

Lost in ecological transition ? Trajectory of a scientist at the Anthropocene

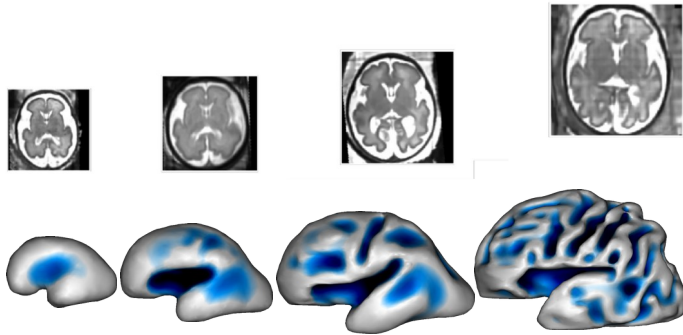
Research School in Discrete Mathematics and Computer Science
2024/01/31

Julien Lefèvre

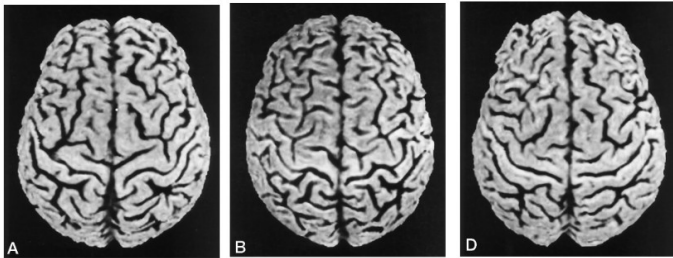
Where do I come from ?

- Master in Applied maths then PhD in signal/image processing in a neuroscience lab (2007)
- Assistant prof in computer science, LSIS, Marseille (2009)
- Now in Institute of Neuroscience of la Timone, Marseille (2018)
- Interdisciplinarity: modelling and understanding the shape of the brain ; application in clinics
But also more fundamental research: spectral analysis of graphs and surfaces

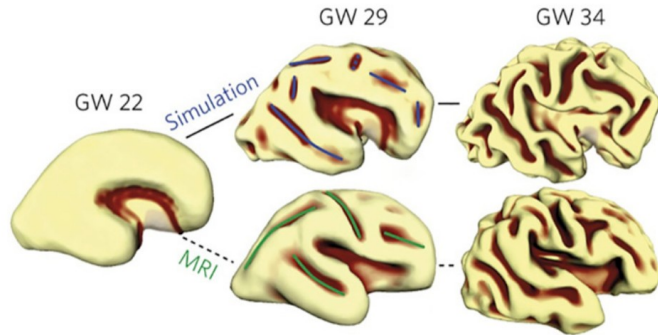
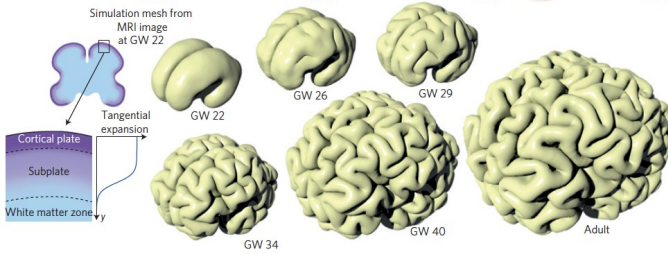
More concretely



Lefevre et al, Cereb Cortex, 2016
 Courtoisie G. Auzias



Biondi et al, Am J Neuroradiol, 1998



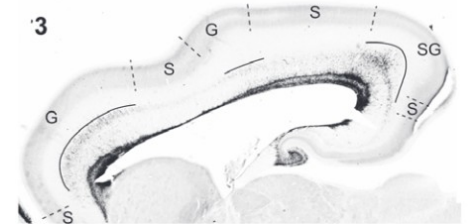
Tallinen et al, Nat Phys, 2016

THE CHEMICAL BASIS OF MORPHOGENESIS

By A. M. TURING, F.R.S. *University of Manchester*

(Received 9 November 1951—Revised 15 March 1952)

It is suggested that a system of chemical substances, called morphogens, reacting together and diffusing through a tissue, is adequate to account for the main phenomena of morphogenesis. Such a system, although it may originally be quite homogeneous, may later develop a pattern or structure due to an instability of the homogeneous equilibrium, which is triggered off by random disturbances. Such reaction-diffusion systems are considered in some detail in the case of an isolated ring of cells, a mathematically convenient, though biologically unusual system. The investigation is chiefly concerned with the onset of instability. It is found that there are six essentially different forms which this may take. In the most interesting form stationary waves appear on the ring. It is suggested that this might account, for instance, for the tentacle patterns on *Hydra* and for whorled leaves. A system of reactions and diffusion on a sphere is also considered. Such a system appears to account for gastrulation. Another reaction system in two dimensions gives rise to patterns reminiscent of dappling. It is also suggested that stationary waves in two dimensions could account for the phenomena of phyllotaxis.



High *Eomes* Gyrus R
 Low *Eomes* Sulcus L

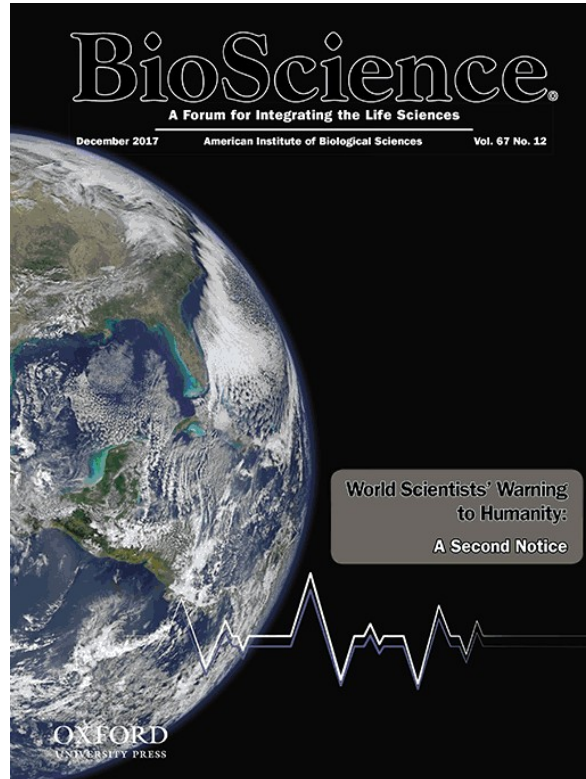
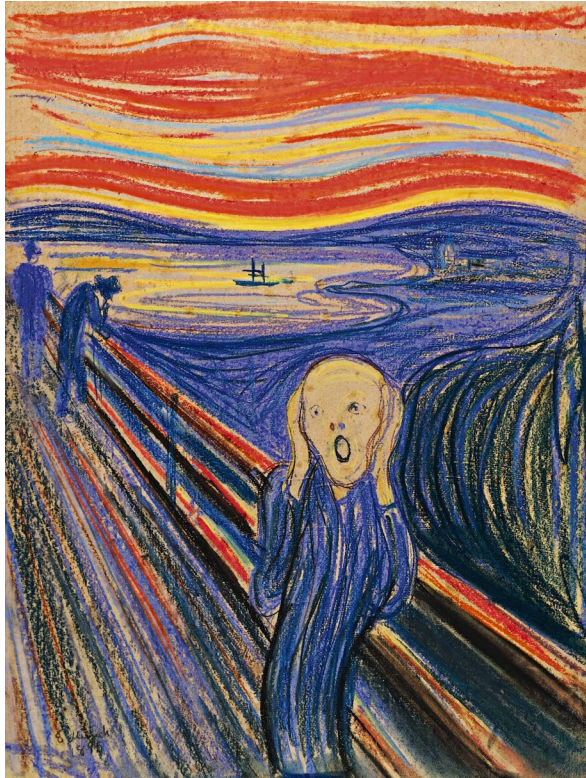
De Romero et al, EMBO J, 2015

A Satori



Mer de Glace, Chamonix, 2017

After the Satori



JOURNAL ARTICLE

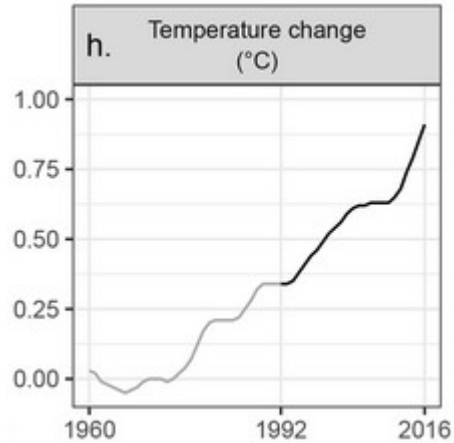
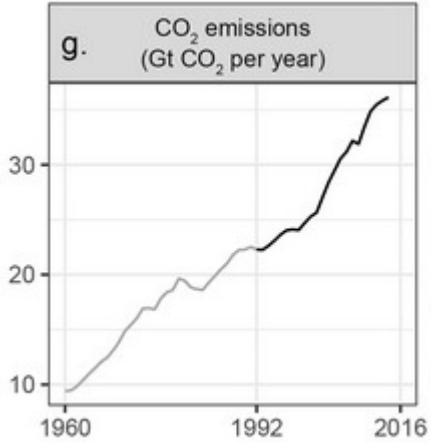
World Scientists' Warning to Humanity: A Second Notice ^{FREE}

William J. Ripple, Christopher Wolf, Thomas M. Newsome, Mauro Galetti, Mohammed Alamgir, Eileen Crist, Mahmoud I. Mahmoud, William F. Laurance, 15,364 scientist signatories from 184 countries

BioScience, Volume 67, Issue 12, December 2017, Pages 1026–1028, <https://doi.org/10.1093/biosci/bix125>

Published: 13 November 2017

After the Satori



JOURNAL ARTICLE

World Scientists' Warning to Humanity: A Second Notice ^{FREE}

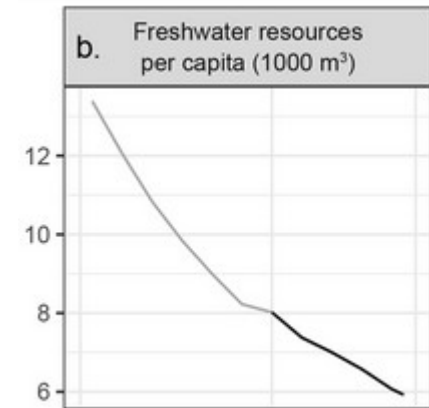
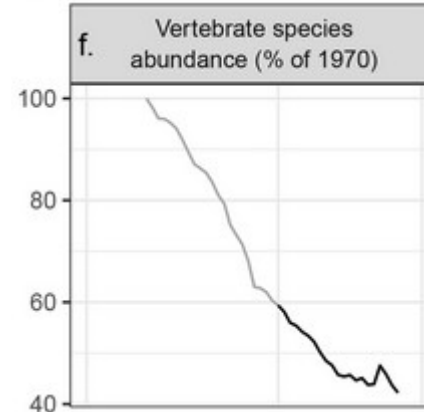
William J. Ripple, Christopher Wolf, Thomas M. Newsome, Mauro Galetti, Mohammed Alamgir, Eileen Crist, Mahmoud I. Mahmoud, William F. Laurance, 15,364 scientist signatories from 184 countries

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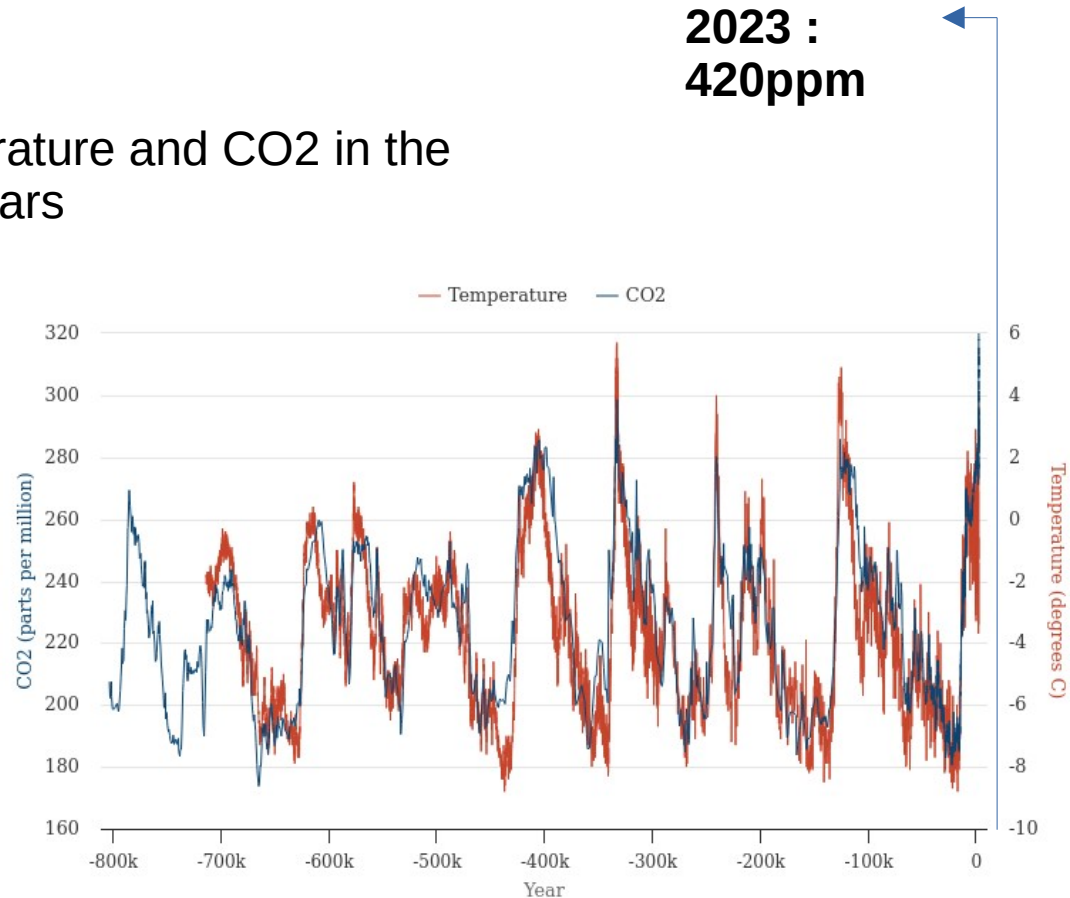
Climate change...

... but also biodiversity and resources



Anthropic nature of climate change

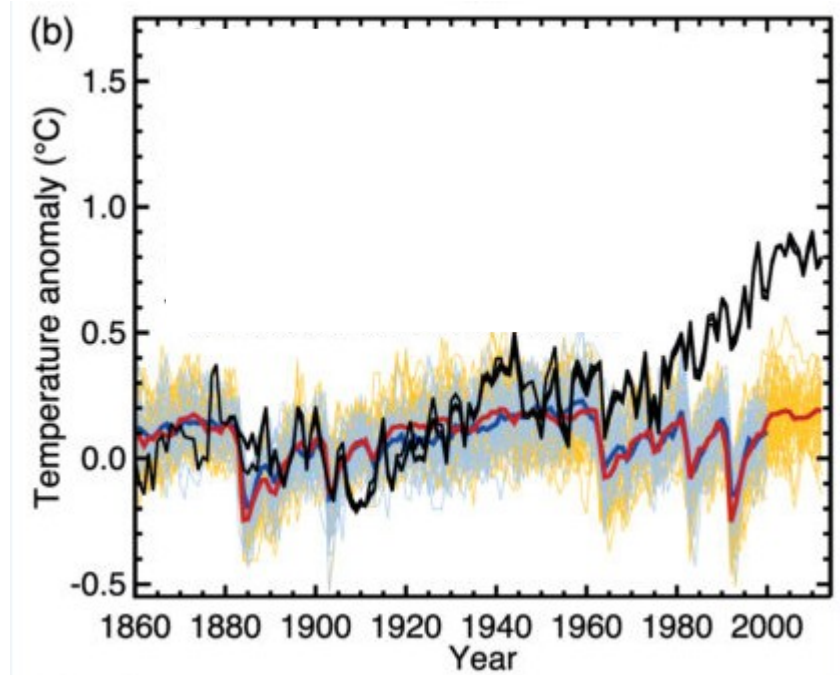
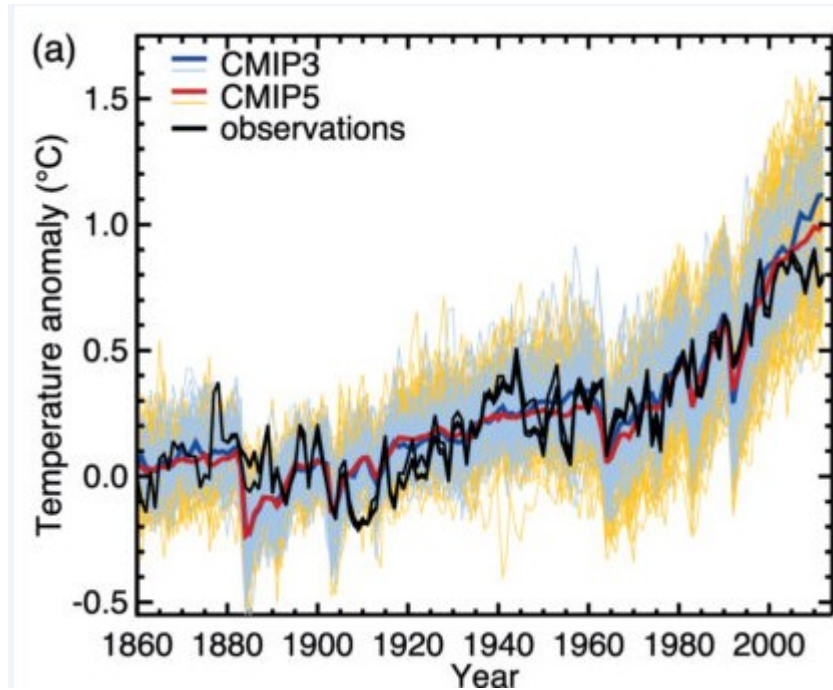
Antarctic temperature and CO2 in the past 800,000 years



Another perspective

Anthropogenic and natural forcings

Natural forcings only



Adapted from Fig TS9


<https://www.ipcc.ch/report/ar5/wg1/technical-summary/>

A last one

Scientists Reach 100% Consensus on Anthropogenic Global Warming

[James Powell](#)   [View all authors and affiliations](#)

[Volume 37, Issue 4](#) | <https://doi.org/10.1177/0270467619886266>

 Contents



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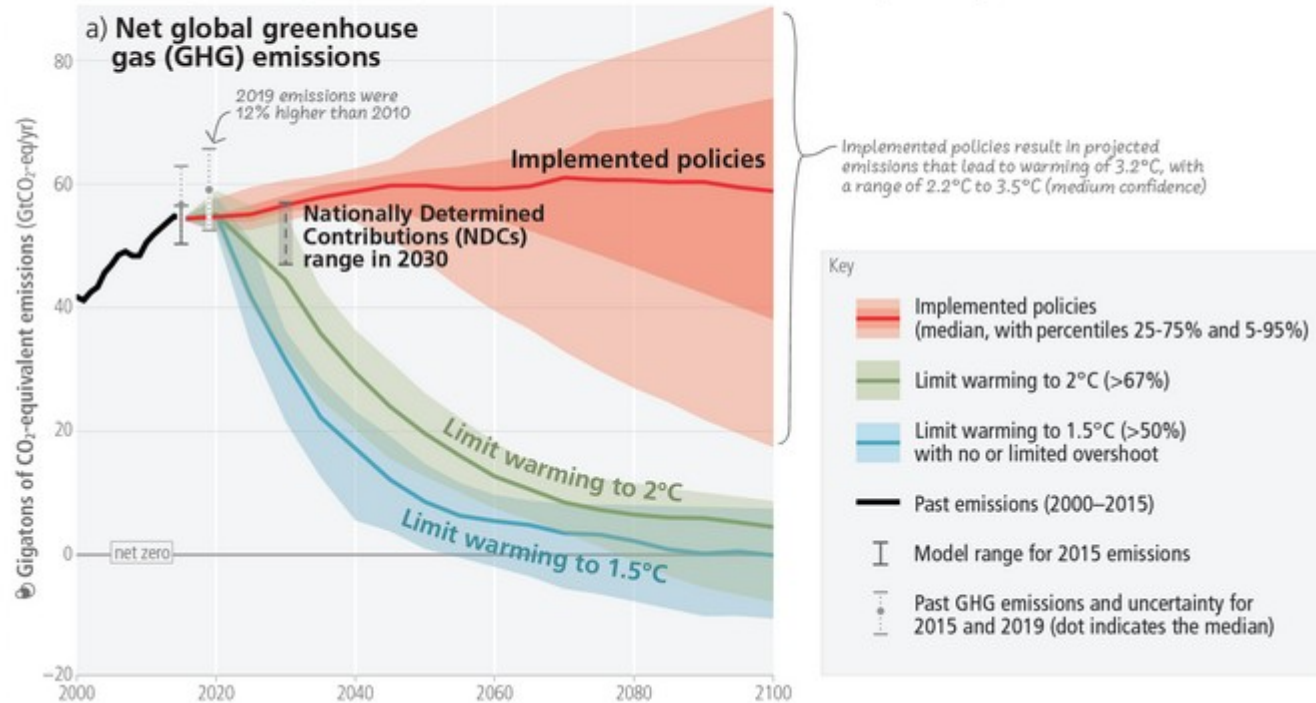
Abstract

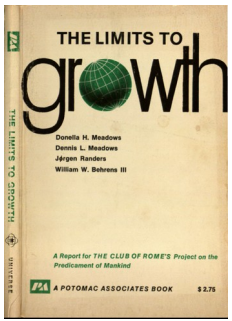
The consensus among research scientists on anthropogenic global warming has grown to 100%, based on a review of 11,602 peer-reviewed articles on “climate change” and “global warming” published in the first 7 months of 2019.

Consequences

Limiting warming to 1.5°C and 2°C involves rapid, deep and in most cases immediate greenhouse gas emission reductions

Net zero CO₂ and net zero GHG emissions can be achieved through strong reductions across all sectors



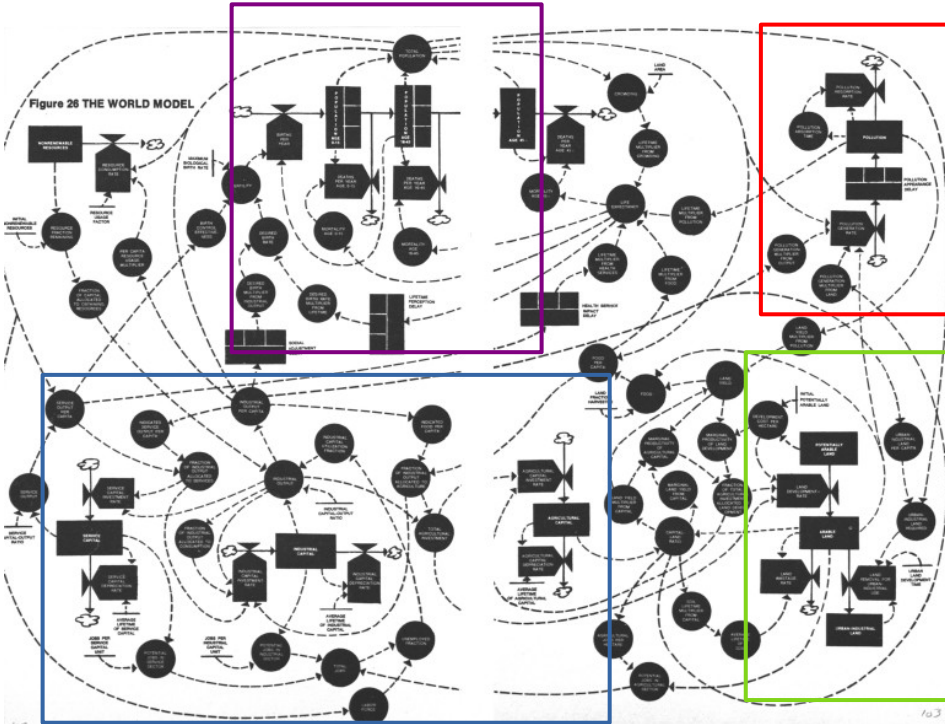


Rediscovering the 70's

System dynamics (J. Forrester, ~ 1950)

Population

Pollution



Capital

Agriculture/Land

Figure 35 WORLD MODEL STANDARD RUN

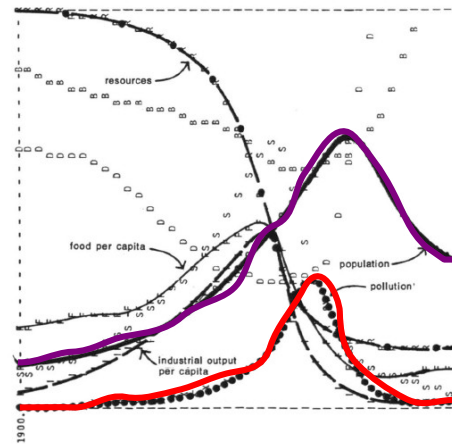
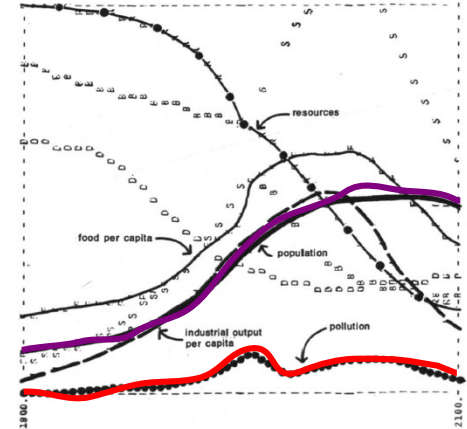


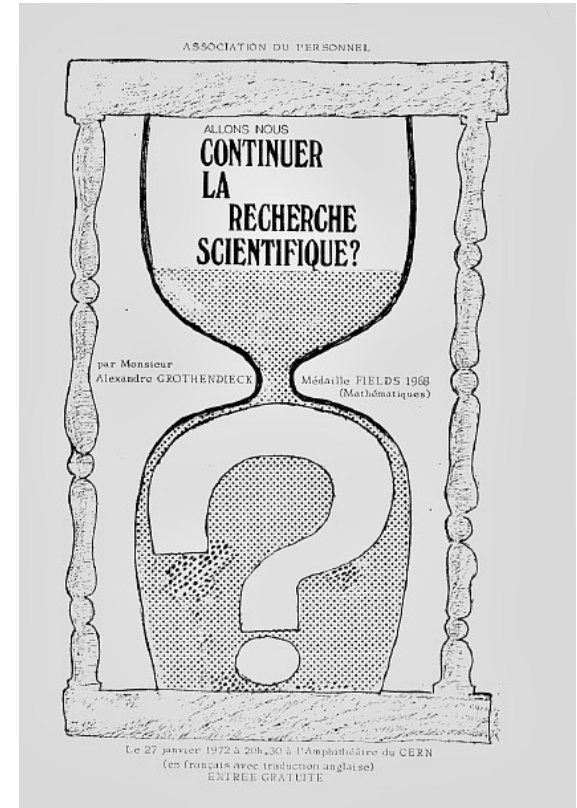
Figure 48 WORLD MODEL WITH STABILIZING POLICIES INTRODUCED IN THE YEAR 2000



Rediscovering the 70's



Rediscovering the 70's



Rediscovering the 70's

'Qu'*une recherche de pointe soit associée à une véritable menace à la survie de l'humanité*, une menace même à la vie tout court sur la planète, ce n'est pas une situation exceptionnelle, c'est une situation qui est de règle. [...]. Je ne veux pas dire par là que la seule cause de tous ces maux, de tous ces dangers, ce soit la science. Il y a bien entendu une conjonction de plusieurs choses ; mais la science, l'état actuel de la recherche scientifique, joue certainement un rôle important.

[...]

Ainsi, depuis un an ou deux, je me pose des questions. Je ne les pose pas seulement à moi-même. Je les pose aussi à des collègues et, tout particulièrement depuis plusieurs mois, six mois peut-être, je profite de toutes les occasions pour rencontrer des scientifiques, que ce soit dans les discussions publiques comme celle-ci ou en privé, pour soulever ces questions. En particulier : « **Pourquoi faisons-nous de la recherche scientifique ?** » Une question qui est pratiquement la même peut-être, à longue échéance du moins, que la question : « Allons-nous continuer la recherche scientifique ? » La chose extraordinaire est de voir à quel point mes collègues sont incapables de répondre à cette question.'

Rediscovering the 70's

'Au début, nous pensions qu'avec des connaissances scientifiques, en les mettant à la disposition de suffisamment de monde, on arriverait à mieux appréhender une solution des problèmes qui se posent. Nous sommes revenus de cette illusion. ***Nous pensons maintenant que la solution ne proviendra pas d'un supplément de connaissances scientifiques, d'un supplément de techniques, mais qu'elle proviendra d'un changement de civilisation.*** C'est en cela que consiste le changement d'optique extrêmement important. Pour nous, la civilisation dominante, la civilisation industrielle, est condamnée à disparaître en un temps relativement court, dans peut-être dix, vingt ou trente ans... une ou deux générations, dans cet ordre de grandeur ; parce que les problèmes que pose actuellement cette civilisation sont des problèmes effectivement insolubles. Nous voyons maintenant notre rôle dans la direction suivante : être nous-mêmes partie intégrante d'un processus de transformations, de ferments de transformations d'un type de civilisation à un autre, que nous pouvons commencer à développer dès maintenant. Dans ce sens, le problème de la survie pour nous a été, si l'on peut dire, dépassé, il est devenu celui du problème de la vie, de la transformation de notre vie dans l'immédiat ; de telle façon qu'il s'agisse de modes de vie et de relations humaines qui soient dignes d'être vécus et qui, d'autre part, soient viables à longue échéance et puissent servir comme point de départ pour l'établissement de civilisations post-industrielles, de cultures nouvelles.'

What are the directions, now ?

- Hard to imagine a post-industrial and anti-science civilisation *à la Grothendieck...*
- Which scale(s) for action ? (local to worldwide)
- What role do scientists play ?
- Which political regime do we wish ?
-

The 6 last years in brief



2018

World Scientists' Warning to Humanity: A Second Notice, Ripple et al + 15.000 scientists

Atecopol Toulouse founded

Appel de 1000 scientifiques

« Face à la crise écologique, la rébellion est nécessaire »



2019

Labos1point5

RENDEZ-VOUS 7

Face à l'urgence climatique, les scientifiques doivent réduire leur impact sur l'environnement

TRIBUNE Un collectif de chercheurs de diverses disciplines, Labos1point5, s'est créé pour promouvoir des pratiques de recherche plus sobres et construire une autre éthique de la recherche.

Après plusieurs semaines de travail, nous avons écrit un manifeste qui appelle à une prise de conscience collective et à une action collective. Nous sommes convaincus que la recherche scientifique a un rôle à jouer dans la lutte contre le changement climatique et que nous devons tous nous mobiliser pour y parvenir.

CETTE TRANSFORMATION NE PEUT AVOIR LIEU QUE SI NOUS SOMMES ENSEMBLE. C'EST POURQUOI NOUS VOUS INVITONS À NOUS REJOINDRE. ENSEMBLE, NOUS POUVONS FAIRE DIFFÉRENCE.

LES SIGNATURES SONT BIENVENUES. CONTACTEZ-NOUS À L'ADRESSE CI-DESSOUS POUR EN SAVOIR PLUS.

LES SIGNATURES SONT BIENVENUES. CONTACTEZ-NOUS À L'ADRESSE CI-DESSOUS POUR EN SAVOIR PLUS.



Round table XR during UICN

2021

Atecopolam founded



CALL FOR SUPPORT LETTERS

We are collecting letters to show our scientist rebels support and solidarity during their imprisonment. Please send letters to sr.prison.mail@gmail.com and include in the subject matter who you are addressing (e.g. "Letter Angelo").

These are the imprisoned scientist rebels: Angelo, Maria, Fernando, Victor, Leonardo, Lorenzo, Agis, Hugo, Sylvain, Joseba, Mate, Marta, Manu, Marceau, Jerome & Nolli.

#LevelWithUs **UNITE AGAINST IMPRISONMENT** scientist rebellion

2022



Geologist R. Abramoff fired from her lab

2023

Scientists on trial Museum histoire naturelle



2024

1st answer : scientist rebellion



Plurality of engagements

DÉBATS · MÉGABASSINES

TRIBUNE

Collectif

« Les mégabassines sont une mal-adaptation aux sécheresses présentes et à venir »

Le déploiement de ces retenues à ciel ouvert menace la préservation de l'eau et freine la transformation de notre modèle socio-économique et de nos modes de vie, affirment dans une tribune au « Monde », des membres du collectif Scientifiques en rébellion.

Publié le 26 mars 2023 à 15h00, modifié le 30 mars 2023 à 11h42 | Lecture 4 min.

Quelle est donc l'utilité réelle des bassines, « greenwashing hydrologique » où l'argent public bénéficie à un petit nombre au détriment de tous les autres ? L'éthique scientifique nous impose de susciter et d'éclairer un débat démocratique, pour que soient prises des décisions collectives à la hauteur des enjeux. Les mobilisations contre les projets de mégabassines nous paraissent légitimes, et les Scientifiques en rébellion estiment nécessaire d'agir pour replacer les débats scientifiques et la gestion des ressources au cœur d'une prise de décision égalitaire entre tous les acteurs.

¶ **Liste des signataires :** Sylvain Kuppel (hydrologie), Odin Marc (géomorphologie), Stéphanie Mariette (génétique des populations), Laurent Lassabatère (hydrologie), Pascal Houillier (médecin, physiologie), Julien Lefèvre (informatique), Lara Elfjiva (anthropologie sociale), tous membres du collectif Scientifiques en rébellion, qui réunit des scientifiques de toutes disciplines, mobilisés contre l'inaction face au dérèglement climatique et à l'effondrement de la biodiversité.

LaProvence.

Contre les énergies fossiles, les labos se rebiffent

Par Delphine TANGUY

Publié le 11/05/23 à 08:39 - Mis à jour le 11/05/23 à 08:39



Hier, des chercheurs marseillais ont mené, au nom du collectif Scientifiques en rébellion, une action de sensibilisation dans une agence bancaire de BNP Paribas, rue Saint-Ferréol.

Photo Georges Robert

Non Violent Civil Disobedience

- « Simple » solution :
 - Targets are obvious (fossil fuel companies...)
 - More and more accepted (~ 50 % of scientists willing to participate, according to <https://osf.io/preprints/psyarxiv/73w4s>)
 - More and more documented and scientifically studied (Bennett et al, Lancet, 2020 ; Racimo et al, Elife, 2022...)
- But :
 - Outside France, risks can be high (R. Abramoff in USA)
 - Requires to be clear with notions such as neutrality
 - Be carefull with authority positioning (same as « merchants of doubts »)

Neutrality and science

- « *As a researcher, the idea of being separated of the real world is just an illusion. I need money for myself, my grants. I belong to a scientific community with issues of influence, power etc. »*
- Realizing the sociological component of science, one can try to identify structuring forces, **values** (= what is desirable or influent in our field) that are **epistemic** or **contextual** and how they can be influenced mutually (see T. Kühn, H. Longino, L. Coutellec).
Examples : preciseness, simplicity, efficiency... (epistemic)
equity, justice, transparency... (contextual)
efficiency can be both (see later)...

Neutrality and science

« *Scientific statements are distinguished from other discourses by the requirement to take account of the facts, without distorting them, which presupposes **being aware of the insidious ways in which our values and interests can bias our view of the world.** This is Weber's ideal of **axiological neutrality.** It therefore concerns the research process itself, centered on fact-finding and analysis. But upstream, Weber acknowledges **the role of values in the selection of problems** deemed worthy of study, and downstream, he recognizes the right of scientists to defend their convictions in the public arena. On the other hand, **it considers that academics should refrain from doing so in the context of their academic activities,** as students do not have the same right to speak as they do. The extent to which we have moved away from this demanding and nuanced concept: by taking for granted the neutrality we're trying to achieve, we are depriving ourselves of the **reflexivity** we need to attain it. »*

A. Berlan, Comment l'idée de neutralité scientifique nous aveugle, 2023

2nd Answer: individual redirection in our field

« It is well known that Information technologies are dematerialized. Computer Science is the future ! »

« We can develop more efficient softwares and machines ! »

« Quantum computing, AI etc will change the game ! »

.... Till I met



POUR UNE INFORMATIQUE ÉCO-RESPONSABLE

Environmental impact of ICT



4 % of global GHG
Rapid increase ~9 % /year

Patterns

CellPress
OPEN ACCESS

Review

The real climate and transformative impact of ICT: A critique of estimates, trends, and regulations

Charlotte Freitag,¹ Mike Bemers-Lee,¹ Kelly Widdicks,^{2,*} Bran Knowles,² Gordon S. Blair,² and Adrian Friday²

¹Small World Consulting, Gordon Manley Building, Lancaster Environment Centre, Lancaster University, Lancaster, Lancashire LA1 4YQ, UK

²School of Computing and Communications, InfoLab21, Lancaster University, Lancaster, Lancashire LA1 4WA, UK

*Correspondence: k.v.widdicks@lancaster.ac.uk

<https://doi.org/10.1016/j.patter.2021.100340>

THE BIGGER PICTURE To avoid catastrophic consequences from climate change, all sectors of the global economy, including *Information Communication Technology (ICT)*, must keep their greenhouse gas (GHG) emissions in line with the Paris Agreement. We examine peer-reviewed estimates of ICT's GHG emissions, which put ICT's share of global GHG emissions at 1.8%–2.8%. We find pronounced differences and much debate concerning the underlying assumptions behind the peer-reviewed studies, which could suggest that global emissions from ICT are as high as 2.1%–3.9%. All study analysts agree that ICT emissions *will not reduce* without major concerted political and industrial efforts, and we provide three reasons for anticipating that ICT emissions are actually going to *increase* without intervention. Our analysis suggests not all ICT carbon pledges are ambitious enough to meet climate targets, and that policy mechanisms for enforcing sector-wide climate target compliance are lacking. Without a global carbon constraint, sector-wide regulations are required to keep ICT's carbon footprint aligned with the Paris Agreement. With a global carbon constraint, ICT would be a greater enabler of productivity and utility, creating opportunity for the sector to be financially successful as a critical part of a global net zero society.

Narratives of ICT's role in climate change

Enablement

ICT allows for efficiency improvements in other sectors and thereby enables emissions savings that are bigger than its own emissions and bigger than any rebound effects.

ICT's net effect is to reduce emissions in the world.

e.g. GeSI

=> Efficiency

Global Jevons Paradox

The efficiency improvements enabled by ICT in other sectors lead to system growth. Rebound effects are larger than the efficiency gains.










ICT's net effect is to increase emissions in the world.

e.g. Sorrell

=> Sobriety

Teaching issues

How to Integrate Environmental Challenges in Computing Curricula?

Authors:  Anne-Laure Ligozat,  Kevin Marquet,  Aurélie Bugeau,  Julien Lefevre,  Pierre Boulet,
 Sylvain Bouveret,  Phillippe Marquet,  Olivier Ridoux,  Olivier Michel [Authors Info & Claims](#)

SIGCSE 2022: Proceedings of the 53rd ACM Technical Symposium on Computer Science Education - Volume 1 • February 2022 •
 Pages 899–905 • <https://doi.org/10.1145/3478431.3499280>

Topics	B1	B3			M1			M2			D	
	HEI6	HEI1	HEI2	HEI7	HEI1	HEI4	HEI7	HEI1	HEI3	HEI5	HEI7	HEI2
<i>Part I - Context</i>												
Environmental issues		x	x	x				x	x	x	x	x
Sustainability frameworks			x	x	x							x
Primary resources				x						x		x
Energy	x	x	x	x			x			x		x
The global economic and production system				x								
ICT Sector: evolution, infrastructure, usages	x		x	x			x		x	x		x
<i>Part II - Understanding: Environmental impacts of ICT</i>												
Direct impacts	x	x	x	x	x	x			x	x		x
Indirect impacts	x		x	x	x	x			x	x		x
Other impacts: geopolitical, social...	x		x	x		x			x	x		
Evolution of the impacts	x				x	x				x		
<i>Part III - Taking action: measuring impacts</i>												
Methodologies			x		x	x						x
Tools and indicators for measuring electrical consumption					x		x			x		
<i>Part IV - Taking action: Towards responsible ICT</i>												
Green IT			x			x	x	x				
ICT standards and labels	x									x		
ICT for Green			x				x	x				
Why and how can organizations integrate ICT's impacts?						x						

Evoked difficulties :

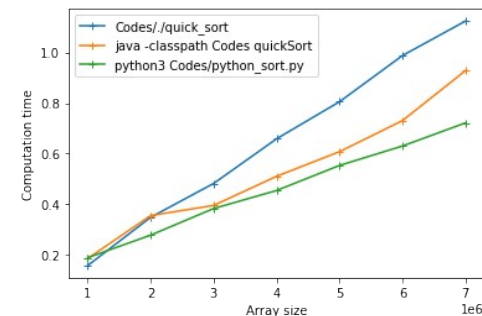
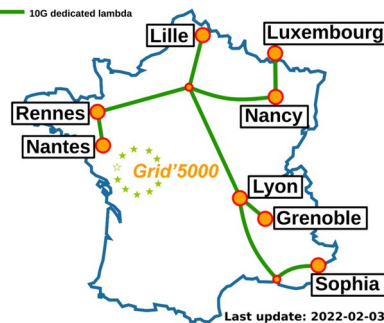
- Legitimacy to teach such subjects
- How to make room in educational program
- What room in educational programs (with societal and ethical) ?
- Teach university staff
- From knowledge to skills

Teaching issues

Introduire les enjeux environnementaux et sociétaux du numérique en L3 informatique

Valentin Emiya^{1,3}, Julien Lefèvre^{2,3}, Frédéric Olive^{1,3},
Pierre-Alain Reynier¹, Corentin Travers¹

Energy consumption



Article reading



LE *MONDE diplomatique*

> Janvier 2019, pages 1, 10 et 11

VOTRE BROSSÉ À DENTS VOUS ESPIONNE

Un capitalisme de surveillance

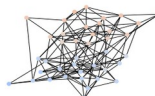
L'industrie numérique prospère grâce à un principe presque enfantin : extraire les données personnelles et vendre aux annonceurs des prédictions sur le comportement des utilisateurs. Mais, pour que les profits croissent, le pronostic doit se changer en certitude. Pour cela, il ne suffit plus de prévoir : il s'agit désormais de modifier à grande échelle les conduites humaines.

PAR SHOSHANA ZUBOFF

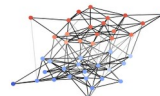
Analyzing the Impact of Filter Bubbles on Social Network Polarization

Uthsav Chitra
Princeton University
uchitra@princeton.edu

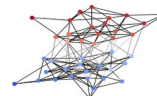
Christopher Musco
New York University
cmusco@nyu.edu



(a) Example synthetic social network graph.



(b) Graph after network administrator changes just 20% of edge weight.



(c) Graph after network administrator changes just 30% of edge weight.

Efficiency vs. Resilience: Lessons from COVID-19

Moshe Y. Vardi

Beyond efficiency*

David H. Ackley

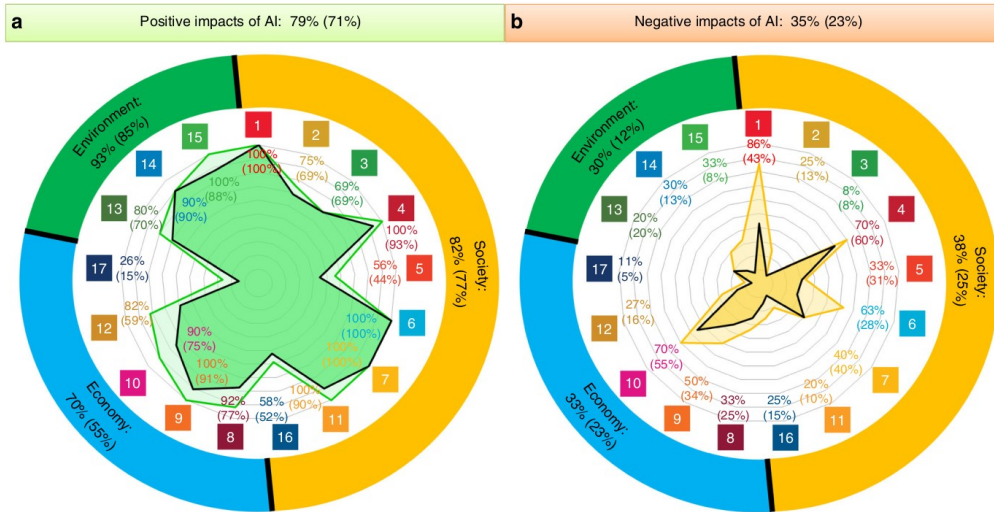
Esteem for efficiency should be tempered with respect for robustness.

AI and/or for environment

Benefits of 'Artificial Intelligence'



Impact of training a large neural network



Vinuesa et al, 2020

Consumption	CO ₂ e (lbs)
Air travel, 1 passenger, NY↔SF	1984
Human life, avg, 1 year	11,023
American life, avg, 1 year	36,156
Car, avg incl. fuel, 1 lifetime	126,000

Training one model (GPU)	
NLP pipeline (parsing, SRL)	39
w/ tuning & experimentation	78,468
Transformer (big)	192
w/ neural architecture search	626,155

Table 1: Estimated CO₂ emissions from training common NLP models, compared to familiar consumption.¹

Strubell et al, 2019

AI and/or environment

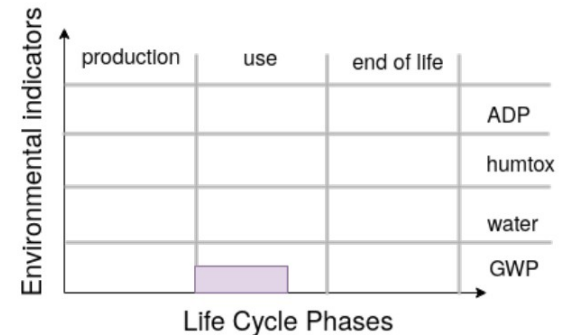
- Litterature in ML/DL suffers from biases (techno-optimism) or ignorance
 - Analysis of ~ 60 articles with applications in transportation, smart cities
 - No mention of negative impacts in terms of GHG emissions
- No clear methodology in the community of AI to assess the pros and cons of a new technology for environment.

Unraveling the Hidden Environmental Impacts of AI Solutions for
Environment Life Cycle Assessment of AI Solutions

by  Anne-Laure Ligozat ^{1,*}  Julien Lefevre ²  Aurélie Bugeau ³  and  Jacques Combaz ⁴ 

AI and/or for environment

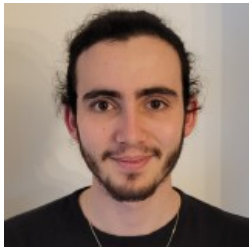
- Impacts need to be more quantified, not only GHG emissions (LCA methodology, ISO 14040)
- Difficulties
 - Lack of data (industrial secret)
 - Hard to anticipate large change
 - Who will decide at the end whether a technology or product need to be deployed ?



Unraveling the Hidden Environmental Impacts of AI Solutions for Environment Life Cycle Assessment of AI Solutions

by [Anne-Laure Ligozat](#)^{1,*}, [Julien Lefevre](#)², [Aur lie Bugeau](#)³ and [Jacques Combaz](#)⁴

AI in the lab



- Summer 2023, 3 months internship by Nathan Lemmers (INSA)
- Several questions :
 - What is the environmental impact of AI in a neuroscience lab ? (quantitative)
 - What is the sociological impact of AI ? (qualitative)
- Underlying hypothesis and long term objectives :
 - We cannot decrease the impacts of a lab through an authoritarian action
 - We may try by engaging all the community in a reflexive approach : understanding individual and collective values, attachments, dependencies...

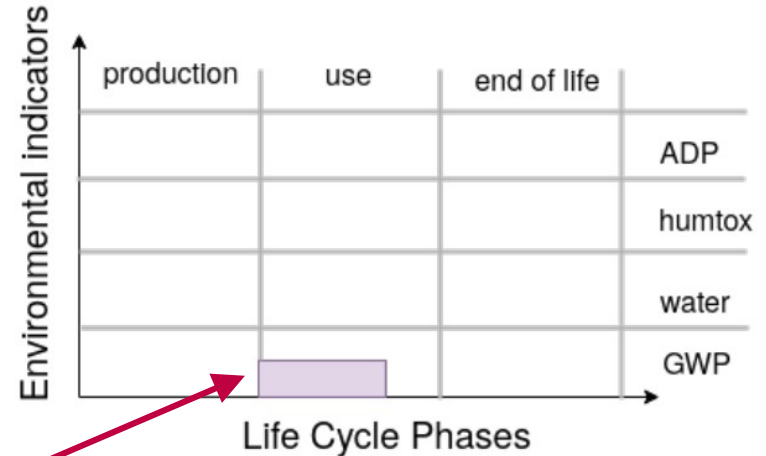
LCA for AI (Machine Learning)

- A lot of unknown impacts

- Several tools for the use phase, **mostly training** :

Code carbon, Eco2ai, Carbontracker, GreenAlgorithm...

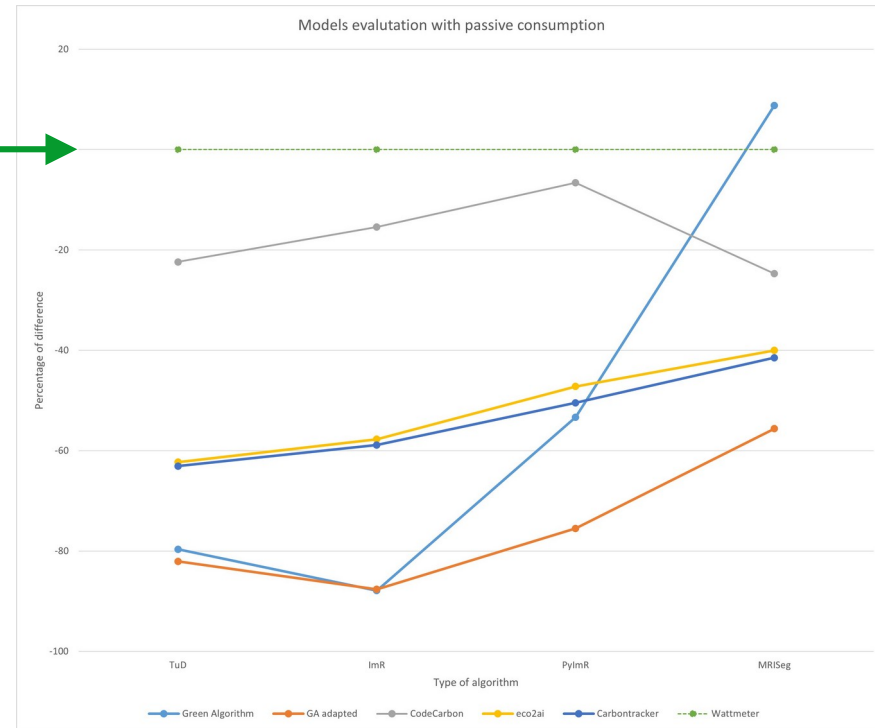
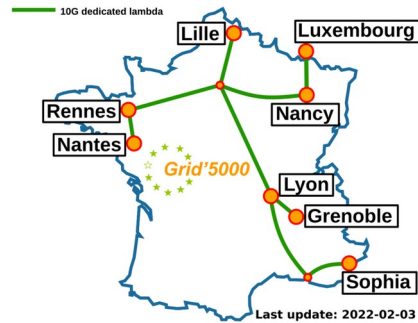
- Methodologies vary (CPU/GPU, proxy of Energy)
- Results vary w.r.t ground truth (physical wattmeters)



Ligozat, Lefevre, Bugeau, Combaz, 2022

Energy consumption (training)

- Comparison of 4 Tools + 1 by Nathan + wattmeters (grid5000)
- 4 algorithms



All the models underestimate passive consumption !

Qualitative study



Marie Jacqué

- 7 semi-directive interviews with AI users
- 3 main axes
 - a) what use ? b) how it changed research activity ? c) what future for AI ?
- 3 main narratives:
 - ecological (“DL consumes a lot of energy”), techno-solutionist (“AI is necessary for health”), ethical (“How to conciliate privacy and openness ?”)
- Values associated to AI, following *Birhane et al, Values encoded in ML, 2022*:
 - performance, efficiency, understanding, useful, open/shareable, few resources...

The Values Encoded in Machine Learning Research

Abeba Birhane*
 abeba@mozillafoundation.org
 Mozilla Foundation & School of
 Computer Science, University College
 Dublin
 Dublin, Ireland

Pratyusha Kalluri*
 pkalluri@stanford.edu
 Computer Science Department,
 Stanford University
 Palo Alto, USA

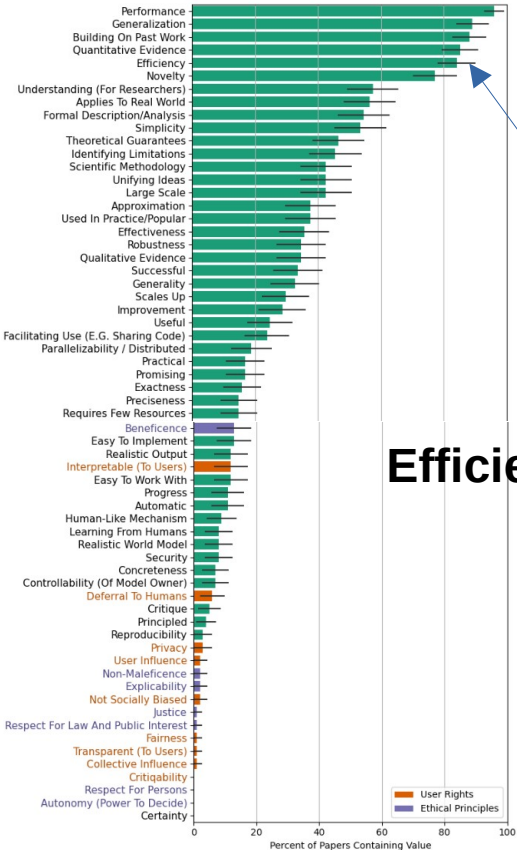
Dallas Card*
 dalc@umich.edu
 School of Information, University of
 Michigan
 Ann Arbor, USA

William Agnew*
 wagnew3@cs.washington.edu
 Paul G. Allen School of Computer
 Science and Engineering, University
 of Washington
 Seattle, USA

Ravit Dotan*
 ravit.dotan@berkeley.edu
 Center for Philosophy of Science,
 University of Pittsburgh
 Pittsburgh, USA

Michelle Bao*
 baom@stanford.edu
 Computer Science Department,
 Stanford University
 Palo Alto, USA

« Machine learning currently exerts an **outsized influence** on the world, increasingly affecting institutional practices and impacted communities. It is therefore critical that we question vague conceptions of the field as **value-neutral** or **universally beneficial**, and investigate what specific **values** the field is advancing. »



Efficiency

- Annotation scheme for studying the values in research articles
- Applied on 100 highly cited papers (ICML, NeurIPS)
- Societal need in 15 % and negative potential in 1 % + 59 values.
- Link between universities and tech companies

- The model uses less of some resource, (e.g., data, energy, label, memory, cost), is fast, or has reduced training time.
- Efficiency is commonly referenced to indicate the ability to scale up, not to save resources.
 - A more efficient inference method allows you to do inference in much larger models or on larger datasets, using the same amount of resources used previously, or more (Jevon's paradox = **rebound effect**).
 - 84% of papers mention valuing efficiency, but **only 15% of those value requiring few resources.**

3rd Answer: collective redirection of our field



How Can Neuroscientists Respond to the Climate Emergency?

Adam R. Aron • Richard B. Ivry • Kate J. Jeffery • ... Robert Schmidt • Christopher Summerfield
Anne E. Urai • Show all authors



FEATURE ARTICLE



POINT OF VIEW

Rethinking academia in a time of climate crisis

Abstract Addressing the climate crisis requires radical and urgent action at all levels of society. Universities are ideally positioned to lead such action but are largely failing to do so. At the same time, many academic scientists find their work impeded by bureaucracy, excessive competitiveness, and a loss of academic freedom. Here, drawing on the framework of "Doughnut Economics," developed by Kate Raworth, we suggest seven new principles for rethinking the norms of scientific practice. Based on these, we propose a call to action, and encourage academics to take concrete steps towards the creation of a flourishing scientific enterprise that is fit for the challenges of the 21st century.

ANNE E URAI* AND CLARE KELLY*

Trends in
**Cognitive
Sciences**

Fast Lane to Slow Science

Uta Frith ¹

nature reviews neuroscience

How neuroscience labs can limit their environmental impact

[Joseph D. Zak](#), [Jenelle Wallace](#) & [Venkatesh N. Murthy](#)

eNeuro

an open-access journal of



THIS ARTICLE

FOR AUTHORS

ALERTS

SUBMIT A MANUSCRIPT

The Neuroscience Community Has a Role in Environmental Conservation

[Joyce Keifer](#) ¹ and [Cliff H. Summers](#) ^{1,2,3}

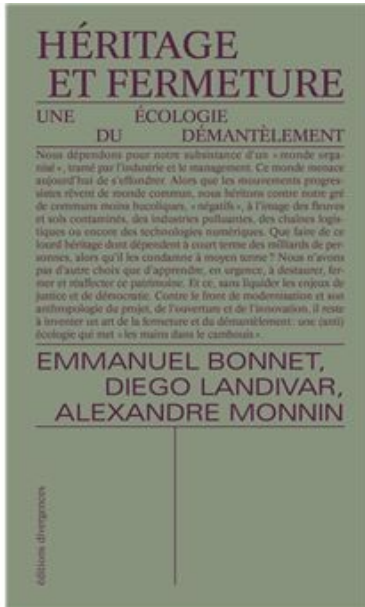
What neuroscience in the Anthropocene Era?



D. Schön

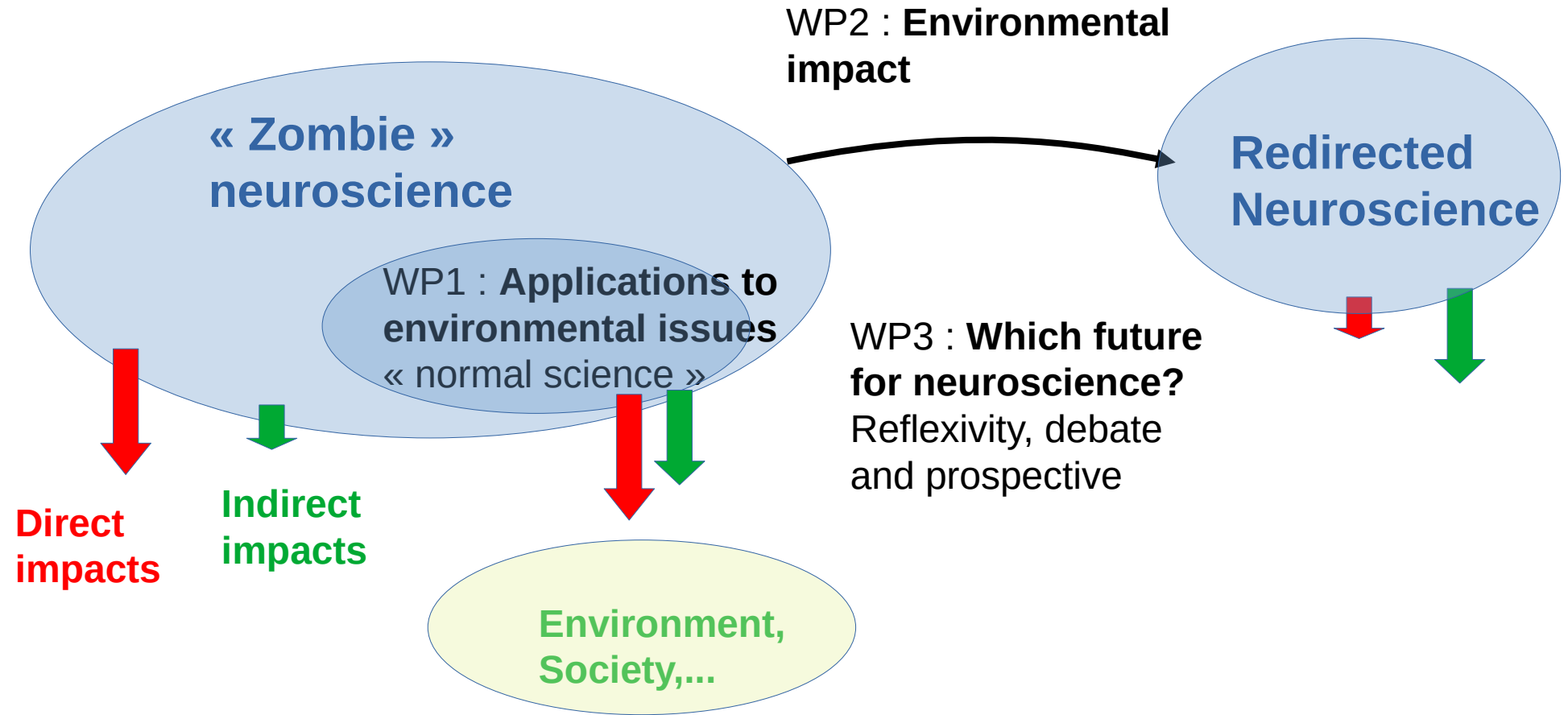


M. Mercier



1. Applications of neuroscience to environmental crisis
2. Decrease the environmental impact of neuroscience
3. Which collective future for neuroscientists ?
Reflexivity, debates

To summarize



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jeudi 18 mai 2023

SOCIÉTÉ

Se réapproprier la production de connaissance

Par **Alexandre Monnin**, **Éric Tannier** et **Maël Thomas**

PHILOSOPHE, BIOLOGISTE ET INFORMATICIEN, PHILOSOPHE

Face à la marchandisation de la recherche scientifique et sa possible mobilisation à des fins destructrices, la science ouverte, aveugle aux conditions d'utilisation des travaux de recherche, est au mieux impuissante, au pire contre-productive. Nous proposons au contraire la définition de communautés se réappropriant les enjeux de la propriété intellectuelle au service de la redirection écologique. Cette construction n'est pas un vœu pieux : elle existe déjà, en tant qu'outil juridique disponible pour tous.tes.

Ethology of Fiedler vector
○○

Perturbations
○○○○○○○

Application 1
○

Application 2
○

Critical discussion
○


5 - Critical discussion

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" The Licensee shall publish an engagement in favor of an **Ecological Redirection** [...]

[It] means that You should have estimated and published a study of Your social and enviromental impacts, along with engagements to transform Your activities toward an integration in an Sustainable functioning of societies and ecosystems."

https://pbil.univ-lyon1.fr/members/tannier/usageright/Results_fr.html

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Merci Trugarez Thank you Danke schön Grazie 谢谢你
Kiitos Gracias اشكرك Graciès متشكروم

L'INT

Guillaume Auzias
Olivier Coulon
Hamed Rabiei
Antonietta Pepe
Amine Bohi
Xiaoyu Wang
Maxime Dieudonné

Neurospin

David Germanaud
Jessica Dubois
Jean-François Mangin
François De Guio
Lucie Hertz-Pannier

Proches collaborateurs

Nadine Girard
Petra Hüppi
Roberto Toro

François Rousseau
Anne Kerachni
Benjamin Fouquet
Oscar Camara
Mireia Alenyà
Michael Dinomais
Mariam Al Harrach

Le groupe ecoinfo Anne-

Laure Ligozat, Aurélie Bugeau,
Jacques Combaz, Jean-
Sébastien Suau, Didier
Mallarino, Denis Trystram,
Sophie Quinton...
... et aussi
Fabrice Flipo
Alexandre Monnin

Unitae Manuel Mercier,
Daniele Schön, Raquel
Bertoldo, Johan Suchier,
Nathan Lemmers

L'atecopolam, Manuel
Mercier, Daniele
Schön, Laurent Perrin,
Myriam Quatrini, Marie
Jacqué, Wolfgang
Cramer, Pierre
Mathieu, Florence Joly,
Dominique Ami, Pierre
Guillon...

L'équipe de l'UE impact du numérique,
Valentin Emiya, Séverine Fratani, Frédéric
Olive, Pierre-Alain Reynier, Corentin
Travers