

2025 Activity Report

RESEARCH CENTRE: Inria Lyon Centre

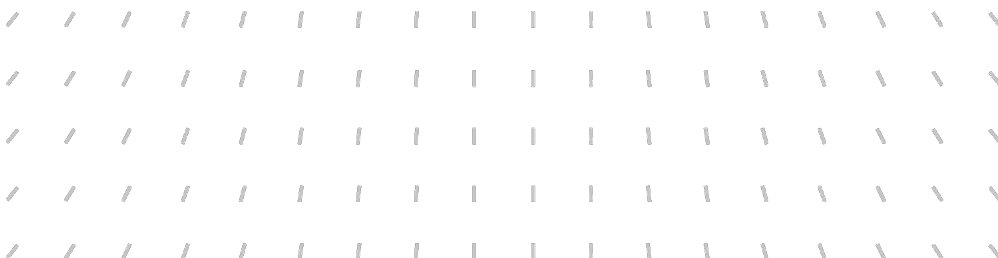
IN PARTNERSHIP WITH: Ecole normale supérieure de Lyon, CNRS

Project-Team

SEMIS

Sciences, Environments, Information, Societies

In collaboration with Laboratoire de Biométrie et Biologie Evolutive (LBBE), Laboratoire de Physique de L'ENS de Lyon



Project-Team SEMIS

Creation of the Project-Team: 2024 December 01

Each year, Inria research teams publish an Activity Report presenting their work and results over the reporting period. These reports follow a common structure, with some optional sections depending on the specific team. They typically begin by outlining the overall objectives and research programme, including the main research themes, goals, and methodological approaches. They also describe the application domains targeted by the team, highlighting the scientific or societal contexts in which their work is situated. The reports then present the highlights of the year, covering major scientific achievements, software developments, or teaching contributions. When relevant, they include sections on software, platforms, and open data, detailing the tools developed and how they are shared. A substantial part is dedicated to new results, where scientific contributions are described in detail, often with subsections specifying participants and associated keywords. Finally, the Activity Report addresses funding, contracts, partnerships, and collaborations at various levels, from industrial agreements to international cooperations. It also covers dissemination and teaching activities, such as participation in scientific events, outreach, and supervision. The document concludes with a presentation of scientific production, including major publications and those produced during the year.

Keywords

Computer sciences and digital sciences

- A3.1. – Data
- A3.1.7. – Open data
- A3.2.1. – Knowledge bases
- A3.2.5. – Ontologies
- A3.3. – Data and knowledge analysis
- A6.3.1. – Inverse problems
- A6.3.3. – Data processing
- A9.16. – Societal impact of AI

Other research topics and application domains

- B1.1.11. – Plant Biology
- B3.1. – Sustainable development
- B3.1.1. – Resource management
- B3.5. – Agronomy
- B3.6. – Ecology
- B3.6.1. – Biodiversity
- B9.1. – Education
- B9.1.1. – E-learning, MOOC
- B9.1.2. – Serious games
- B9.2. – Art
- B9.6.2. – Juridical science
- B9.6.9. – Political sciences
- B9.6.13. – Philosophy of science
- B9.7. – Knowledge dissemination
- B9.7.1. – Open access
- B9.7.2. – Open data
- B9.9. – Ethics
- B9.11.1. – Environmental risks

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1 Team members, visitors, external collaborators

Research Scientists

- Eric Tannier [Team leader, INRIA, Senior Researcher, HDR]
- Stephane Grumbach [INRIA, Senior Researcher, HDR]
- Pablo Jensen [CNRS, Senior Researcher]

Faculty Member

- Philippe Rygiel [ENS Lyon, Professor, from Aug 2025, HDR]

PhD Student

- Sebastien Grappe [INRIA]

Technical Staff

- Thomas Lahaie [INRIA, Engineer, until Sep 2025]

Administrative Assistants

- Sylvie Boyer [INRIA]
- Emilie Gatignol [INRIA]

2 Overall objectives

In a now well-known and controversial article entitled “Do artifacts have politics?”, Langdon Winner [37] details several examples of technologies analyzed not in terms of their effectiveness, i.e., productivity gains or environmental impact, but from the perspective of changes in the organization of the societies in which they are deployed: how **a technology**, whether or not this was intended by its designers or distributors, **gives power and autonomy** to certain actors, while causing others to lose it. This political dimension has been studied by philosophers, sociologists, historians, and economists of technology for several decades. In *Politiques de la Nature* (1998), Bruno Latour makes the entry of scientific knowledge about nature into politics an important, if not essential, dimension of the links between science, the environment, and society, and thus of the exercise of democracy in general in our societies.

Two major forces transforming contemporary societies structure our project.

The first, the **Anthropocene**, and the crossing of several planetary boundaries by industrial societies, redefines the roles of knowledge and technology. The roles they may have played in this overshoot and the role they may play in the possibility of building social organizations whose effects on their environment do not threaten the living conditions of their members.

The second is the spread of **digital technology** and the advent of platform economies. Digital technology is a force that redistributes power in various human activities, some of which, such as food, identity control, and transportation, are strategic sectors for states.

These two forces interact in geopolitical, economic, and social transformations: the circulation of information guides the way in which a society organizes its ecological redirection, preparing for the scarcity of certain resources or the impossibility of using them because of their impact on the environment [31].

We propose two areas of research, both of which incorporate the Anthropocene and digital technology. The first focuses on the digital and agroecological transformation of agriculture, and the second on societies' ability to prepare for the future by integrating the transformative forces at work.

3 Research program

Our two areas of research cut across our work and are structured to encourage discussion and provide general guidance for our specific topics. At the end of each area, we mention planned work involving collaboration between members of the proposed team.

3.1 Agroecology and digital technology

Participants: Eric Tannier, Stephane Grumbach, Sebastien Grappe, Philippe Rygiel.

External Collaborators: Isabelle Piot-Lepetit (INRAE Montpellier, DigitAg), Simon Castellan (Inria, Rennes), Xavier Aubriot, Sophie Nadot (Paris Saclay University), Vincent Daubin (LBBE Lyon), Jos Kafer (ISEM Montpellier), Laure Derail (Tela Botanica), Florian Charvolin (CNRS, Max Weber Center, Lyon), Anne-Laure Fougères (University of Lyon 1), Marie-Thérèse Charreyre (CNRS Lyon).

Funding: PEPR Agro-ecology and Digital Technology (flagships “Cobreeding” and ‘Coeditag’, ANR “Sciences with and for society” Flores, ANR Flowers

The first area of research concerns agricultural production, a field particularly affected by ecological and digital transformations. We will work on two scales: one global, studying the geopolitical effects of the introduction of digital platforms in this strategic field, the other local, at the scale of human communities interacting with plant communities.

3.1.1 Geopolitics of Digital Agricultural Platforms: Current Situation and Future Challenges

Over the past three decades, intermediation platforms have gradually revolutionized the organization of multilateral markets. They initially connect consumers and producers in two-sided markets, handling intangible exchanges, information, and payments, without generally being involved in production [26]. The novelty of these platforms is that they can operate from a remote location, i.e., without geographical boundaries. The largest platforms are unique in history, with billions of users, rapidly reaching the top of market capitalization rankings while profoundly disrupting societies worldwide. They already dominate a large number of sectors such as retail, information, and carpooling, for example, and are on the verge of disrupting other sectors such as healthcare, education, and agriculture.

The introduction of digital equipment on farms is causing changes and reconfigurations in organizations, value chains, sectors, and territories [35]. It is also altering relationships between actors in the agricultural sector and other stakeholders [34]. For example, the use of Climate Fieldview by a growing number of farmers enables accurate and personalized advice by gathering data on soil, environment, weather, previous crops, and available resources to optimize profits.

The rapid integration of intermediation platforms in agriculture is already transforming global food supply chains and systems. The geopolitical implications of these platforms are largely unexplored, representing a critical gap in current academic research. Understanding the geopolitical dimensions is crucial for policymakers, industry players, and international organizations. This research aims to provide an overview of the current situation and future challenges of agricultural intermediation platforms by studying French and German strategies for the digital transformation of agriculture and by articulating the European agricultural strategy with that of other major powers.

Our objectives will be to:

- Study the current geopolitical landscape of intermediation platforms in agriculture, particularly in France and Germany, by linking their strategies to the Common Agricultural Policy (CAP) and comparing them to the strategies of other major geopolitical powers, particularly the United States of America and China.
- Identify and analyze the main challenges and opportunities associated with these platforms.
- Explore Europe’s position relative to other key nations and international organizations in shaping the geopolitics of agricultural platforms.

- Study the potential impact and role of platformization on sustainability, social conditions, agroecology, food crises, etc.
- Develop recommendations for sustainable governance and international collaboration in the sector, which could contribute to the development of a European digital agricultural platform strategy complementary to the Common Agricultural Policy.

On a broader scale, it is important to understand the economic and political roles of platforms, which have developed independently of the agricultural sector but nevertheless provide services to it, and how they impact the markets they supply and change the relationships between actors in these markets [28, 30, 22].

3.1.2 Participatory botanical platform

In *Manières d'être vivant* [32], philosopher Baptiste Morizot defines permaculture (a recent neologism referring to practices similar to agroecology) as an agricultural practice that “requires more design and information, replacing the need for control and domination.” This idea, which we will explore further as a team, is original in several respects. On the one hand, Morizot sees permaculture, a technique that is currently marginal in agricultural production and whose scalability is debated, as one that requires information. And it is true that in permaculture practices, the flow of information is crucial. Environmental measurements are collected by practitioners, exchanges with the biotope are organized on the basis of actions and reactions, and the actors (at least those we have been able to observe, without claiming to be exhaustive or representative) exchange information via dedicated platforms and make frequent use of digital tools. And this despite the fact that the philosophy and economics of permaculture are based on rejecting certain machines that create dependency, alter the landscape in favor of large farms, pollute, and are costly in terms of resources. Another original feature is that Morizot contrasts information with domination and control. While digital tools are sometimes designed or used for the purpose of domination and control, the way seems open for the design of tools that would replace them.

We will explore this idea, which is not self-evident, as many digital techniques are used by industrial agriculture (platforms, robots, sensors, computer-based decision support tools) [26]. However, agroecology certainly makes use of them [35]: for example, attention to the symbiosis between plants, soils, and microbes stems from recent scientific knowledge that owes much to digital technologies. The abandonment of systematic plowing [27], which was an ancestral practice in traditional agriculture, stems from knowledge of soil structure and life, to which bioinformatics has greatly contributed [25].

3.2 Places of anticipation

Participants: Eric Tannier, Stephane Grumbach, Pablo Jensen, Sebastien Grappe, Philippe Rygiel.

External collaborators: Julien Barrier (Triangle, ENSL), Pablo Kreimer (Maimonides University, Buenos Aires, Argentina), Florian Charvolin (Max Weber Center, ENS Lyon and Lyon 2 University), Samir Boumediene (CNRS, ENS Lyon)

In 1984, Pierre Nora published the first milestones of his *lieux de mémoire* [33], which he defined as “cultural landmarks,” geographical places or cultural objects, books, songs, flags, which connect human communities to their past. These “places” help to preserve the memory of communities, connecting them to a past, i.e., the present-day reconstruction of a real or reconstructed past for the needs of present-day society.

Our cross-cutting theme is the application of a kind of temporal symmetry to places of memory. There are cultural landmarks that connect human communities to their future: a school, a science laboratory, a tree seed, speculative fiction, global warming, forward-looking economic or systemic models, foresight workshops, a utopia, a university... We will describe how science and technology influence and are influenced by social representations of the future, and experiment with forward-looking approaches that enable us to understand and construct social representations (future designs, future literacy, three horizons, etc.).

We will detail two possible fields of study.

3.2.1 The roles of knowledge production in the Anthropocene

We seek to understand the co-evolution between generic or local knowledge production systems and social organizations, in order to understand the past role of this production in the advent of the Anthropocene and its future role in building societies that respect planetary boundaries while meeting the needs of populations.

Generic systems allow for long-distance control via long circuits, while local knowledge is mobilized locally in short circuits. From this perspective, the scientific and industrial revolutions could be seen as the gradual establishment of long circuits, both epistemic and material, through the construction of a standardized world in techno-scientific networks [23]. The great acceleration that led modernity to the ecological crisis is said to be the result of the synergy between experimental science and industry, leading to the creation of stable positive feedback loops that allow the world to be sucked in and controlled.

We hypothesize that the distinction between knowledge adapted to short or long circuits is relevant to better understand the changes in knowledge that are currently underway. To return to the example of agriculture, we can distinguish between generic agronomic knowledge, derived from standardized and calibrated practices, and knowledge relevant to agroecology. The former becomes all the more relevant as its fields resemble laboratories, i.e., free of any uncontrolled ecological processes and standardized by inputs, chemical fertilizers, and pesticides [24]. Thus, genes represent knowledge about living organisms that allows them to be stabilized for insertion into long technical, scientific, or industrial networks. Modern genetics was born in the laboratories of the Carlsberg brewery [21], which was seeking to obtain stable yeasts for mass, standardized beer production. Conversely, agroecology, which begins by gathering information from the field itself by observing the processes already at work that are specific to that field, is an example of short-circuit information flow.

The research project of Philippe Rygiel during his year of "delegation" at Inria is also in this scope: "Mutations des données et des modes de mesure et de connaissances XIXe XXe autour des mesures des migrations." (Changes in data, measurement methods, and knowledge in the 19th and 20th centuries concerning migration measurements.)

3.2.2 Prospective initiatives

Science, environment, and society workshops. The workshops are a collective discussion of research questions and their historical and philosophical context [36]. They were launched at Inria in 2021 and have spread widely among science laboratories. We are among the designers and regularly deploy them in various environments. This is an original experiment in dissemination, awareness-raising, and facilitating discussion spaces on the social and environmental consequences of research. It is cited by the ethics committees of the CNRS and INRAE as an interesting way for researchers to address issues of environmental responsibility. Part of our activity will be devoted to enriching the resources of this workshop and improving the mechanisms. Another part, in collaboration with philosophers of science, will be devoted to a study of the effects of this reflective exercise on practitioners of science and technology.

We run several workshops each year, and demand is still strong enough to suggest that this pace will continue over the next four years.

Future designs experiments. "Future designs" are foresight methods invented in Japan that involve bringing the future into an assembly, if possible with deliberative and decision-making powers. One method consists of having future generations represented in the assembly and training certain participants to defend their interests in the decisions made. Another consists of asking the assembly to simulate its counterpart in the distant future and to deliberate on its past (our present).

These mechanisms serve to inform decisions based on long-term interests and to avoid relying on futures that overlook important dimensions, even though we affect or are affected by these dimensions. We will develop and apply these methods to the management committees of public institutions and private companies. We intend to develop these practices, without being sure that there will be an audience for them over the next four years; the outcome will depend on the reactions of the institutions we approach.

4 Application domains

We are involved in several institutional and para-institutional initiatives related to our research topics:

- Organization of "science, environments, society" workshops: several dozen one-day workshops have been organized since 2021, and demand remains high throughout France. An English version was recently launched. These workshops provided an opportunity for discussions with several philosophers of science, some of whom are interested in following the approach.
- Organization of "future designs" workshops at the Insa Lyon management committee
- Coordination of the simple questions factory in Lyon, an interdisciplinary group open to third places of research or associations, to discuss the future of professions and knowledge production activities.
- Leading the "engaged and connected sciences" movement, which brings together a dozen organizations similar to the "simple questions factory" or collectives close to research and committed to ecological redirection.
- Pablo Jensen is in charge of the "ecological transition" project at ENS Lyon
- involvement in the resilience school promoted by the Lyon City Council, a structure welcoming researchers, artists, associations, and city council services with the aim of experimenting with ways to make a living environment resilient.
- Development of an "ecological transition" module with Samir Boumediene of ENS Lyon for all first-year students.

We will thus be able to contribute to the activities of the "think tank" or "do tank" at Inria or the foundation, depending on the needs and sensibilities encountered. The existence of the team will provide an opportunity for Inria to organize its activities to reflect on how the institute is participating in the digital transformation of the world. These reflections already exist in several places, both inside and outside the institute, but perhaps deserve to be brought together or further developed, as they are, for example, at INRAE with the existence of a sociology-economics department [29].

In addition to academic dialogue with the humanities on the transformation of the world into information and planetary limits, the team can be a forum for dialogue with other social components: companies, associations, and collectives involved in the subject. Part of our thinking involves exploring social demand by giving prominence to "simple questions" rather than complex questions arising from epistemology itself or the requirements of industrial production. We therefore intend to conduct part of our research activity in contact with the public, making use of open spaces in the city shared with associations, collectives, and local businesses.

5 Social and environmental responsibility

5.1 Footprint of research activities

Pablo Jensen is in charge of ecological transition at ENS Lyon. In the scope of this activity, he assesses the ecological footprint of ENS, organizes regular seminars on ecological transition.

5.2 Impact of research results

The impact of research results is a central component of our research agenda. In this scope, we regularly organize workshops (ateliers SEnS) dedicated to the collective reflection and strategy regarding these impacts.

6 Highlights of the year

2025 marks the first year of existence of the SEMIS project-team, officially born in December, 2024. A major highlight of the year was the formal establishment of the team and the consolidation of its interdisciplinary research programme.

We welcome Philippe Rygiel, professor at ENS Lyon, as a member of the team, for a "delegation" academic year.

7 Latest software developments, platforms, open data

7.1 Latest software developments

7.1.1 plantinator

Name: plantinator

Keywords: Data management, Algebraic Data Types, Decision

Functional Description: Plantinator is a database management software for morphological data about plants as well as automatic identification key generator

URL: <https://botascopia.inria.fr>

Contact: Simon Castellan

7.1.2 bioindication

Name: Bioindication

Keywords: Environment perception, Agroecology

Functional Description: Bioindication is a web platform designed to facilitate the reading of the landscape by users: identification of species living in a space, calculation of biodiversity indices, location, indicator values, suggestions of species or varieties to cultivate.

Release Contributions: First version

News of the Year: Bioindication is regularly used in its educational version, in two licence modules at Insa-Lyon. This involved around 20 teachers and several hundred students.

URL: <http://bioindication.com>

Contact: Eric Tannier

Participants: Arnaud Tilbian, David Parsons, Eric Tannier, Damien De Vienne, Jean-Sebastien Beaulne, Christophe Rigotti, Hugo Daudey, Julien Barnier, Simon Penel

7.2 New platforms

Participants: Eric Tannier.

- Bioindication is released as a participatory platform bioindication.com and an [educational version](#) has been released to be used by teachers at Insa Lyon.
- Botascopia botascopia.inria.fr is a participatory platform containing a database, an editor for citizen science filling, and the software Plantinator.

7.3 Open data

We participate in the Botascopia database botascopia.inria.fr which is a participatory base of morphological traits of plant species.

We also participate in a reflection on the open science licensing, related to the necessity of the control and sovereignty of data, in collaboration with the CIS (centre internet sociétés).

8 New results

8.1 Complexity of the law

Participants: Stéphane Grumbach.

Human societies are confronted with a surge of complexity. Interdependencies between increasingly remote phenomena multiply, the pace of change accelerates, volatility as a consequence increases. Governing becomes much more challenging, and so does designing laws. Not surprisingly, legal systems, in an attempt to cope with escalating difficulties, expand rapidly and sometimes tend to become more complex themselves, so potentially less predictable. Historically, complexity increase is addressed by processing more information, with increasingly detailed knowledge of increasingly many things, while monitoring increasingly many interactions. The all-embracing growth of the digital reveals the depth of the current evolution. Global digital platforms orchestrate multi-sided markets worldwide. The difficulty for humans to catch up is paralleled by the emergence of autonomous algorithmic systems which process information beyond human capacities. Legal systems dynamically adjust to the evolution of societies, but the current evolution might induce a philosophical transformation. Law enforcement is based on knowledge of facts. The amount of accessible data is a game changer, for it allows to personalize how individuals are to be considered. In addition, the complexity of both the data and the rules reduces their accessibility to human understanding, thus favoring the delegation of juridical activities to algorithmic processing. [11]

8.2 Reinventing Governance in a Volatile World

Participants: Stéphane Grumbach.

We contributed to the co-authored book *Reinventing Governance in a Volatile World* addressing public governance worldwide, identifying challenges and innovative ways to improve the lives of those governed. [10]

Based on their work on the Governance Cluster of the international think-tank Global Forum/Shaping the Future, the authors analyse successful strategies and key findings that help governments and institutions promote engagement and involve a broader set of stakeholders in decisions and governance, as well as the place of technology in its proper role as a supporting instrument. The book addresses crucial issues such as the depletion of trust and democracy at the global level, governance of the environment, the crisis of leadership, sovereignty concerns over the Internet and artificial intelligence (AI) and the need for behavioural change for greater sustainability. It provides tools and illustrative case studies for governance actors, including engagement mechanisms and arguments for action.

The book's primary audience includes governments, policy analysts, civil society bodies/NGOs and other national and international actors involved in public governance. It is also of interest for students and researchers of political science, public administration, governance and management and international relations.

8.3 Néolibéralisme et intelligence artificielle : une même vision du monde ?

Participants: Pablo Jensen.

We participated in the writing of the collective book *Penser l'intelligence artificielle – Enjeux philosophiques, politiques et culturels de l'automatisation numérique* by writing a chapter entitled "Néolibéralisme et intelligence artificielle : une même vision du monde ?" [13]

8.4 Detecting global financial crises with scarce data by multivariate nonlinear filtering

Participants: Pablo Jensen.

An original procedure was devised for the automated detection of global financial crises from multivariate databases of share prices. It consists of: i) the construction of time series from the time-windowed estimations of crisis relevant information (cross-correlations or volatilities); ii) the piecewise-linear filtering of times series by nonlinear filtering, achieved by nonsmooth proximal minimization implemented by an efficient iterative algorithm; iii) the estimation of a reassigned time in each window; iv) the detection of crises and estimation of their intensities by exploiting the multivariate structure of denoised time series. Applied to a world dataset of 32 indices over 6 decades, this original model based procedure detects all major crises from the reference lists. It also permits to devise a typology in reference to an archetypal financial crisis. It is automated, data-driven and reproducible notably for the analysis of financial crises over history, or contemporary crises on worldwide databases, via a novel toolbox. Finally it is robust to scarce, incomplete and noisy data. [5]

8.5 Simple model for the transition from local to centralized production

Participants: Pablo Jensen.

We devised a simple model of a crucial phenomenon in modern societies: The shift from local to centralized production, leading to economies of scale and mass production transported over long-distance networks. Agents combine two distinct (and limited) resources, time and raw materials, either to produce for self-consumption or to sell on the market. The model shows a rich landscape of diverse production regimes, including mixed regimes where agents optimize utility by combining time spent working for the market, for self-subsistence, or by taking time off. [6]

8.6 The *Silene latifolia* genome and its giant Y chromosome

Participants: Eric Tannier.

We participated to a consortium studying the sex chromosomes of *Silene latifolia*, a dioic flowering plant, and an article was published in *Science* in 2025 [7].

8.7 From the doctoral oath of scientific integrity to a personal oath: a writing and reflection workshop on the responsibility and role of scientists in society

Participants: Eric Tannier.

We have developed a workshop on the doctoral oath of scientific integrity and writing a personal oath, intended for doctoral students and, more generally, research staff. The workshop has been offered since 2025 as training in research ethics in a number of doctoral schools in France. Using an original approach, it examines several aspects of research practice and its social and environmental challenges: the responsibility of scientists, commitment, the role of science in the Anthropocene, and the place of ethics and integrity in doctoral studies and science in general. [17]

9 Partnerships and cooperations

Participants: Pablo Jensen, Stéphane Grumbach, Eric Tannier.

9.1 International research visitors

Research stays abroad Stéphane Grumbach has visited several universities in Japan, China, Corea, Italy in April-June 2025.

9.2 National initiatives

- Eric Tannier participated in ANR Flores 2024-2025 as the scientific referent for Inria Lyon.
- Eric Tannier participated in ANR Flowers 2025-2029 as the scientific referent for Inria Lyon (Flores and Flowers are two distinct ANR projects)
- Philippe Rygiel participated in the ANR Exo-Popp (Extraction optique d'entités nommées manuscrites sur les actes de mariage de la population de Paris, 1880-1940)
- Stéphane Grumbach and Eric Tannier and Sebastien Grappe participated to the PEPR Digital Agroecology (projects Coeditag and Cobreeding)

9.3 Regional initiatives

Eric Tannier was co-head of a ShapeMed project, university of Lyon, with Anne-Laure Fougères

9.4 Public policy support

- In collaboration with the City of Lyon, Eric Tannier and Pablo Jensen contributed to the development of an “École de la Résilience” (School of Resilience), with a proposed location in the former École des Beaux-Arts building on rue Neyret. In 2021, prior to the creation of Semis, Pablo Jensen and Stephane Grumbach initiated a call for the creation of such a space. This initiative was subsequently taken up by the municipality, which mandated the association Cité Anthropocène to lead its prefiguration phase. The project is included in the 2025-2026 prefiguration programme and will involve several public events focusing on botany and futures studies. One of the botany-related events brought together the École des Beaux-Arts, local community centres, and various associations, around our software Plantinator and platform Botascopia.
- Philippe Rygiel is currently conducting a CIFRE doctoral thesis in partnership with Le Rize (Villeurbanne), focusing on the history of the Maison du Peuple.
- Stéphane Grumbach and Sebastien Grappe are contributing to the Erasme-Descartes Conference on food sovereignty, organised with the support of the French Embassy in the Netherlands, the Institut français in the Netherlands, and the Kingdom of the Netherlands. The conference is scheduled to take place on 27 November 2025.
- Stephane Grumbach is a member of the “GÉODE” team, which has been awarded the label Centre of Excellence in International Relations and Strategy by the French Ministry of the Armed Forces. In this capacity, he has previously taken part in meetings with defence stakeholders, although not in the most recent period.
- Eric Tannier took part in a seminar organised by the Diplomatic and Consular Academy, an institution under the French Ministry for Europe and Foreign Affairs. This participation was occasional and limited to a single event.
- Eric Tannier has submitted to a ShapeMed call a research project, as a co-leader with the "service de santé de la mairie de Villeurbanne" as a partner.

10 Dissemination

10.1 Promoting scientific activities

10.1.1 Scientific events: organisation

Member of the organizing committees

- Pablo Jensen was a member of the organizing committee of "Future Earth", international conference, Nantes, June 2025.
- Eric Tannier co-organised and facilitated, together with Matteo Barsuglia, of a residency entitled "Which Sciences for Which Futures", hosted in Arles during the *Agir pour le vivant* festival in August 2025 and funded by the CNRS.
- Philippe Rygiel was a member of the organizing committee of the congress "Migrer en dehors des sentiers battus", Nice, décembre 2025.

10.1.2 Scientific events: selection

Member of the conference program committees

- Philippe Rygiel is network chairman of the European Social Sciences History Conferences.

10.1.3 Journal

Member of the editorial boards

- Pablo Jensen is the director of the collection "Mutations" of the ENS Lyon editions.
- Philippe Rygiel is funding editor of The Journal of Migration History.
- Philippe Rygiel is chief editor of the Palgrave Series on Migration History.
- Philippe Rygiel is member of the editorial board of "Mouvement Social".
- Eric Tannier is a recommender for PCI Evolutionary Biology and PCI Mathematical and Computational Biology.

Reviewer - reviewing activities We were reviewers for *Physical Review Letters*, *Scientific Reports*, *Peer Community Journal*

10.1.4 Invited talks

- Pablo Jensen "Imaginaires et transition de la recherche", **5ème journée David Claessen pour l'Environnement** - 10 avril 2025, ENS Paris
- Stephane Grumbach: "Infrastructures and Dataspaces for Citizens: Agritech, Food Logistics" Keynote12 Global Forum / Shaping the Future, Madrid, October 2025.
- Stephane Grumbach: "EU Food sovereignty, A driver for sustainability, competitiveness and resilience." 23rd Erasmus Descartes Conference, A Franco-Dutch Dialogue, Rotterdam, November 2025.
- Eric Tannier led reflective and forward-looking workshops within the research community during the launch day of the debate-based game "Digital Technologies and the Environment", organised by the French Ministry of Higher Education and Research, on 6 November 2025.
- Eric Tannier contributed to the seminar "Social Transformations Driven by Digital Technologies", organised by the Diplomatic and Consular Academy at emlyon business school, on 14 November 2025.
- Eric Tannier delivered a seminar entitled "Rebound Effects in Bioinformatics" at Inria Bordeaux, as part of the SED seminar series, in October 2025.

- Eric Tannier took part in an intervention at Lumière University Lyon 2 as part of the “Stand Up for Science” events, in 2025.
- Eric Tannier gave a presentation entitled “The Resurrection of a Prehistoric Wolf” at the Centre d’Étude du Vivant in Paris, in February 2025.
- Philippe Rygiel has given the keynote speech at Crime, Surveillance and mobilities in the Atlantic, 19th and 20th century, Iscte-Insituto Universitario de Lisboa, Keynote speech, 10,11 12 September 2025, "Extradition and the Public: Press-Made Publicness in the Long Nineteenth Century. A data-driven distant historical reading of journals newspapers, and discourses.
- Philippe Rygiel has given an invited talk at the « Structuration et analyse de la donnée historique Seminar », Paris I, 21 novembre 2025, "Quality of historical data".

10.1.5 Scientific expertise

- Stephane Grumbach is a member of the Board of Trustees, NEXA Center for Internet and Society, Torino.
- Stephane Grumbach is a member of the Advisory Board of the Global Forum Shaping the Future.
- Eric Tannier was an expert of the European Union programme "Marie Curie".
- Philippe Rygiel is an expert of the European Research Council, for the Research foundation Flanders (FWO), and for the Centre National de la Recherche Helvétique and for Fullbright.

10.1.6 Research administration

- Pablo Jensen is a member of the CID53 CNRS.
- Pablo Jensen is in charge of the mission "transition" at ENS Lyon.
- Pablo Jensen and Stephane Grumbach are members of the executive committee of IXXI Lyon.
- Eric Tannier and Philippe Rygiel have been members of the Scientific Advisory Board of IXXI Lyon since 2024.
- Eric Tannier has been a member of the Site-Specific Specialised Committee (Formation Spécialisée de Site – FSS) at the Inria Lyon Centre since 2023, serving as a staff union representative.
- Philippe Rygiel is the leader of the "Organisation de la session 2027 de l’European Social Sciences History Conférence" gathering four labs at ENS Lyon.

10.2 Teaching - Supervision - Juries - Educational and pedagogical outreach

10.2.1 Teaching

- Pablo Jensen gives 20h of lectures per year in the master M2 "Modélisation des Systèmes complexes".
- Stephane Grumbach gives 10h teaching at ENS Lyon.
- Stephane Grumbach gives lectures on geopolitics and digital technologies at CHELS, Cycle master diplomatie Asie.
- Eric Tannier teaches research Ethics for M2 Bioinformatics at University of Lyon 1 (8h).
- Eric Tannier teaches research ethics at University of Lyon for doctoral studies (16h).
- Philippe Rygiel teaches the M2-level course « Migration and citizenship Law » at ENS Lyon (~ 30h).
- Philippe Rygiel supervises a teaching module in the CHELS on transitions : "Transformations des mobilités et des circulations".

10.2.2 Supervision

- Stéphane Grumbach and Philippe Rygiel supervise the PhD thesis of Sébastien Grappe.
- Eric Tannier has supervised Thomas Lahaie as a software engineer.
- Philippe Rygiel supervises four PhD theses (in addition to the one of Sébastien Grappe) and one Marie-Curie post-doctoral researcher.

10.2.3 Educational and pedagogical outreach

- Eric Tannier participated in a test of the serious game "Digital technologies and environment" at collège Gabriel Rosset (3e).
- Eric Tannier organised botanical events for the centre social du Tonkin (5e-3e).
- Eric Tannier facilitated a workshop entitled "Cultures of the Futures" for the conference "Neurosciences of Tomorrow" in Marseille, in October 2025.
- Eric Tannier contributed to the MOOC on Research Ethics in 2018-2019, which is still used by thousand of doctoral students every year.

10.3 Popularization

10.3.1 Specific official responsibilities in science outreach structures

- Pablo Jensen and Eric Tannier are members of the scientific committee of the Lyon science shop (boutique des sciences).
- Pablo Jensen is the main animator of the "Fabrique des Questions Simples", of which Stéphane Grumbach and Pablo Jensen are both founding members.
- Stéphane Grumbach is a member of the team "Geode, Géopolitique de la Datasphère", Paris.

10.3.2 Productions (articles, videos, podcasts, serious games, ...)

- Philippe Rygiel has served as one of the historical advisors for the « Emigrés européens, des histoires oubliées », Arte, octobre 2025.
- Eric Tannier co-authored a popular science book "L'univers des courges" on permaculture, cooking, and nutrition, in collaboration with Marie-Thérèse Charreyre (CNRS), Christophe Gaudry (farmer), and Estelle Petit (Institut Lyfe, former Institut Bocuse, an research institute on culinary arts). The book is scheduled for publication by L'Harmattan in February 2026.
- Eric Tannier produced a popular science podcast for [Interstices.info](https://www.interstices.info) presenting the results of the ANR Evoluthon project, which he coordinated, in 2025.
- Eric Tannier served as scientific advisor for a debate-based educational game on the environmental footprint of digital technologies, developed in partnership with Inria and the association L'Arbre des Connaissances. The game was released on 6 November 2025 and tested with students from Gabriel Rosset middle school (Lyon 7th district).

10.3.3 Participation in Live events

- Eric Tannier took part in a round-table discussion on artificial intelligence during the Fête de la Science, in October 2025.
- Eric Tannier contributed to botanical field outings and public events centred on an automatically generated plant identification key (Botascopia), developed in collaboration with social centres in Lyon and Villeurbanne, the École des Beaux-Arts de Lyon, the City of Lyon, the Cité Anthropocène association, and the Croix-Rousse urban farm.

- Eric Tannier participated in a round-table discussion organised by the Shifters association in connection with a film screening, on 22 November 2025.
- Eric Tannier contributed to a participatory public event entitled “The Garden of Simple Questions” during the Agir pour le Vivant festival in Arles, in August 2025.
- Eric Tannier facilitated a workshop in Crest (Drôme) in March 2025 on indicators of shared health, organised with the Biovallée association, targeting health professionals, elected officials, and members of civil society organisations.
- Eric Tannier delivered a public lecture during France Design Week in Lyon on low-tech approaches and computing, in September 2025.
- Eric Tannier gave a public lecture at the Dialogues en Humanité event in Lyon (Parc de la Tête d’Or) on bioindicator plants, in July 2025.
- Eric Tannier delivered a public lecture at the Université Ouverte de Lyon entitled “The Role of Research in the Anthropocene”, in March 2025.

11 Scientific production

11.1 Major publications

- [1] S. Albert, J.-E. Aubert, S. Grumbach, J. Millard and P. Wormeli. *Reinventing Governance in a Volatile World*. 1. Routledge, 14th Feb. 2025. DOI: [10.4324/9781003510666](https://doi.org/10.4324/9781003510666). URL: <https://hal.science/hal-05004207>.
- [2] S. Castellan, J. Käfer and E. Tannier. ‘Back to the trees: Identifying plants with Human Intelligence’. In: LIMITS 2023 - Ninth Workshop on Computing within Limits. Virtuel - Online, France: LIMITS, 2023, pp. 1–11. DOI: [10.21428/bf6fb269.265c52ce](https://doi.org/10.21428/bf6fb269.265c52ce). URL: <https://hal.science/hal-04121511>.
- [3] S. Grumbach. *L’Empire des Algorithmes*. 18th May 2022. URL: <https://inria.hal.science/hal-04013718>.
- [4] P. Jensen. *Deep Earnings : le néolibéralisme au coeur des réseaux de neurones*. 3rd May 2021. URL: <https://hal.science/hal-03432456>.

11.2 Publications of the year

International journals

- [5] C. Bastidon, A. Parent, P. Abry, P. Borgnat, P. Jensen and B. Pascal. ‘Detecting global financial crises with scarce data by multivariate nonlinear filtering’. In: *Journal of Physics: Complexity* 6.3 (18th July 2025), p. 035003. DOI: [10.1088/2632-072X/ade948](https://doi.org/10.1088/2632-072X/ade948). URL: <https://hal.science/hal-05234050> (cit. on p. 12).
- [6] G. Benito-Calvino and P. Jensen. ‘Simple model for the transition from local to centralized production’. In: *Physical Review E* 111.3 (14th Mar. 2025), p. 034307. DOI: [10.1103/PhysRevE.111.034307](https://doi.org/10.1103/PhysRevE.111.034307). URL: <https://inria.hal.science/hal-04993734> (cit. on p. 12).
- [7] C. Moraga, C. Branco, Q. Rougemont, P. Veltsos, P. Jedlička, A. Muyle, M. Hanique, E. Tannier, X. Liu, E. Mendoza-Galindo et al. ‘The *Silene latifolia* genome and its giant Y chromosome’. In: *Science* 387.6734 (6th Feb. 2025), pp. 630–636. DOI: [10.1126/science.adj7430](https://doi.org/10.1126/science.adj7430). URL: <https://hal.science/hal-04293712> (cit. on p. 12).
- [8] E. Tannier, T. Tricou, S. Benali and D. de Vienne. ‘HGTs are not SPRs: In the presence of ghost lineages, series of Horizontal Gene Transfers do not result in series of Subtree Pruning and Regrafting’. In: *Molecular Biology and Evolution* 42 (2nd June 2025), pp. 1–6. DOI: [10.1093/molbev/msaf128](https://doi.org/10.1093/molbev/msaf128). URL: <https://hal.inrae.fr/hal-05105493>.

Conferences without proceedings

- [9] P. Rygiel. ‘Extradition and the Public: Press-Made Publicness in the Long Nineteenth Century. A data-driven historical reading of journals newspapers, and discourses’. In: *Crime, Surveillance and mobilities in the Atlantic, 19th and 20th century*, Iscte-Instituto Universitario de Lisboa, Keynote speech, 10,11 12 september 2025. Lisbonne, Portugal, 10th Sept. 2025. URL: <https://hal.science/hal-05454688>.

Scientific books

- [10] S. Albert, J.-E. Aubert, S. Grumbach, J. Millard and P. Wormeli. *Reinventing Governance in a Volatile World*. 1. Routledge, 14th Feb. 2025. DOI: [10.4324/9781003510666](https://doi.org/10.4324/9781003510666). URL: <https://hal.science/hal-05004207> (cit. on p. 11).

Scientific book chapters

- [11] S. Grumbach. ‘The Complexity of the Law — Empowered Machines, Singularized Humans’. In: *Il valore del dissenso. Riflessioni con Vincenzo Zeno-Zencovich*. Roma Tre Press, 2025. URL: <https://hal.science/hal-05310214>. In press (cit. on p. 11).
- [12] S. Grumbach and C. Zanin. ‘Intermediation Platforms and Geopolitical Asymmetries, Lessons from a Pandemic’. In: *The Elgar Companion to the Geopolitics of Digital Sovereignty*. Edward Elgar, May 2026. URL: <https://inria.hal.science/hal-05310047>. In press.
- [13] P. Jensen. ‘Néolibéralisme et intelligence artificielle : une même vision du monde ?’ In: *Penser l’intelligence artificielle : Enjeux philosophiques, politiques et culturels de l’automatisation numérique*. 2025. URL: <https://hal.science/hal-05452270> (cit. on p. 11).
- [14] P. Rygiel. ‘Extradition and the Rights of Foreigners in Late Nineteenth-Century Europe’. In: *Indesiderabili. Politiche e pratiche di selezione e criminalizzazione dei migranti*. Il Mulino, 2025, pp. 63–90. URL: <https://hal.science/hal-05454424>.
- [15] P. Rygiel. ‘Immigration and emigration’. In: *Nouvelle histoire de la France. Passés composés*, 2025, pp. 265–277. URL: <https://hal.science/hal-05454443>.
- [16] P. Rygiel. ‘Polish Presences in France from the Late Ancien Régime to the First World War’. In: *En Pologne c’est à dire nulle part. La Pologne et les Polonais dans la culture française après les partages (1795-1918)*. Champs vallon, 2025. URL: <https://hal.science/hal-05454395>.

Reports & preprints

- [17] M. Barsuglia, A. Bérard, V. Daubin, P. Delva and E. Tannier. *Du serment doctoral d’intégrité scientifique à un serment personnel : un atelier d’écriture et de réflexion sur la responsabilité et le rôle des scientifiques dans la société*. 20th Dec. 2025. URL: <https://hal.science/hal-05427594> (cit. on p. 12).
- [18] J.-S. Beaulne, A.-L. Fougères, B. Mellouet-Fort and E. Tannier. *Santés en communs.: Éléments pour un récit prospectif de la Biovallée*. Université Claude Bernard Lyon 1, 20th Oct. 2025. URL: <https://hal.science/hal-05322903>.
- [19] S. Castellán, A. Alcolei, A. Atlan, X. Aubriot, M. Bellot, G. Cabot, L. Dahmani, J. Käfer, S. Nadot, S. Oort, A. Schermann-Legionnet and E. Tannier. *Botascopia: a digital setup for generating low tech plant field guides*. 2025. URL: <https://hal.science/hal-05419216>.

Scientific popularization

- [20] V. Daubin, E. Tannier and E. Chabrol. ‘La vie artificielle comme banc d’essai pour l’évolution moléculaire [podcast]’. In: *Interstices* (23rd Oct. 2025). URL: <https://inria.hal.science/hal-05376183>.

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- [21] C. Bonneuil and F. Thomas. *Gènes, pouvoirs et profits*. QUAE, 2009 (cit. on p. 8).
- [22] M. Carolan. ‘‘Smart’’ farming techniques as political ontology: access, sovereignty and the performance of neoliberal and not-so-neoliberal worlds’. In: *Sociologia ruralis* 58.4 (2018), pp. 745–764 (cit. on p. 7).
- [23] P. Carroll-Burke. ‘Tools, instruments and engines: Getting a handle on the specificity of engine science’. In: *Social Studies of Science* (2001) (cit. on p. 8).
- [24] S. Ceccarelli. *Plant breeding with farmers — A technical manual*. ICARDA, Aleppo, Syria, 2012 (cit. on p. 8).
- [25] G. Dixon and E. Tilston, eds. *Soil Microbiology and Sustainable Crop Production*. Springer, 2010 (cit. on p. 7).
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- [28] J. Ingram and al. ‘What are the priority research questions for digital agriculture?’ In: *Land Use Policy* 114 (2022) (cit. on p. 7).
- [29] d. e. INRAE. <https://www.inrae.infrawan.fr/departements/ecosocio> (cit. on p. 9).
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- [34] S. Rotz and al. ‘The politics of digital agricultural technologies: a preliminary review’. In: *Sociologia Ruralis* 59.2 (2019), pp. 203–229 (cit. on p. 6).
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