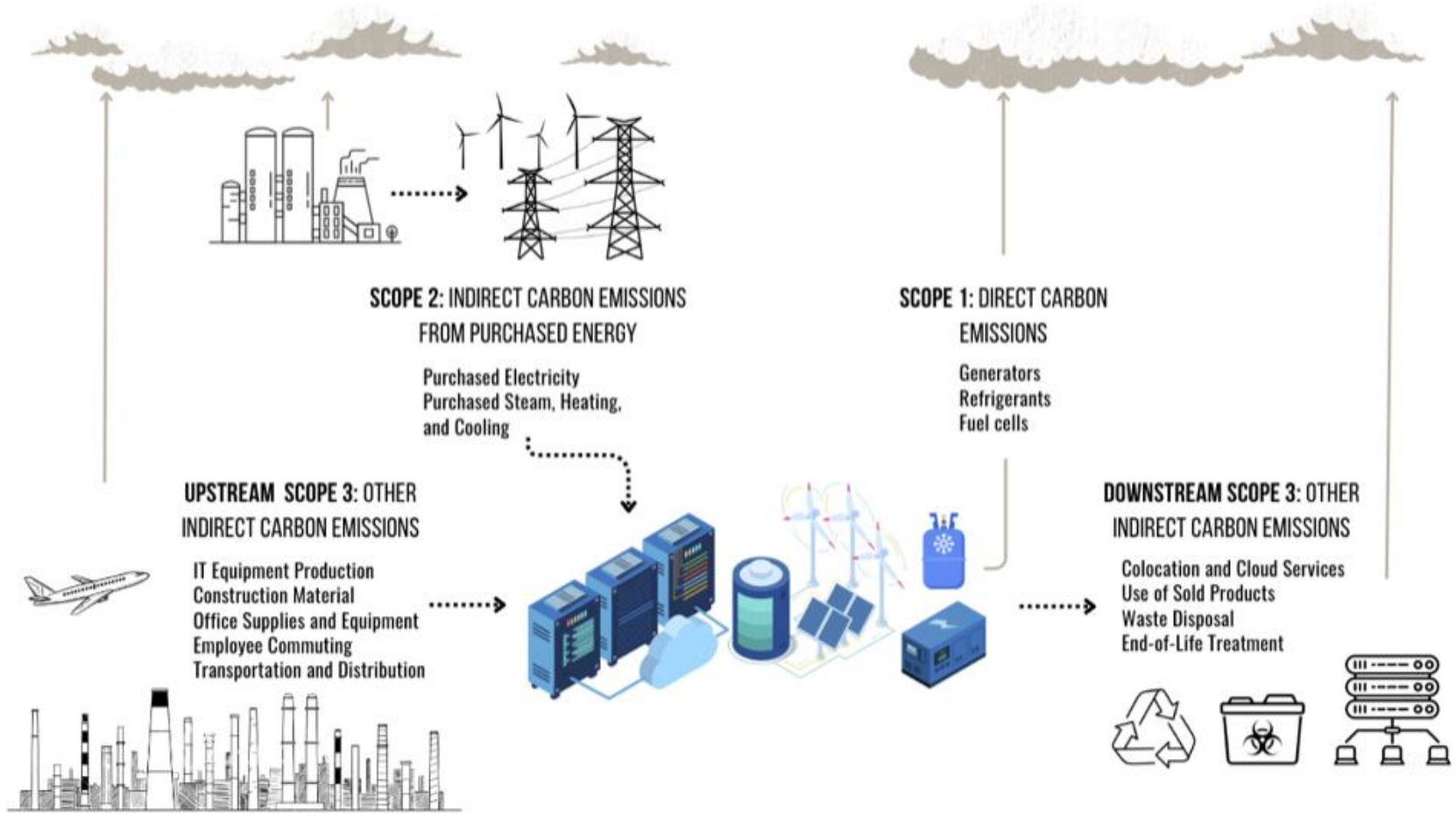
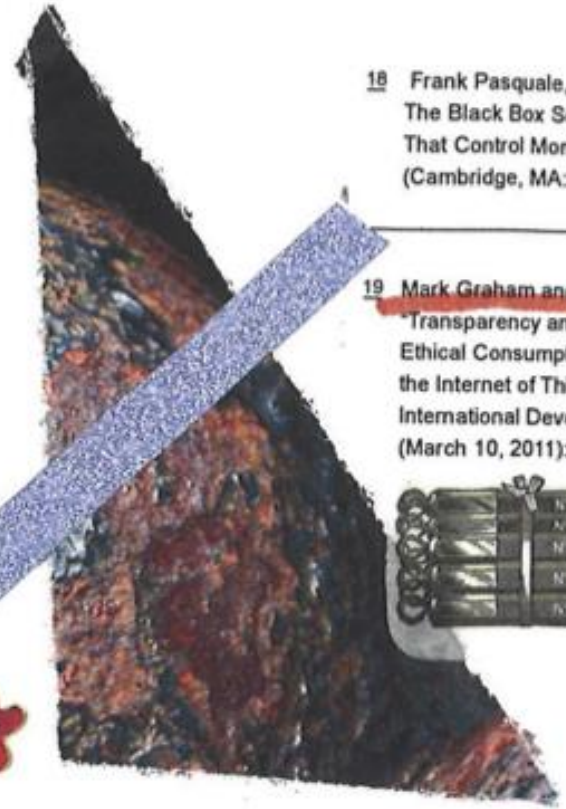


Figure 1: Overview of Scope 1, 2, and 3 Carbon Emissions in Data Centers: Direct, Indirect, and Value Chain Emissions

Huang, R. et al (2024). White Paper on Global Artificial Intelligence Environmental Impact. https://doi.org/10.13140/RG.2.2.17090.39368

income disparities is just one of the possible ways of representing a deep systemic inequality. We have both researched different forms of 'black boxes' understood as algorithmic processes, [18] but this map points to another form of opacity: the very processes of creating, training and operating a device like an Amazon Echo is itself a kind of black box, very hard to examine and track *in toto* given the multiple layers of contractors, distributors, and downstream logistical partners around the world. As Mark Graham writes, "contemporary capitalism conceals the histories and geographies of most commodities from consumers. Consumers are usually only able to see commodities in the here and now of time and space, and rarely have any opportunities to gaze backwards through the chains of production in order to gain knowledge about the sites of production, transformation, and distribution." [19]

(9)



18 Frank Pasquale,
The Black Box Society: The Secret Algorithms That Control Money and Information
(Cambridge, MA: Harvard University Press, 2016).

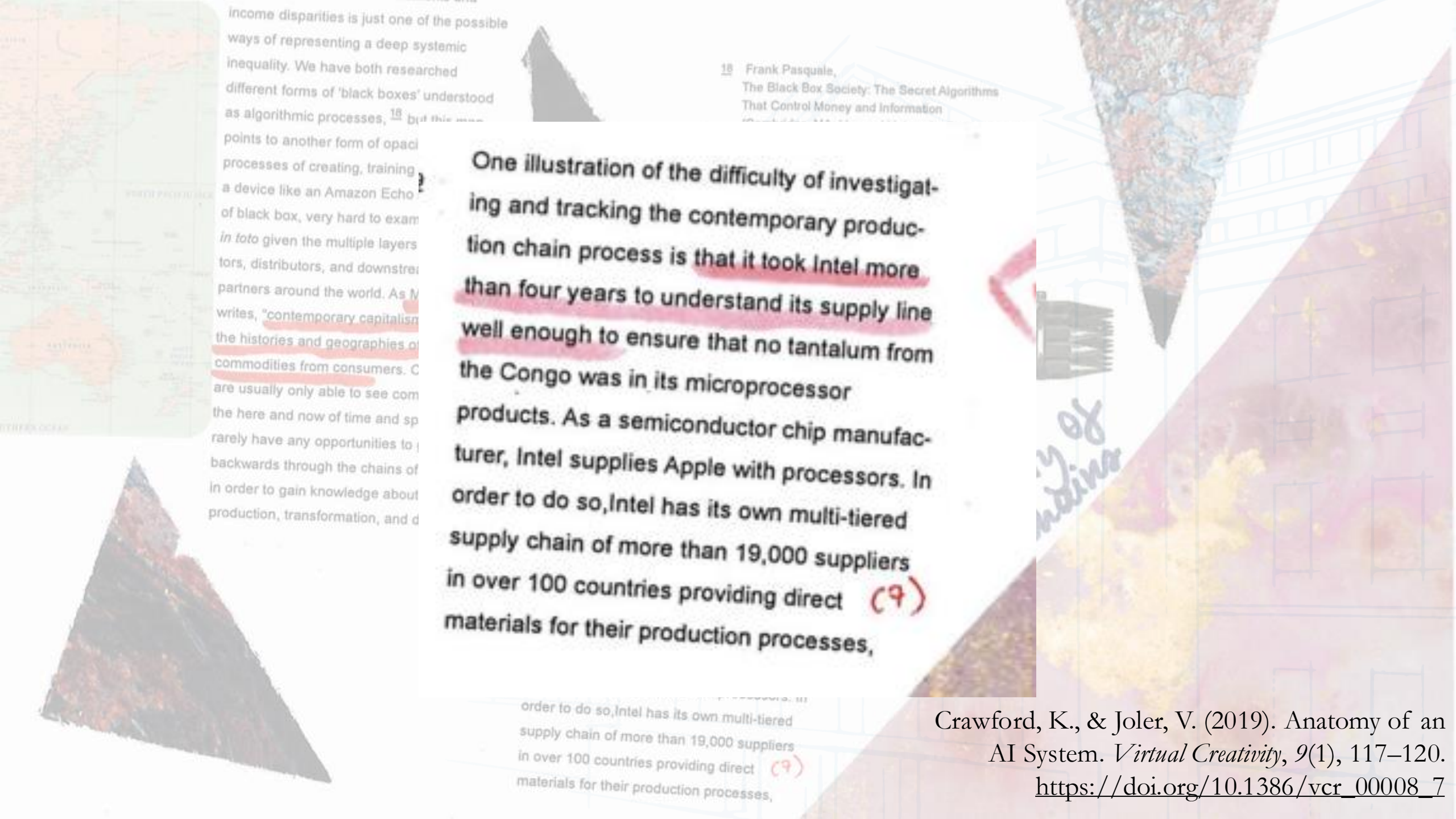
19 Mark Graham and Håvard Haarstad,
"Transparency and Development: Ethical Consumption through Web 2.0 and the Internet of Things," Information Technologies & International Development 7, no. 1
(March 10, 2011): 1.

p. 7

One illustration of the difficulty of investigating and tracking the contemporary production chain process is that it took Intel more than four years to understand its supply line well enough to ensure that no tantalum from the Congo was in its microprocessor products. As a semiconductor chip manufacturer, Intel supplies Apple with processors. In order to do so,Intel has its own multi-tiered supply chain of more than 19,000 suppliers in over 100 countries providing direct materials for their production processes,

(9)

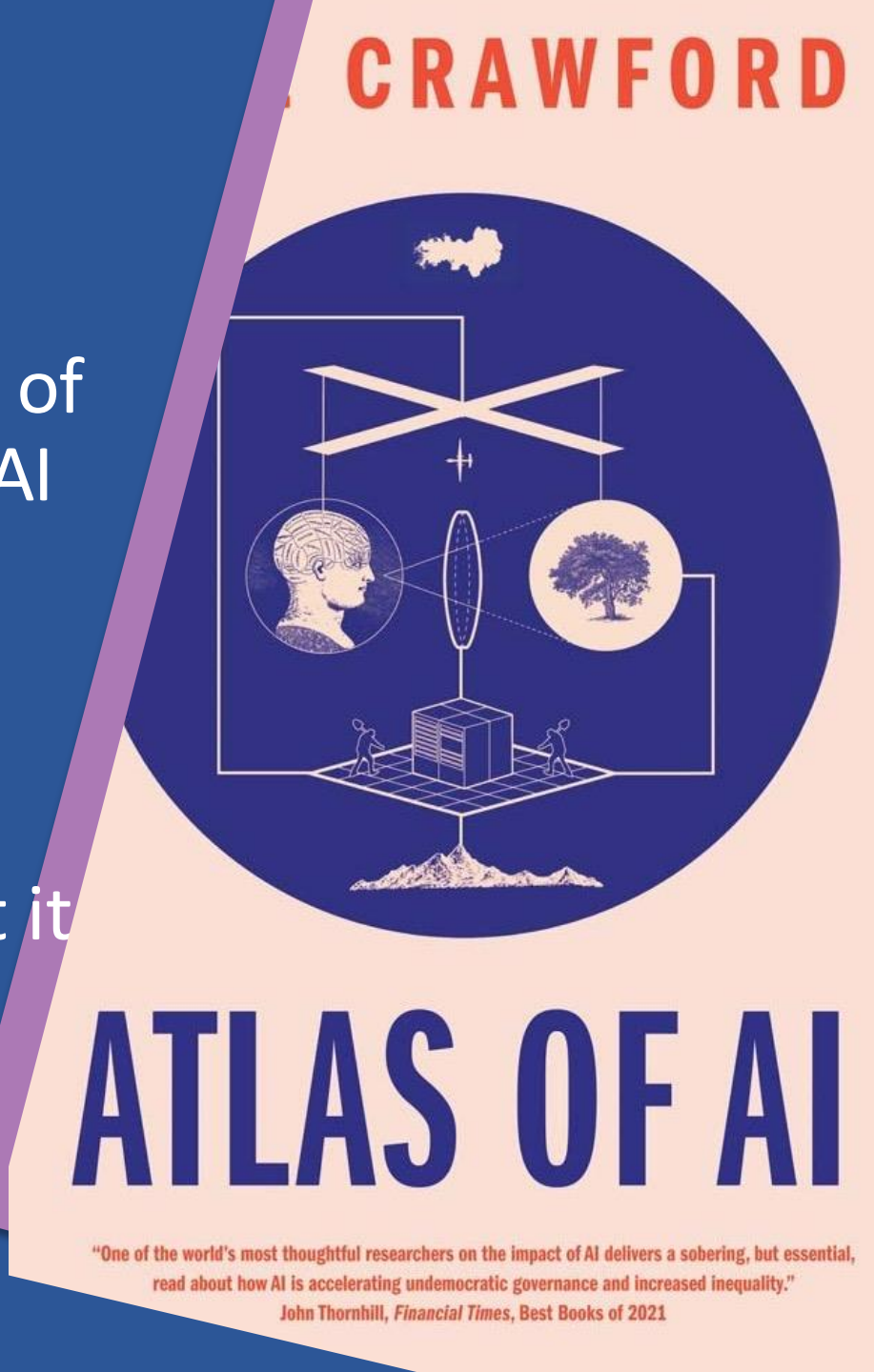
complexity of supply chains



Crawford, K., & Joler, V. (2019). Anatomy of an AI System. *Virtual Creativity*, *9*(1), 117–120. https://doi.org/10.1386/vcr_00008_7

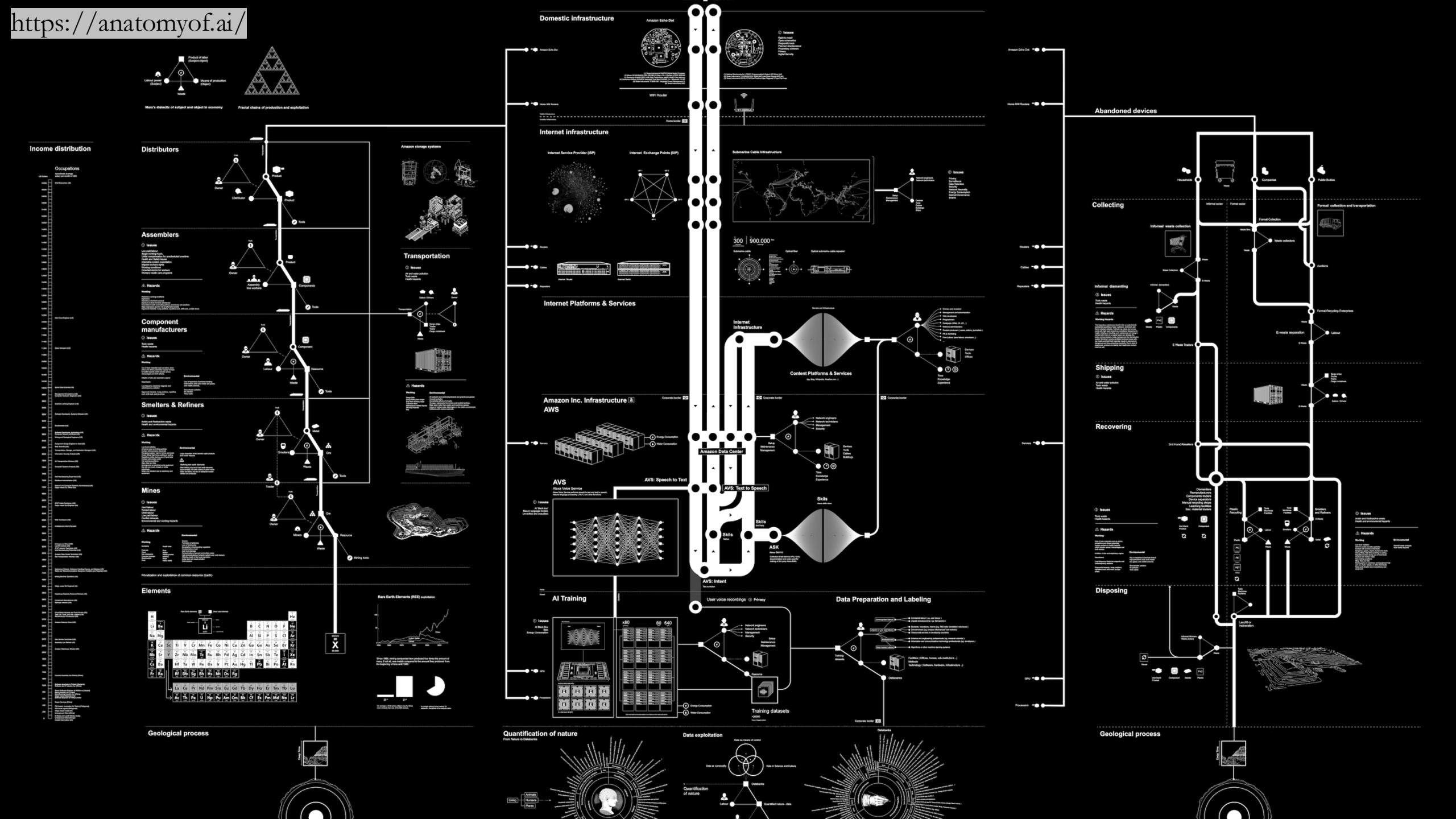
AI problems = planet problems

"the core issue is the deep entanglement of technology, capital, and power, of which AI is the latest manifestation," creating "the planetary infrastructure of AI as an extractive industry: from its material genesis to the political economy of its operations to the discourses that support it aura of immateriality and inevitability"



Crawford, Kate 2021. Atlas of AI: power, politics, and the planetary costs of artificial intelligence. New Haven: Yale University Press, p. 217.

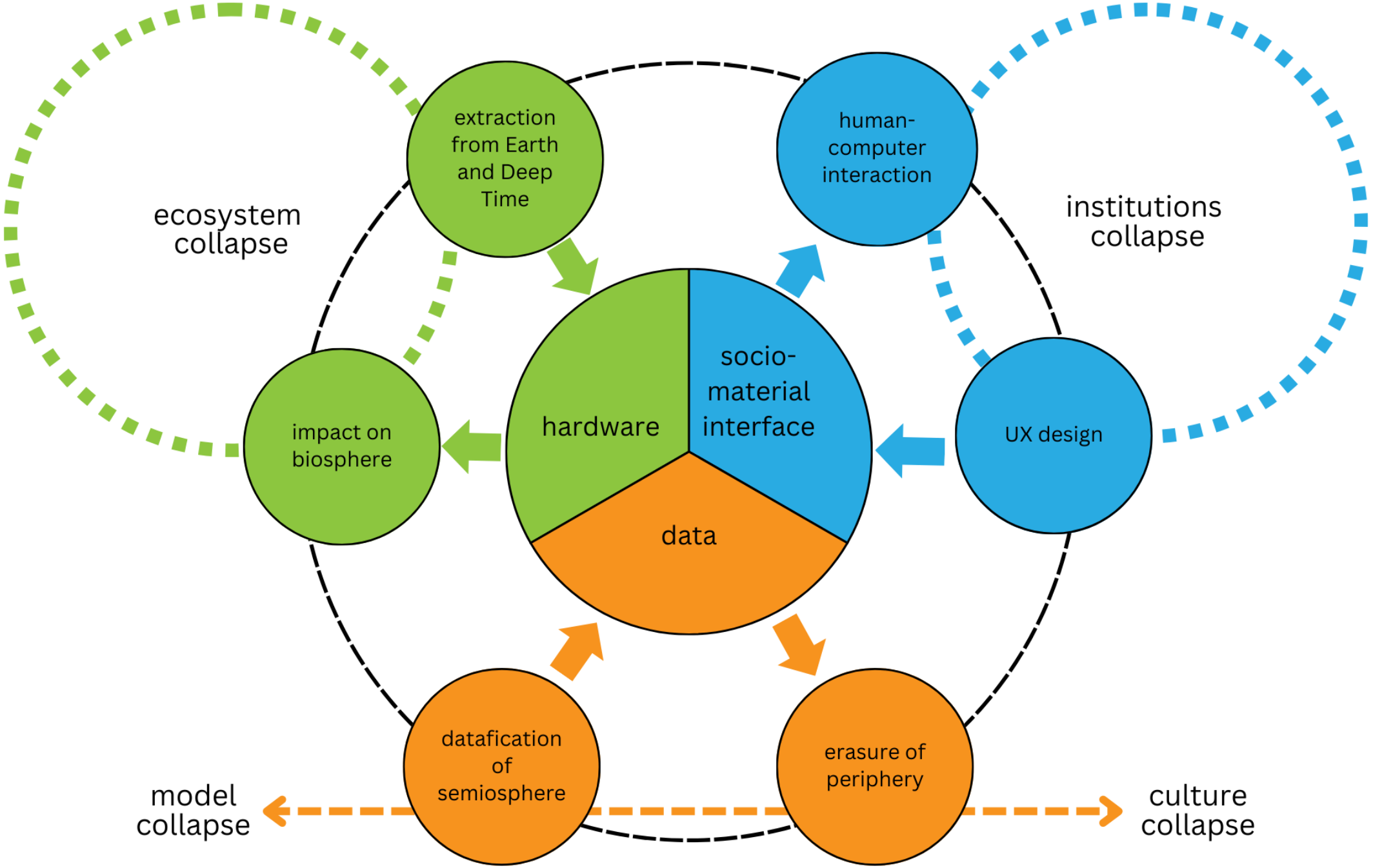
https://anatomyof.ai/



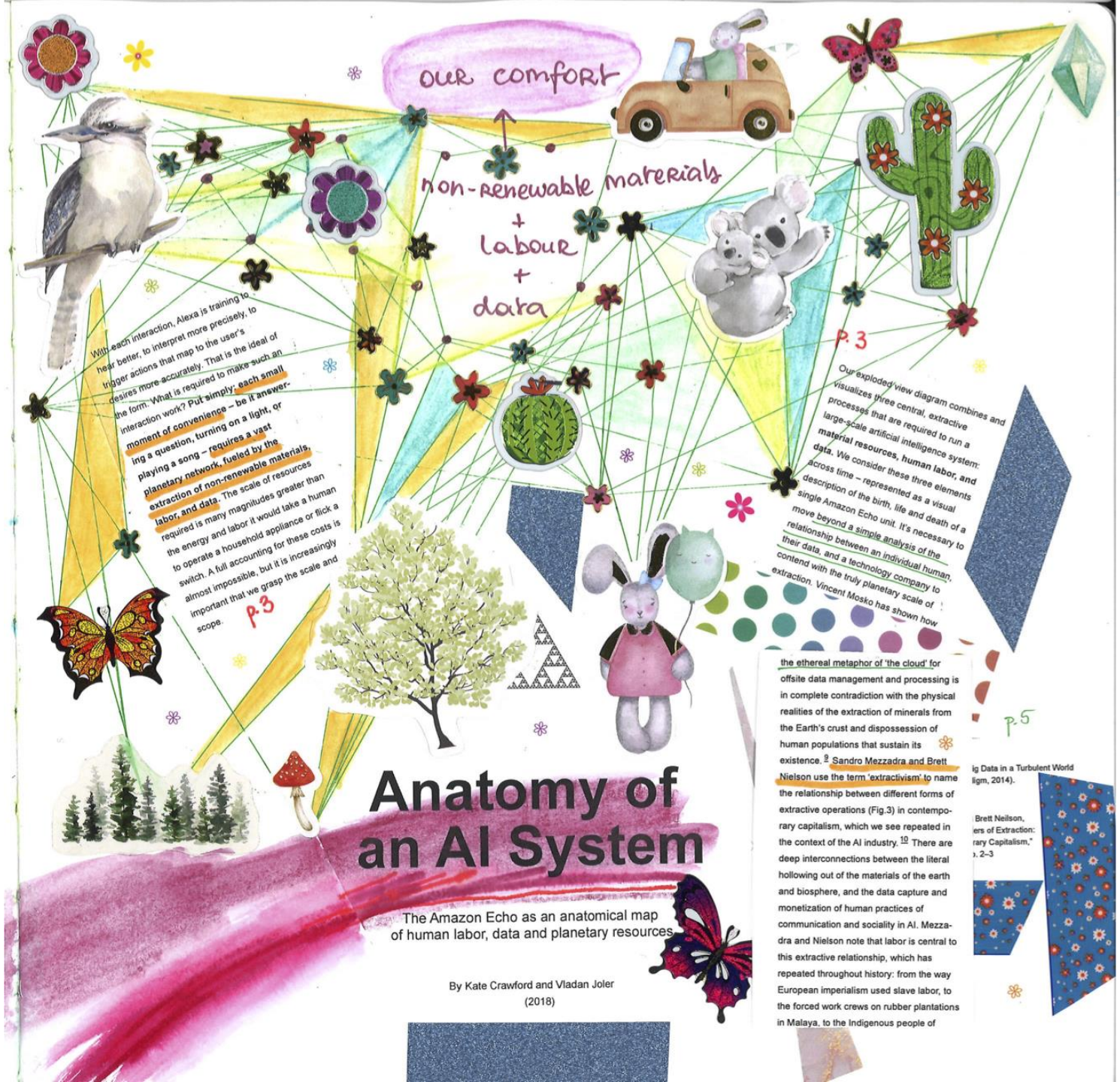
Asking an AI: the planetary cost of a query

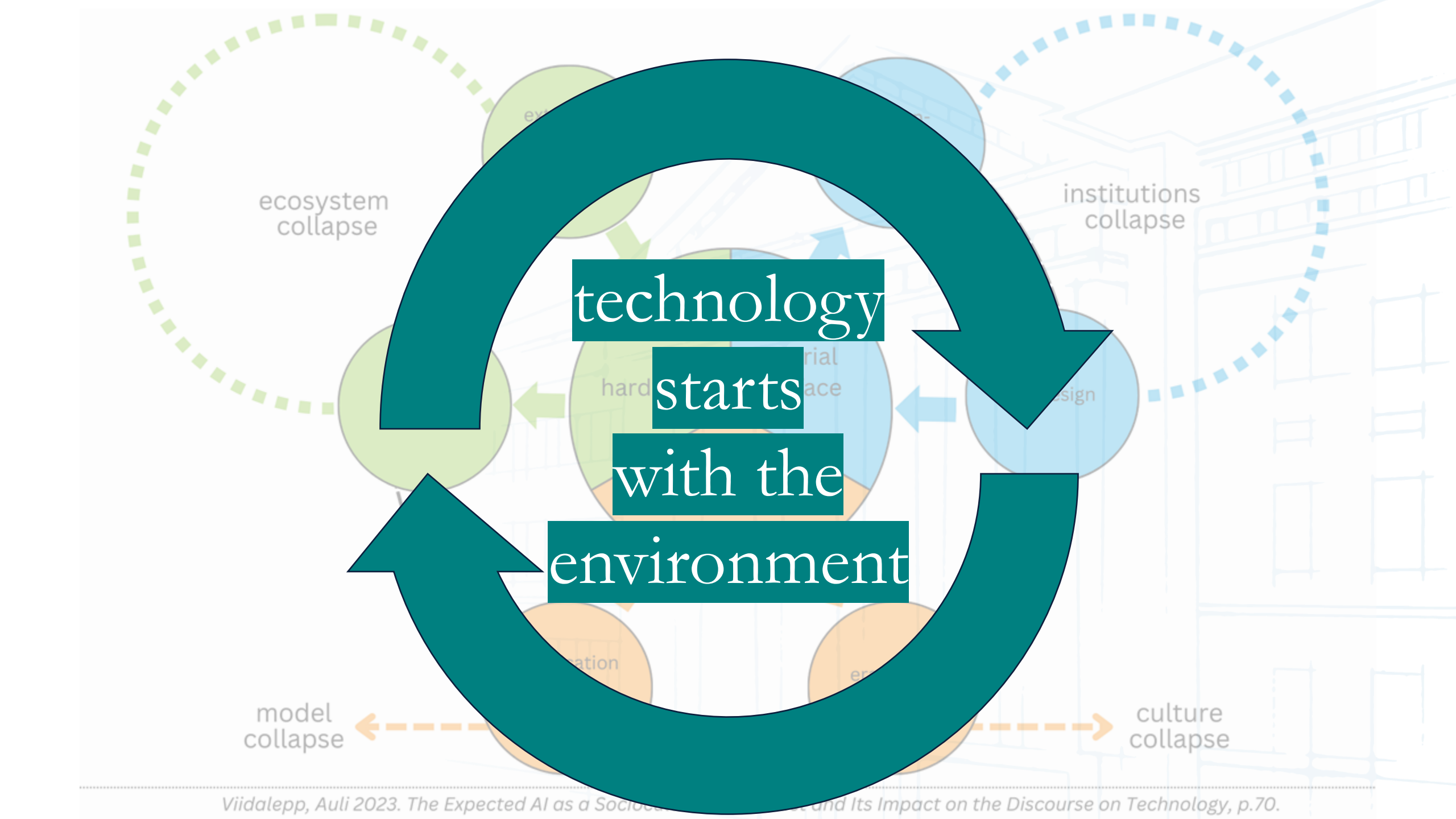
"**Put simply: each small moment of convenience – be it answering a question, turning on a light, or playing a song – requires a vast planetary network, fueled by the extraction of non-renewable materials, labor, and data**. The scale of resources required is many magnitudes greater than the energy and labor it would take a human to operate a household appliance or flick a switch."

Kate Crawford & Vladan Joler 2019. Anatomy of an AI System. – Virtual Creativity, 9 (1), 117–120.



Viidalepp, Auli 2023. The Expected AI as a Sociocultural Construct and Its Impact on the Discourse on Technology, p.70.


OUR COMFORT
non-renewable materials
+
labour
+
data
With each interaction, Alexa is training to hear better, to interpret more precisely, to trigger actions that map to the user's desires more accurately. That is the ideal of the form. What is required to make such an interaction work? Put simply: each small moment of convenience – be it answering a question, turning on a light, or playing a song – requires a vast planetary network, fueled by the extraction of non-renewable materials, labor, and data. The scale of resources required is many magnitudes greater than the energy and labor it would take a human to operate a household appliance or flick a switch. A full accounting for these costs is almost impossible, but it is increasingly important that we grasp the scale and scope.
p.3
p.3
Our exploded view diagram combines and visualizes three central, extractive processes that are required to run a large-scale artificial intelligence system: material resources, human labor, and data. We consider these three elements across time – represented as a visual description of the birth, life and death of a single Amazon Echo unit. It's necessary to move beyond a simple analysis of the relationship between an individual human, their data, and a technology company to contend with the truly planetary scale of extraction. Vincent Mosko has shown how
the ethereal metaphor of 'the cloud' for offsite data management and processing is in complete contradiction with the physical realities of the extraction of minerals from the Earth's crust and dispossession of human populations that sustain its existence. [9] Sandro Mezzadra and Brett Nielson use the term 'extractivism' to name the relationship between different forms of extractive operations (Fig.3) in contemporary capitalism, which we see repeated in the context of the AI industry. [10] There are deep interconnections between the literal hollowing out of the materials of the earth and biosphere, and the data capture and monetization of human practices of communication and sociality in AI. Mezzadra and Nielson note that labor is central to this extractive relationship, which has repeated throughout history: from the way European imperialism used slave labor, to the forced work crews on rubber plantations in Malaya, to the Indigenous people of
p.5
Anatomy of an AI System
The Amazon Echo as an anatomical map of human labor, data and planetary resources.
By Kate Crawford and Vladan Joler
(2018)



Viidalepp, Auli 2023. The Expected AI as a Socio[illegible] and Its Impact on the Discourse on Technology, p.70.

Thank you!

https://auli.viidalepp.org

Viidalepp, Auli 2024. The AI as an envirotechnical system. — BALTEHUMS III, Poznań, Poland, 23–25 October 2024. doi:10.5281/zenodo.13983378