Mathematical research and its connections to technology, according to Günther Anders.

Ivan Gentil

with the help of Laurent Bétermin and Hadrien Cambazard

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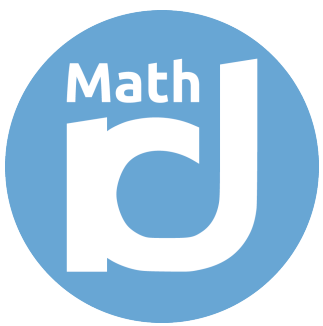


Who am I ?

I'm a mathematician and that is my last result. With Simon Zugmeyer and Louis Dupaigne to appear in Annales de l'Institut Fourier.

We introduced and proved a new model : the spherical optimal Caffarelli-Kohn-Nirenberg inequality

$$\left(\int_{\mathbf{R}^d} |v|^p d\mu_{\mathbf{S}}\right)^{2/p} \leq C\left(\int_{\mathbf{R}^d} \Gamma_{\mathbf{S}}(v) d\mu_{\mathbf{S}} + \frac{n(n-2)}{4}\alpha^2 \int_{\mathbf{R}^d} v^2 d\mu_{\mathbf{S}}\right),$$

with

$$d\mu_{\mathbf{S}} = |x|^{-bp}\left(\frac{2}{1+|x|^{2\alpha}}\right)^n dx.$$

and

$$\Gamma_{\mathbf{S}}(v) = |x|^{2(1-\alpha)}\frac{(1+|x|^{2\alpha})^2}{4}|\nabla v|^2.$$

with many parameters α, b, p, n and d.

Who am I ?

- I'm a mathematician and I'm not a philosopher and I'm not going to become one.
- My goal is very simple : to share my questions with you. Discussions on this subject are often interesting.
- What I am doing is nothing other than *ethical reflexivity*. I remind you, the French oath it has been mandatory since 2023, for all students.
- Nevertheless, I need philosophy to give some answers to my questions.
  When philosophers explain things, it becomes sometimes simpler...
- Finally, this is an invitation to discuss about that questions.

Two questions

I have two simple questions.

- What are my roles in the society like a mathematician ?
- Are the applications of my research compatible with my personal values ?

• Many philosophers worked on this domain, see Lewis Mumford, Ivan Illich, Hannah Arendt, Murray Bookchin, Jacques Ellul, Simone Weil also now Célia Izoard, Harmut Rosa etc.
• We can try to see how mathematics (mathematical research) are reflected in Günther Anders's general concepts.
Günther Anders allows us to view mathematics as a gear (a cog)

in the big machine of technology.
That is a megamachine in the sense of Günther Anders.

Here is the outline of my talk.

1. Who is Günther Anders : his biography and his work.
   - Why is he important ?
   - We'll explore in this talk two key ideas of Anders : megamachines and the Promethean gap.
2. What is technology or technologic system ?
3. What are megamachines according to Anders.
4. A brief conclusion ?

Who is Günther Anders (1902-1992) ?

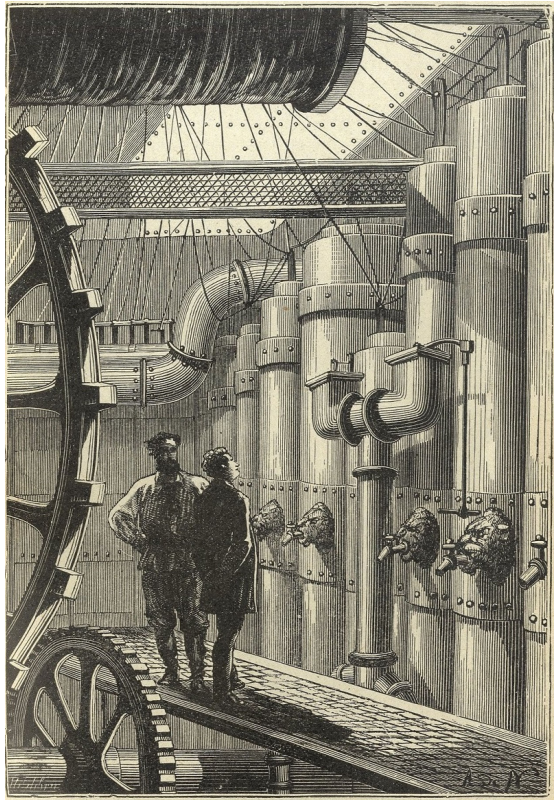
- He left Nazi Germany in 1933 to Paris and then to the US.
- He enjoyed a great freedom of speech ; He as an unfiltered, sometimes even shocking style.
- On August 6, 1945, after the explosion of the Hiroshima bomb, Günther Anders immediately understood *the monstrous nature* of the bomb.
  He draws a somewhat crazy parallel between the atomic bomb and the death camps (Auschwitz), explaining connections between these monstrous machines of human creation, **products of the same division of labor**.
- His major work, *The Outdatedness of Human Beings* (German : Die Antiquiertheit des Menschen).
  He tried to understand the obsolescence of human, linked to the industrial revolutions of the 20th century.
- His thinking is currently at the heart of today's technical challenges, **particularly regarding generative AI.**

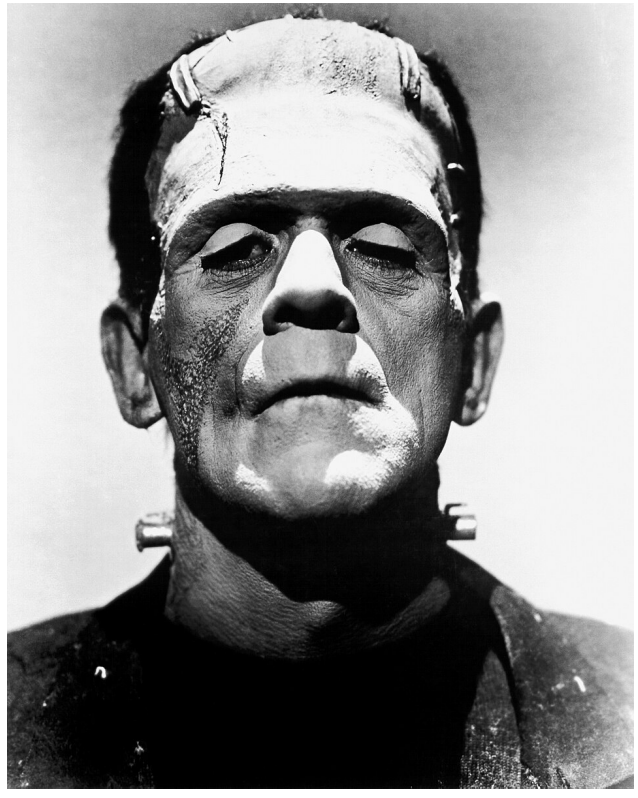
What is a technical system ?

The definition of the technical system is coming from Jacques Ellul, Cornelius Castoriadis or also Lewis Munford.

- Technology is, on the one hand : the totality of material and immaterial objects created by human beings for a **specific purpose**.
- A technical system is **also** *the know-how (the knowledge or the expertise) and the methods*, that is, *the set of all procedures put in place by human beings to* **achieve the ends**.
- **What is the final goal of a technical system ?**
  - A quest for **efficiency** for **performance.**
  - Castoriadis refers to **technical thinking**, or **technical imagination**.
- What about math, then ?

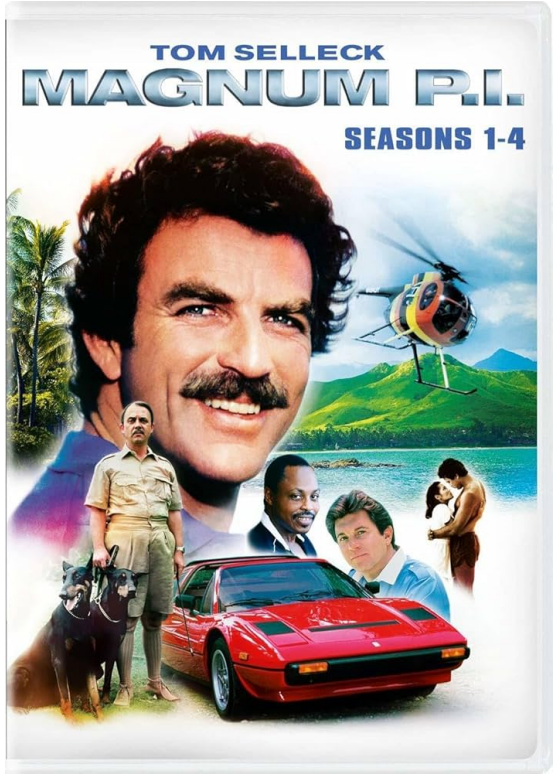
This technical imagination is inspired by **Jules Verne** or **Mary Shelley**





Technologies is everywhere !

In all movies, we can see cars : *Magnum* (1980) and *A Man and a Woman* of Lelouch (1966) !



Megamachines, according to Anders 1/2

We have an infinite loop, as described by Anders.
Megamachine is a *philosophical* concept of the role of technology in our civilizations.
Why technology is everywhere in our world ?
Why is it so difficult to attack or change it ?

- ↪ Roughly speaking, when a technical system becomes bigger and bigger, is becomes a *megamachine*, or even a *hypermegamachine* according to Castoriadis.
- ↪ A new technical system is accepted because it is adapted to the other existing systems.
- ↪ Megamachine seeks *maximum performance and efficiency*.
- ↪ This is a war for the whole world. Megamachine want *to control the world.*
- ↪ According to Anders, megamachines refer *to a colonial and imperialist approach.*

Megamachines, according to Anders 2/2

- ↪ The megamachine is constituted of beings, that are parts of the machine (cogs, gears...)
  Without the beings that compose the megamachine, the megamachine is nothing. But the saddest part is that, conversely, without the machine, the beings are also nothing.
- ↪ We cannot leave the machine.
  The beings are integrated into the machine, or the beings are rejected and in that case, **we become waste, rubbish.**
- ↪ What are examples ?
  - Nazi Germany.
  - A multinational corporation : for instance *the digital world*.
- ↪ Megamachines want to control the world and we don't want to be ejected...

  And so the loop goes on, *technical systems proliferate more and more.*

What about maths and megamachines ?

There are at least 2 megamachines around mathematics.

- The first megamachine is **institutional**. Beings are instituitions (and in France the CNRS, INRIA, INRAE), universities, ERC, researchers, teachers etc. but also publishers (Springer or Elesevier).
  The famous **Publish or Perish**, or have project or perish, or have Phd students or perish...
  Finally, institutions don't care about mathematical problems or results... they need students and projects.
- But there is a more complex megamachine : the megamachine of mathematics itself. Please don't be afraid !

  Axiomatic system, partly based on Bourbaki's group, becomes then an **effective, high-performing research**.

  Finally it generates a megamachine containing all its flaws (defects) : it contains *a colonial and imperialist approach.*

Two remarks on megamachine

- **Are megamachines a problem ?**
  Megamachine exists only through the infinite division of labor.
  - Finally, in a megamachine, people (beings of the megamachines) don't understand what is the purpose of their work. People could work for slavery, for the nuclear bomb, global warming etc. they don't know.
    And this is the main problem of the megamachine.
  - This is one of the problem of maths, maybe the applications are not related to our personal values, for instance generative IA, drones for war, mass surveillance etc.
- **Can we stop a megamachine ?**
  We can try to stop it like in the movie **2001 : A Space Odyssey**.
  In fact, we *can not stop* a megamachine like that.

  Just one example, in the Soviet Union, when the empire exploded, the consequences were terrible and finally, we are still dealing with the effects.

Chaque jour, un nouvel instrument
toujours plus beau sort des automates.
Nous sommes les seuls à avoir été ratés,
les seuls à avoir été créés obsolètes.

Conçus et dépassés
bien trop tôt pour d'obscures raisons,
nous sommes là, alors qu'il est déjà tard,
inadaptés dans ce monde.

Aucune chance pour nous de garder la tête haute
dans la société des choses bien adaptées.
Aux seules choses est permise la confiance en soi,
aux seuls instruments est permise la fierté.

Günther Anders, « Aux engrenages » des Hymnes molussiens.

Anders' algorithm

Günther Anders proposes a quite simple algorithm, to know if your action is *related to your personal values*.

- If I'm working into a megamachin, I can't imagine or fell the effects of my action.
- Related to my own values, I have to choose between three possibilities. I have to review again the effect of my action in order
  - to accept them,
  - to reject them,
  - to attack them.
- I think that the algorithm is not Markovian, and that is a problem.

• **My question : is my mathematical research is well associated to my personal values ?**

What about my research ?

Optimal transport for instance. Let me recall the main steps.

1. Optimal transport was first developed by Monge before the French Revolution.
2. Kantorovich further developed this problem.
3. Major theorems emerged around the year 2000, with work by Brenier and Benamou-Brenier.
4. The community then developed a series of abstract theories ; for instance, a notion of curvature in metric measure spaces. Lott-Sturm-Villani and several schools in Italy and in Germany, etc.
   Results came rapidly, and the theories became robust.
5. And direct applications were proposed. Indeed, the theory of optimal transport allows us to define a distance between two images. **Applications to image identification became straightforward, with uses in medicine, security, mass surveillance, and so on.**
   You have understood, mass surveillance and tyrannical regimes is not associated to my personal values...

- What we did during this talk.
  - What is a technical system.
  - Mathematical research is a technical system and also a *megamachine* in the sense of Anders.
  - The consequences of megamachines are a problem for me especially according to my very own values.
  - This presentation provides me an opportunity to discuss about that, **that is the ethical reflexivity about my mathematical research.**

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Many thanks for your attention.