

Les artistes au service des connaissances dans les sciences du vivant

Claire Damesin

Laboratoire ESE (écologie, société, évolution), Université Paris-Saclay

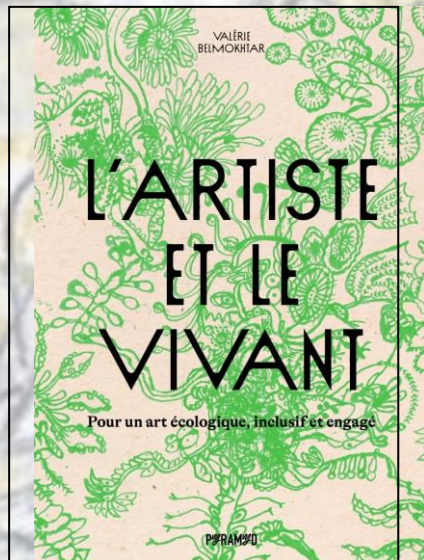
Académie d'Agriculture de France, juin 2025

Les artistes et le vivant



Fresque des lions,
grotte Chauvet

Les artistes et le vivant



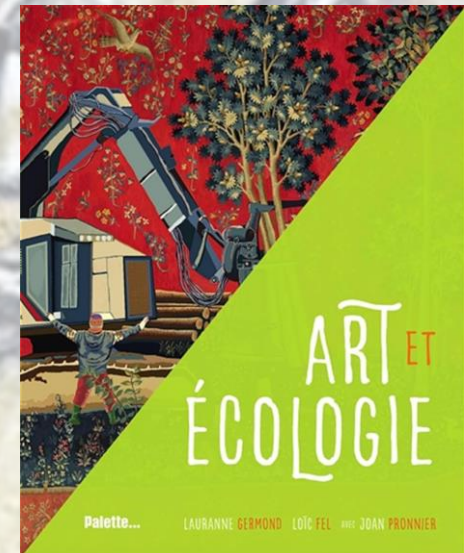
2022



2023



2022



2021

Fresque des lions,
grotte Chauvet

art science

art-science

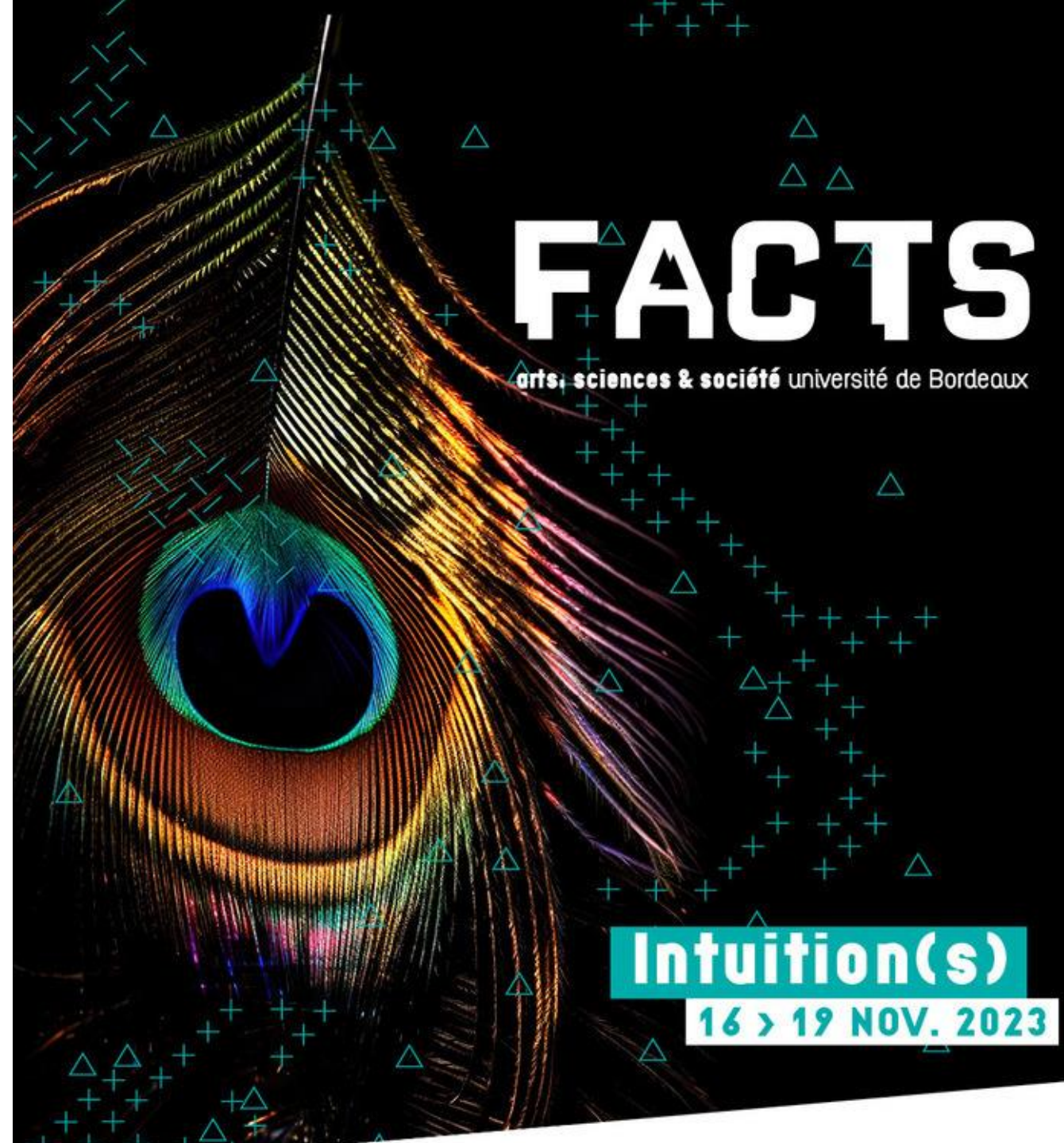
L'art-science

Essor depuis 10-15 ans

Projets art-science

Résidences d'artistes dans les laboratoires

Festivals art-sciences



art-science

MULTIPLES

Quel focus ici?

L'art peut-il servir la science

-dans la « **production** » des connaissances

-**dans les réflexions** en recherche fondamentale et appliquée ?

Où, comment ? (focus science moderne)

Art et science: deux mondes antinomiques ?

Démarche

Objective

Cadrée

Démarche > personnalité

Production d'articles

Sensible

Flexible

Personnalité > démarche

Production d'oeuvres

Pas de substitution possible...

SOMMAIRE

1. Pourvoyeurs de preuves licites

Dessins à l'appui

Prouesses techniques

2. Agents de liaison inter-disciplinaire

Au sein des sciences du vivant

Entre sciences du vivant et sciences humaines

3. Explorateurs en fronts de science

Aux confins de la vie et de la conscience

Vers l'objectivation de l'intersubjectivité ?

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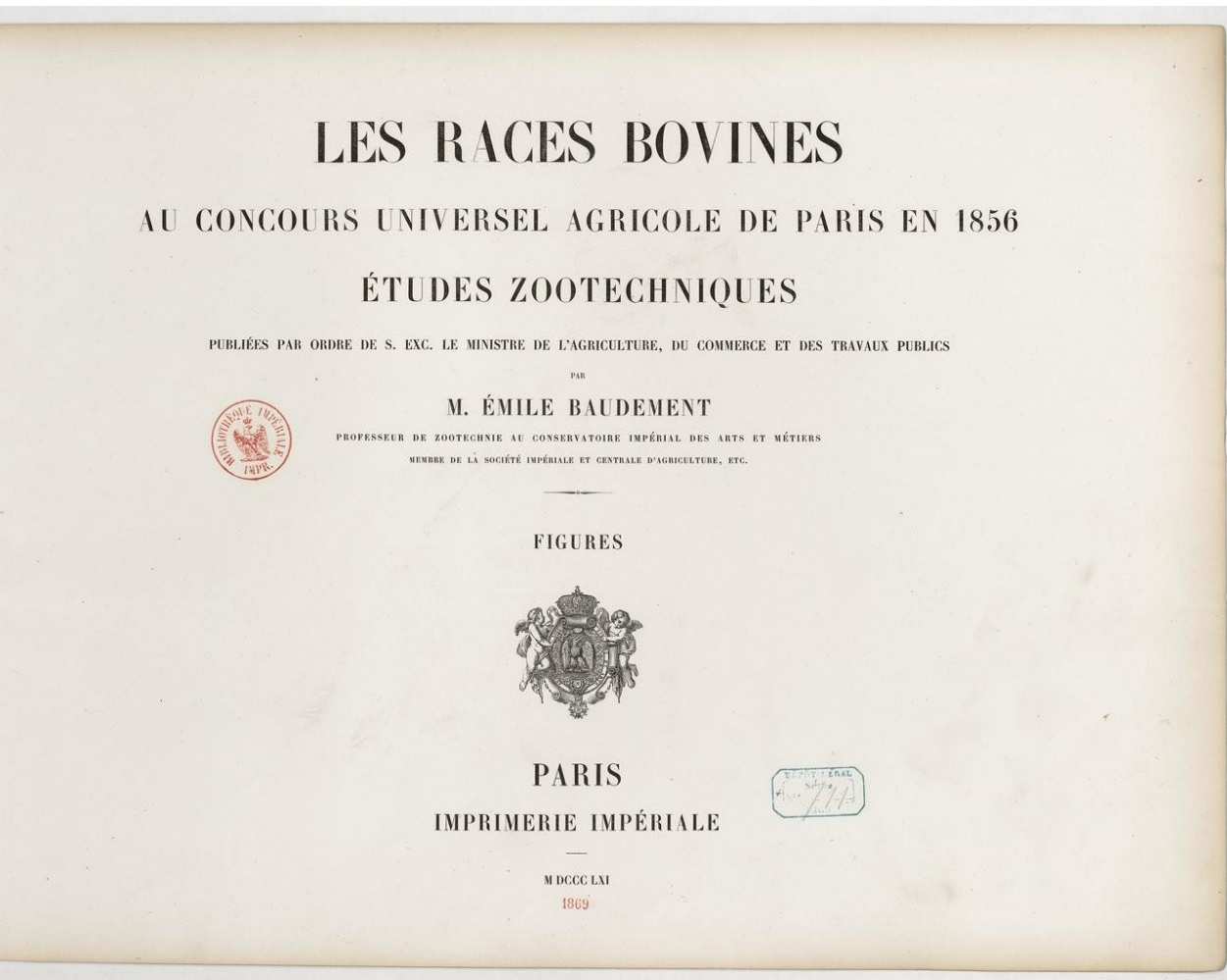
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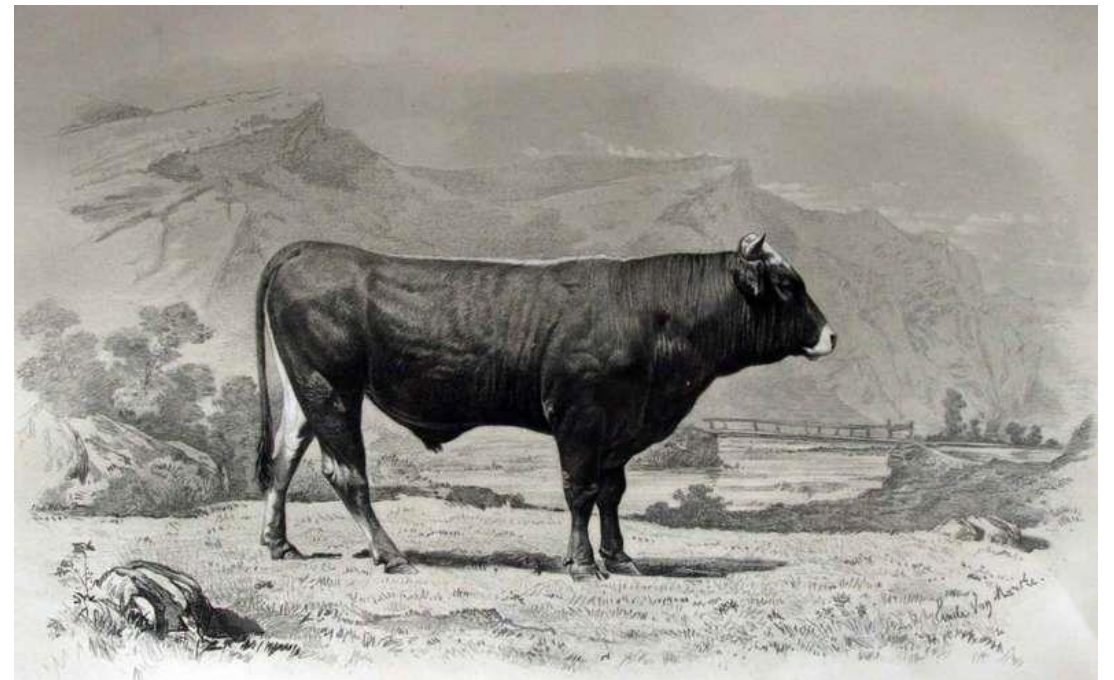


Source gallica.bnf.fr / Bibliothèque nationale de France

Émile Baudement, *Les races bovines au Concours universel agricole de Paris en 1856*, Paris, 1861–62.

Émile Baudement
professeur
de zoologie appliquée
à l'agriculture et à l'industrie (1852-1863)
Institut agronomique de Versailles

Membre de l'Académie d'Agriculture de France



Rosa Bonheur (1822-1899)



Labourage nivernais (1849)

Huile sur toile, 1,33 * 2,6 m. Musée d'Orsay, Paris

LES RACES BOVINES



“The **artists** were not only illustrators, but rather, Baudement implies, **participants** in the process of zootechnic classification [...]. “*



Photos: site bnf.fr

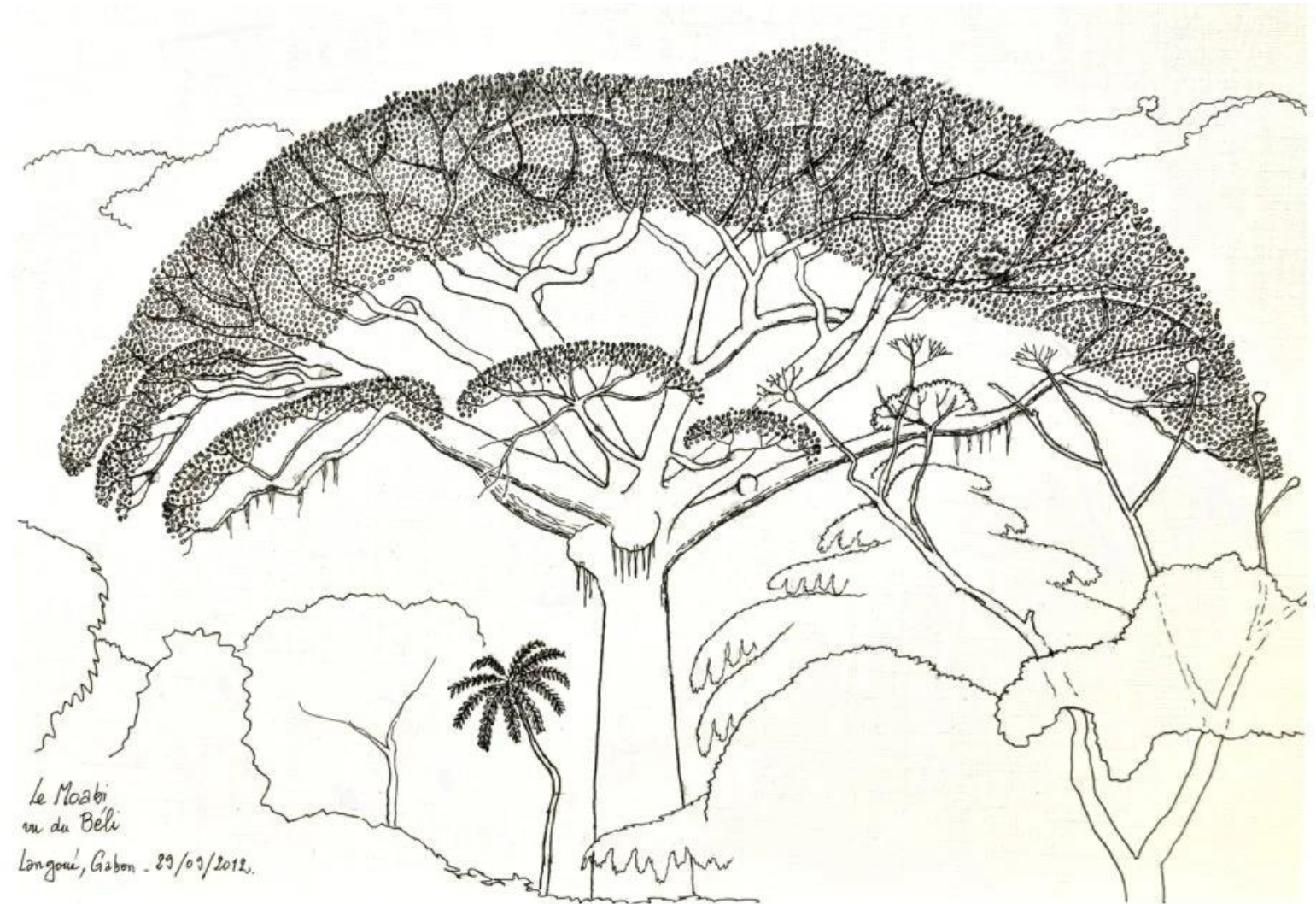
*Triplett S (2023) Bovine reproductions: animal husbandry and acclimatization in the cattle paintings and prints of Rosa Bonheur. *Art History*

Francis Hallé



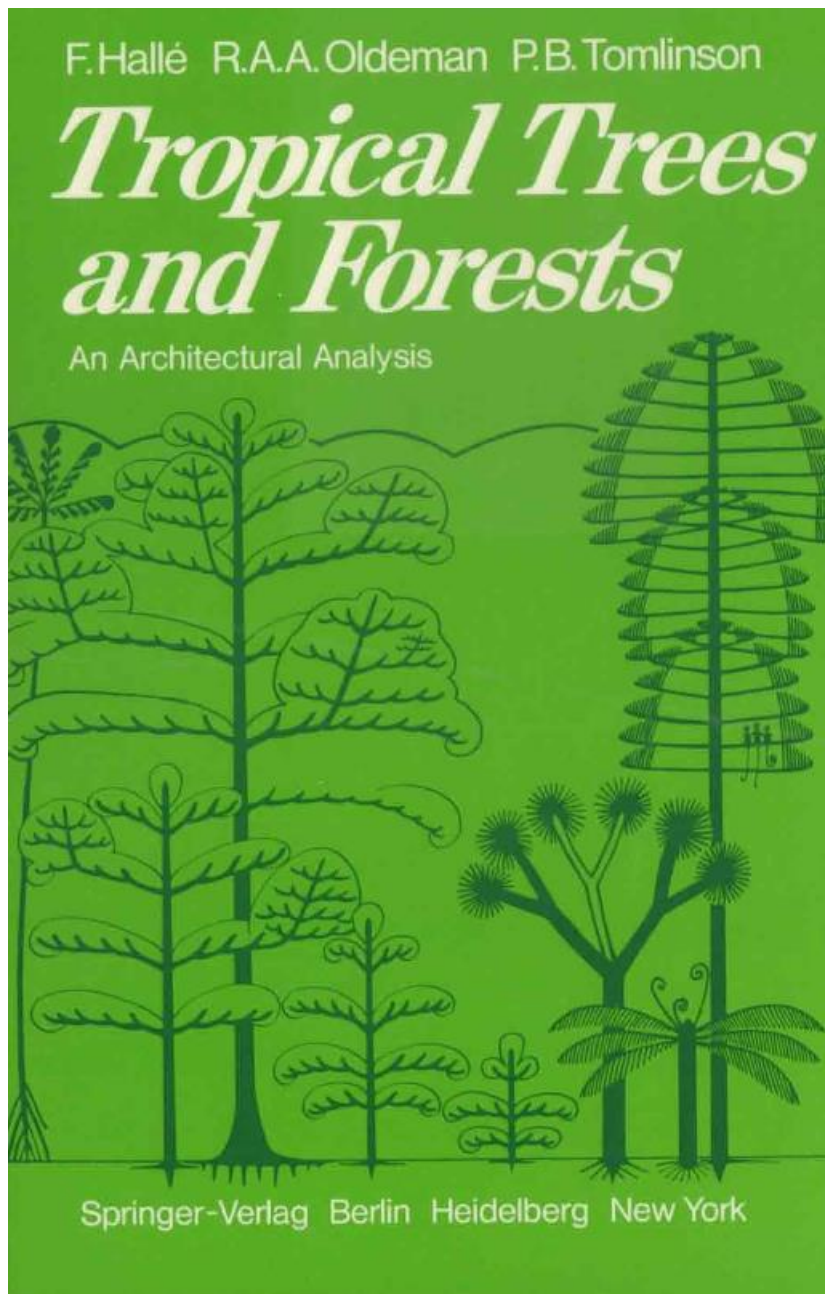
Francis Hallé dans un arbre, dans le documentaire de Luc Jacquet, 2012 (The Walt Disney Company France)

Francis Hallé

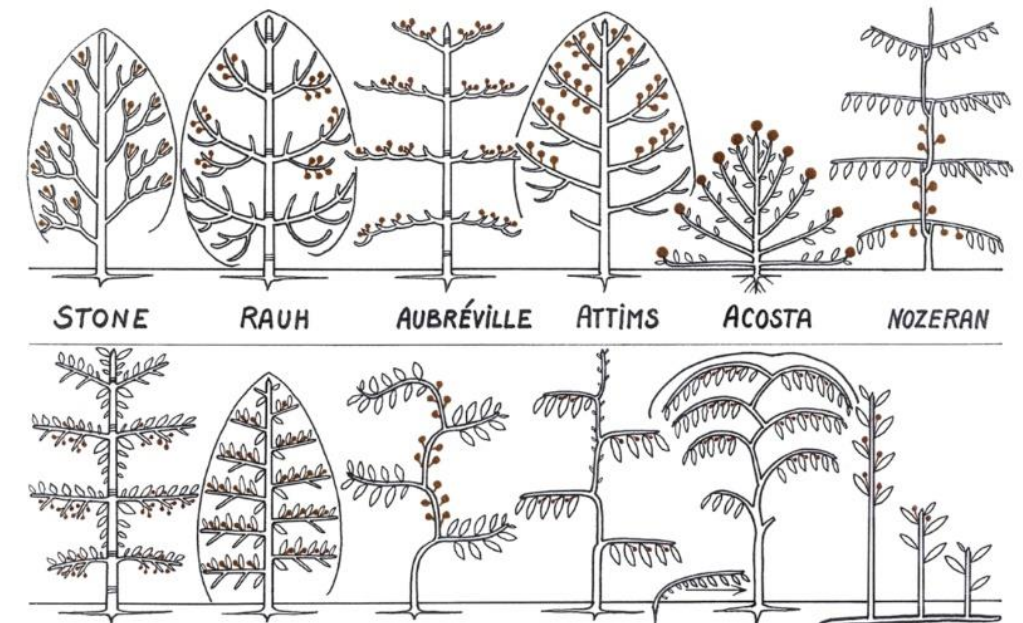
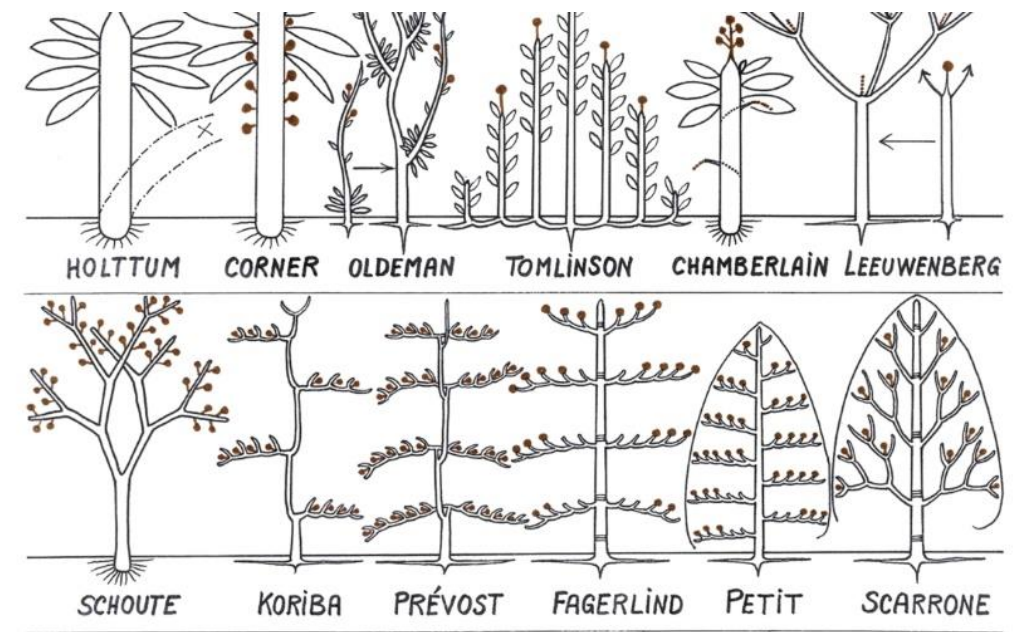
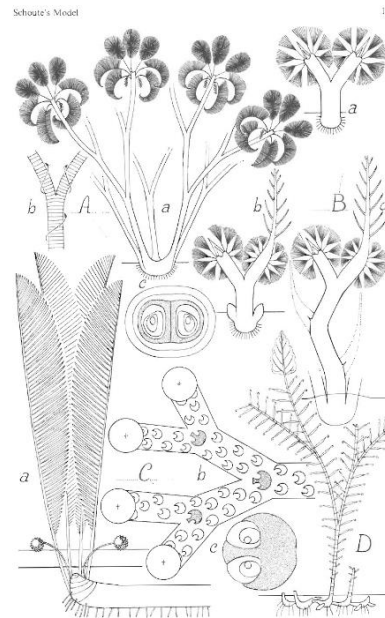
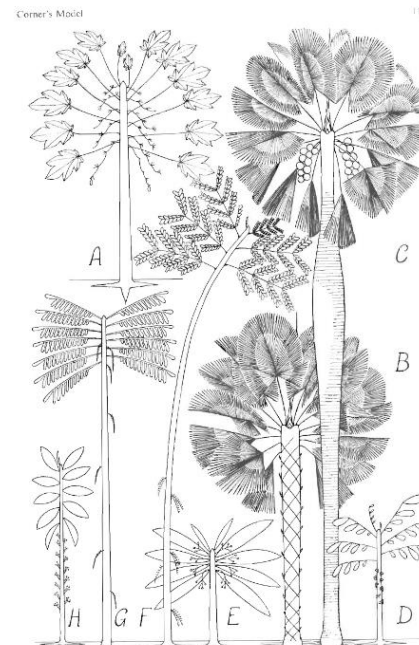


Le Mosti
du Béli
Longoué, Gabon - 29/09/2012.

Baillonella toxisperma, SAPOTACEAE, le "Mosti"
Gabon



1978





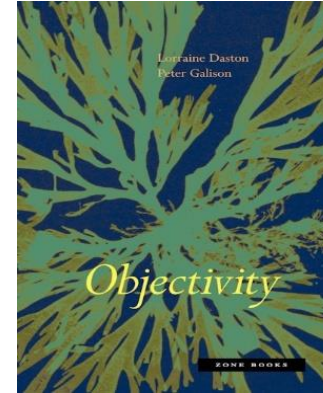
Le dessin,
« c'est une **réflexion** »

"Je **comprends** l'architecture
en dessinant"

*Vidéo Youtube "Cité anthropocène",
Francis Hallé- Dessine moi la beauté.
(Interview par Lou Herm) 21 min 14, post 12-2024*

Qu'est ce que l'objectivité?

Le dessin, la beauté sont-ils objectifs?



Qu'est ce que l'art de l'observation?

« Huber ... un maître dans l'art de l'observation. Il était aussi aveugle. » *

Comment comprend-on la réalité?

Connaissance rationnelle/sensible/intuitive --- *Spinoza*

* Singy P (2008) Les yeux d'Huber : l'art de l'observation scientifique avant l'émergence du positivisme. In Expérience et observation dans les sciences de la vie au XVIII^e siècle, Bull. d'histoire et d'épistémologie des sciences de la vie , vol 15, Pages 147 à 172

SOMMAIRE

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« Savoir regarder, c'est tout. »

Meissonier E



Étude de cheval,
Meissonier E (1815-1891)
Musée Bonnat-Helleu, Bayonne



Faugh-A-Ballagh, G. A. Turner, 1845



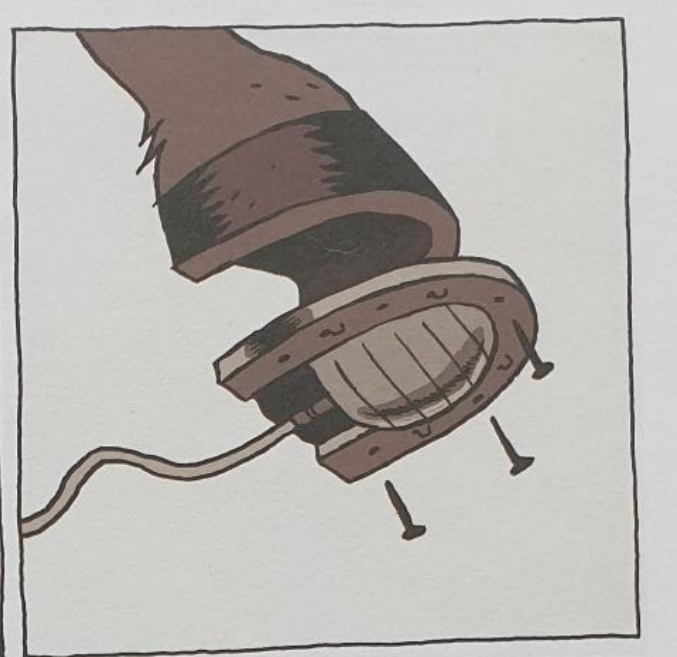
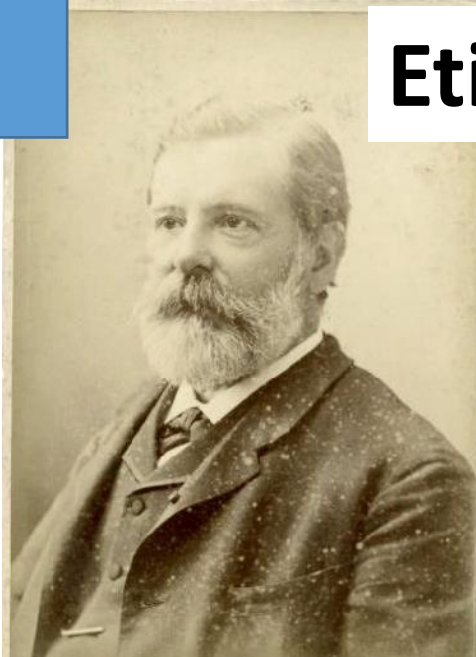
Turner FC (1845) ,



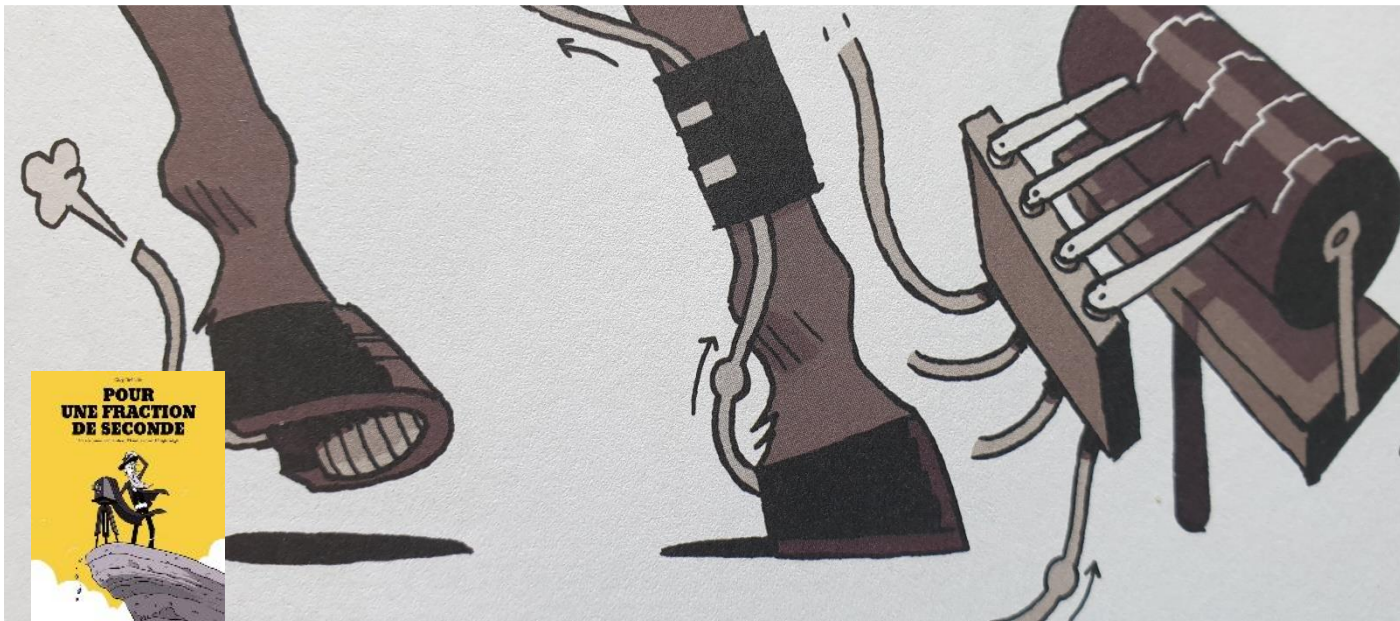
Le derby d'Epsom,
Géricault T (1821)

France

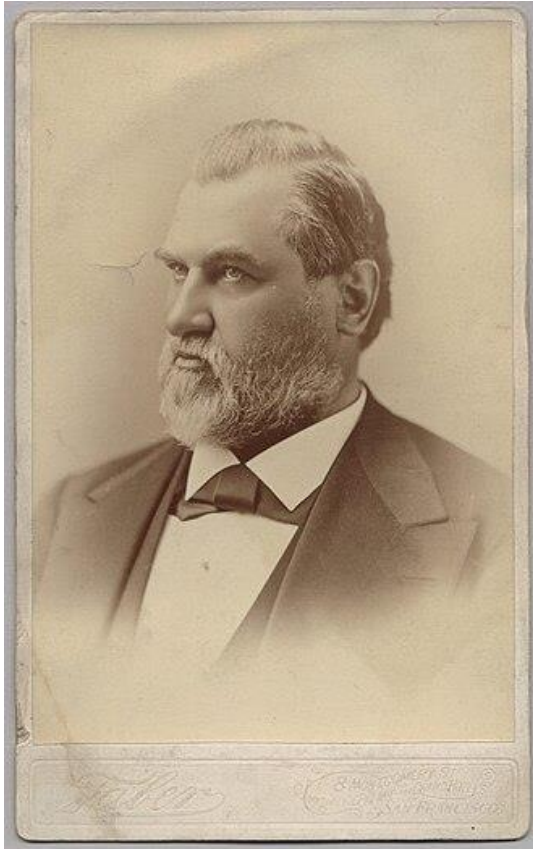
Etienne Jules Marey



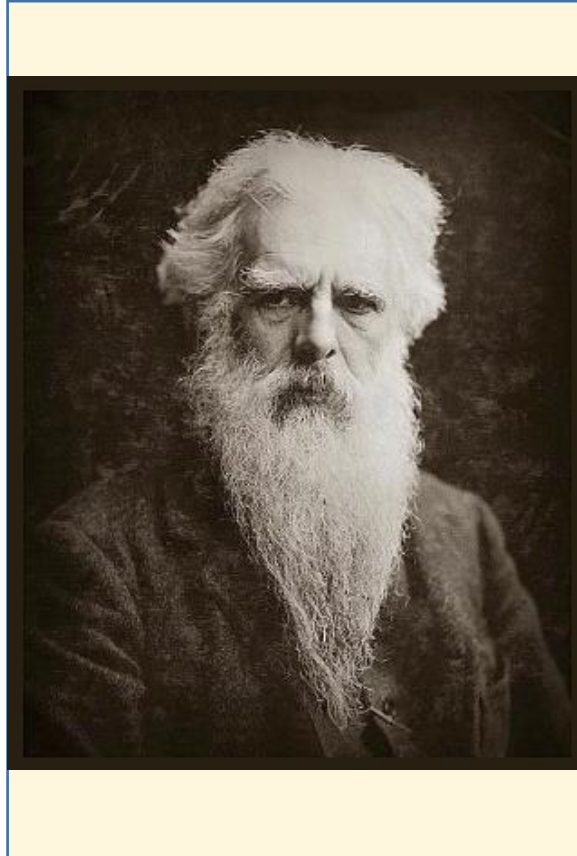
succession des appuis, on a groupé ces quatre styles en deux séries : l'une qui trace les appuis des pieds droit et gauche



Etats-Unis



**Leland Stanford,
riche homme d'affaires**



Eadweard Muybridge, Loya, Valley of Yosemite, c. 1872



Équivalent
1 million d'euros







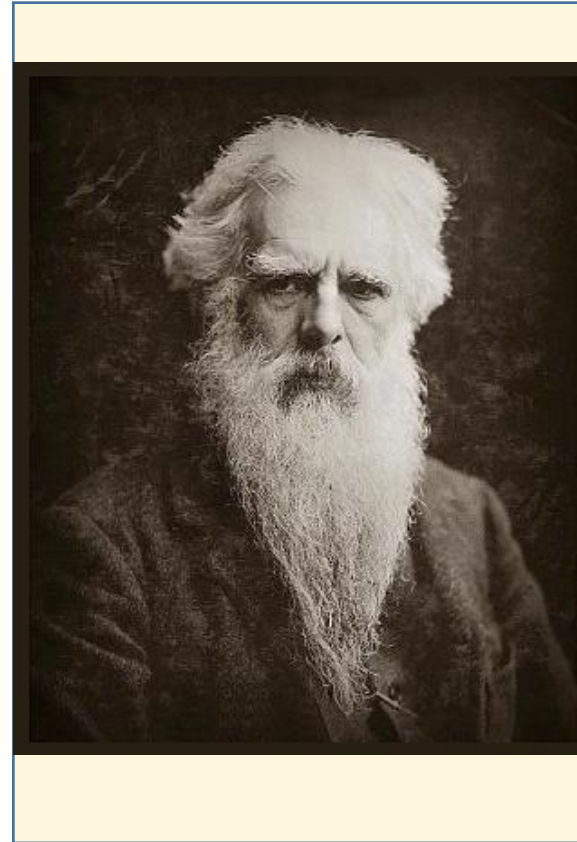


**Les « travailleurs de la preuve »,
Gaston Bachelard à propos des chercheurs.**

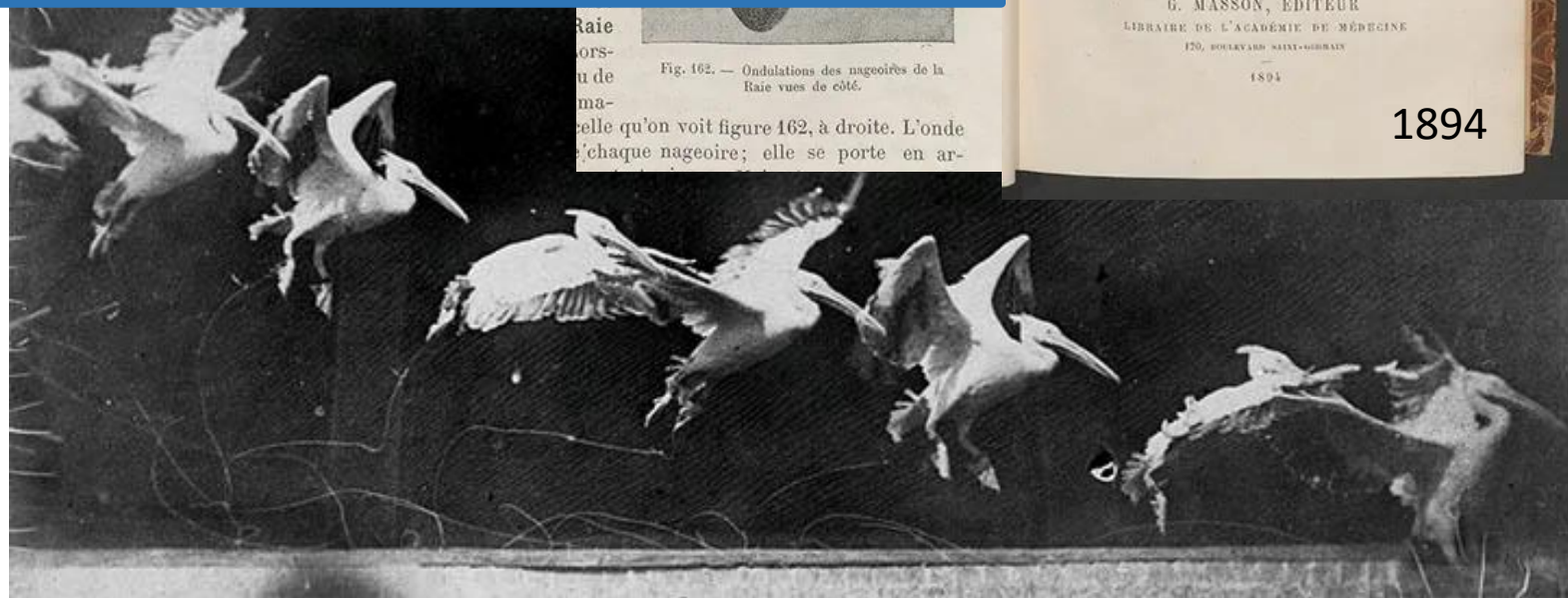
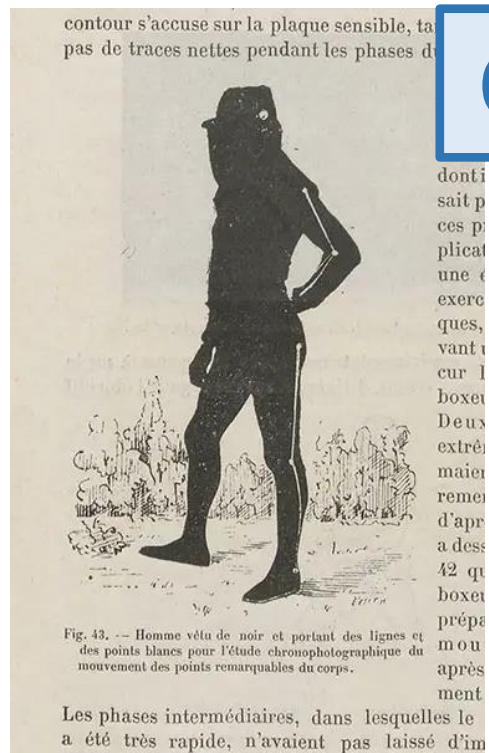
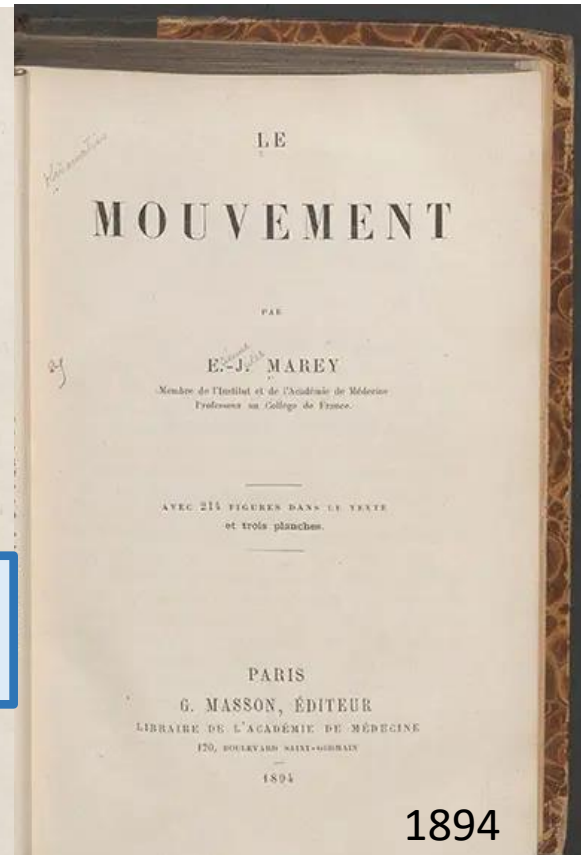
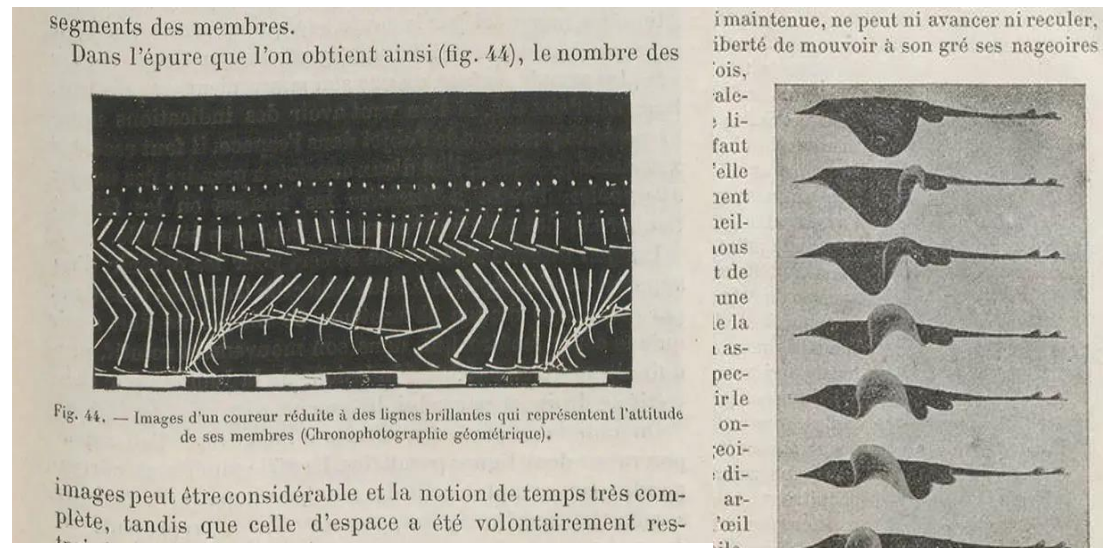
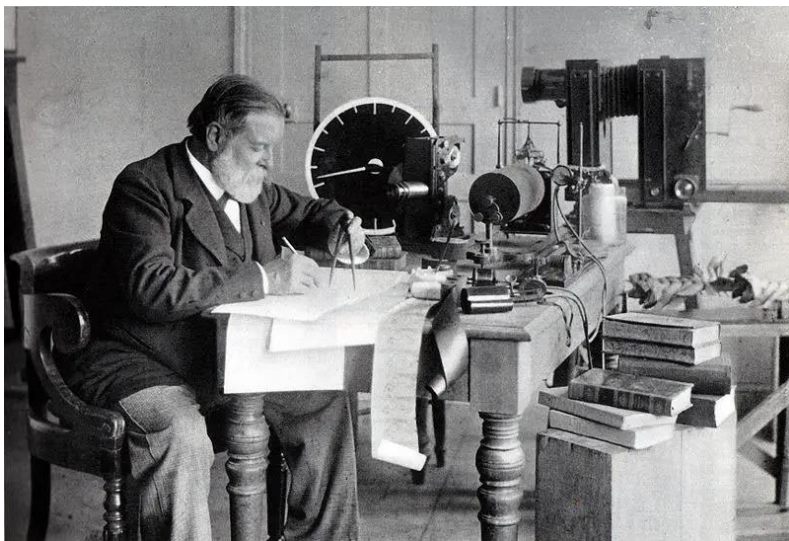




Marey, le scientifique



Muybridge, l'artiste



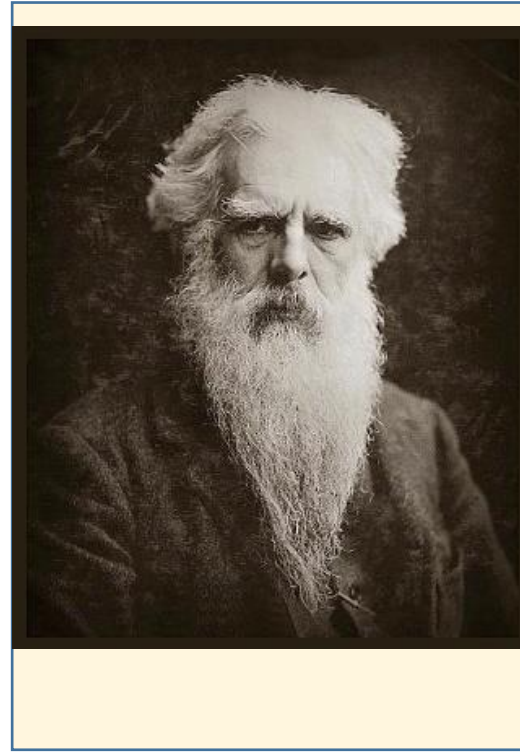
1894

Fusil photographique de 1882

«Arts et sciences: même combat? »*



Marey



Muybridge

« [...] les scientifiques et les artistes **testent** et **créent** dans des **espaces de recherche fondamentalement identiques** .»*

*Sueur J (2021) *The conversation*

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David Goodsell



David Goodsell

biologie

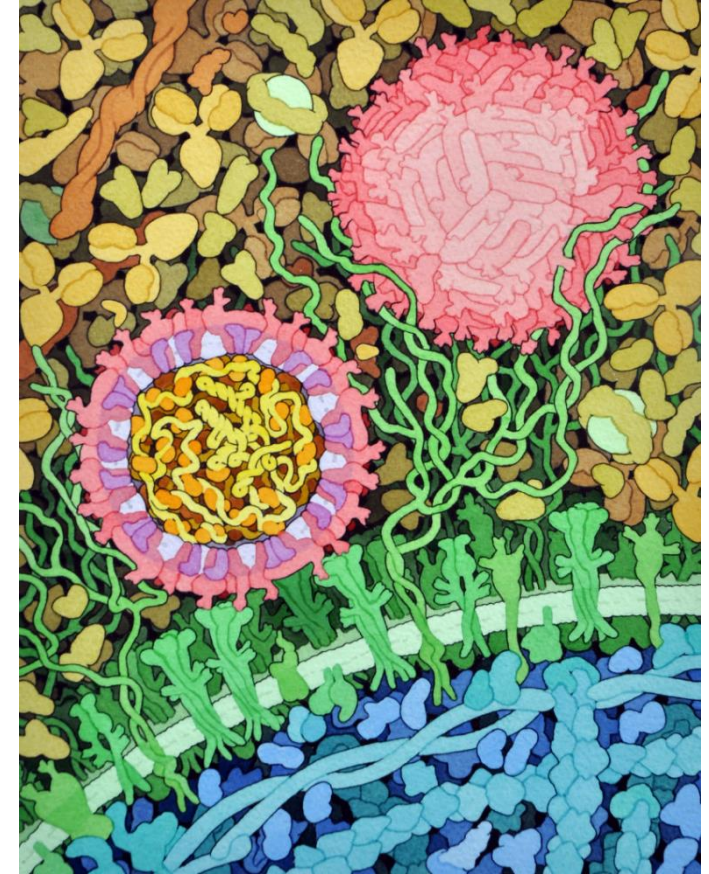


“Mesoscale illustration of a nerve synapse.”

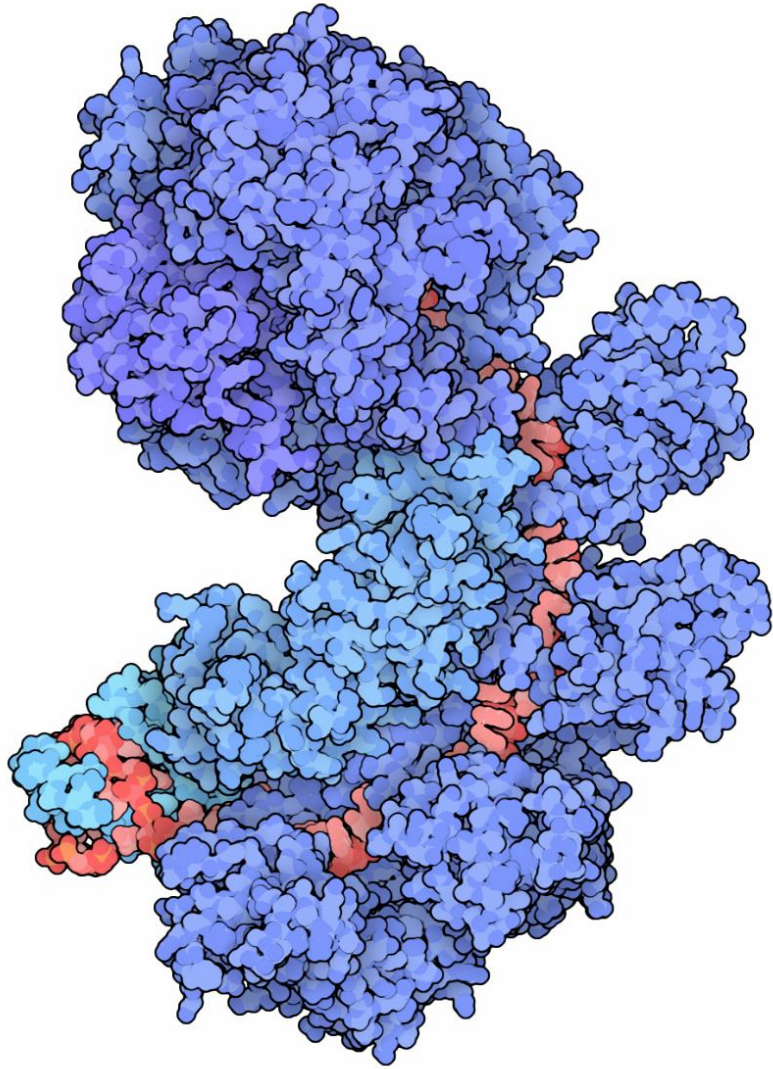
chimie



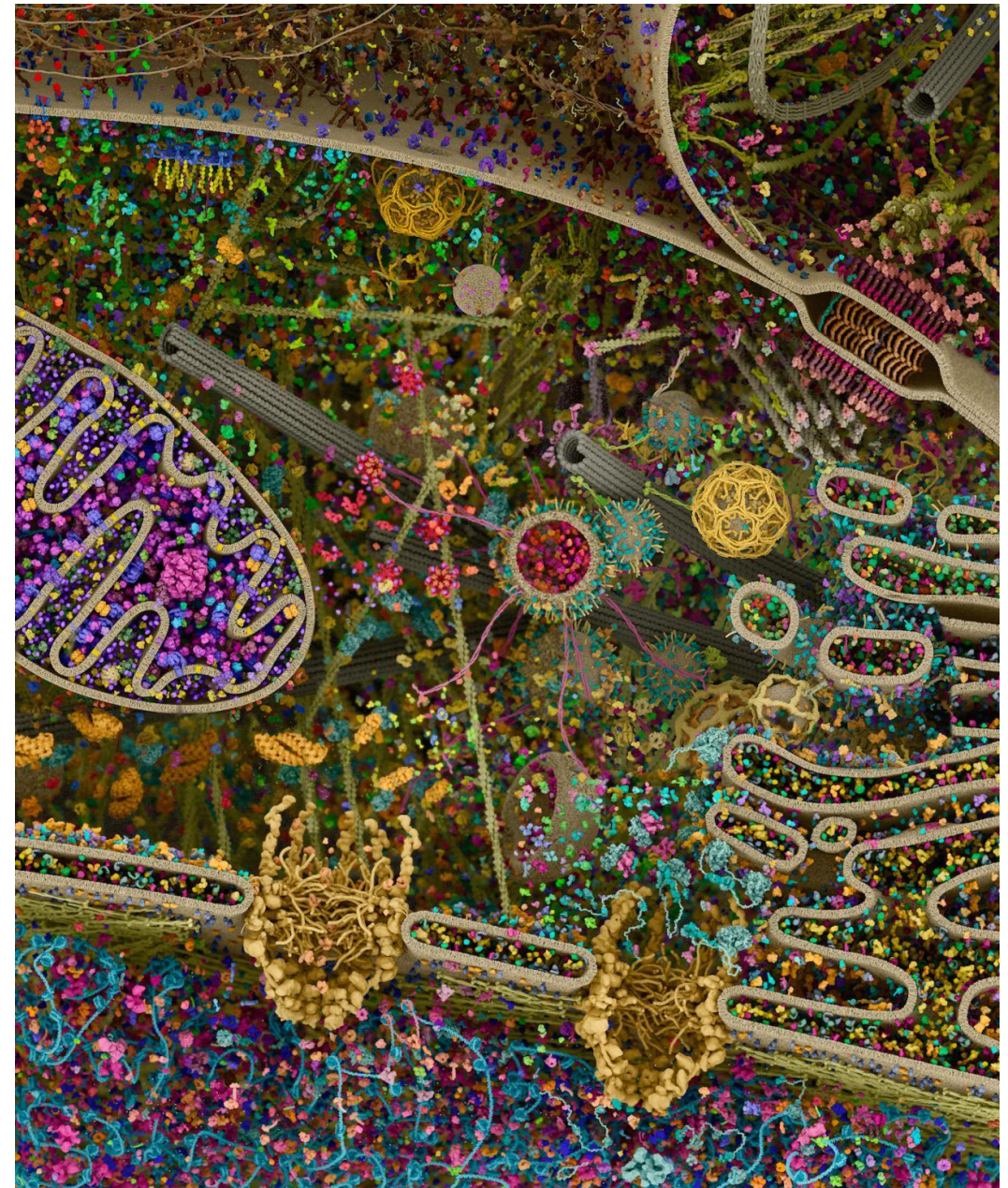
Professor of Molecular Biology



Example of molecular landscape:
Zika Virus (2016).



Example of individual protein:
Cascade surveillance complex of the Type I CRISPR bacterial immune system from Escherichia coli (2015).

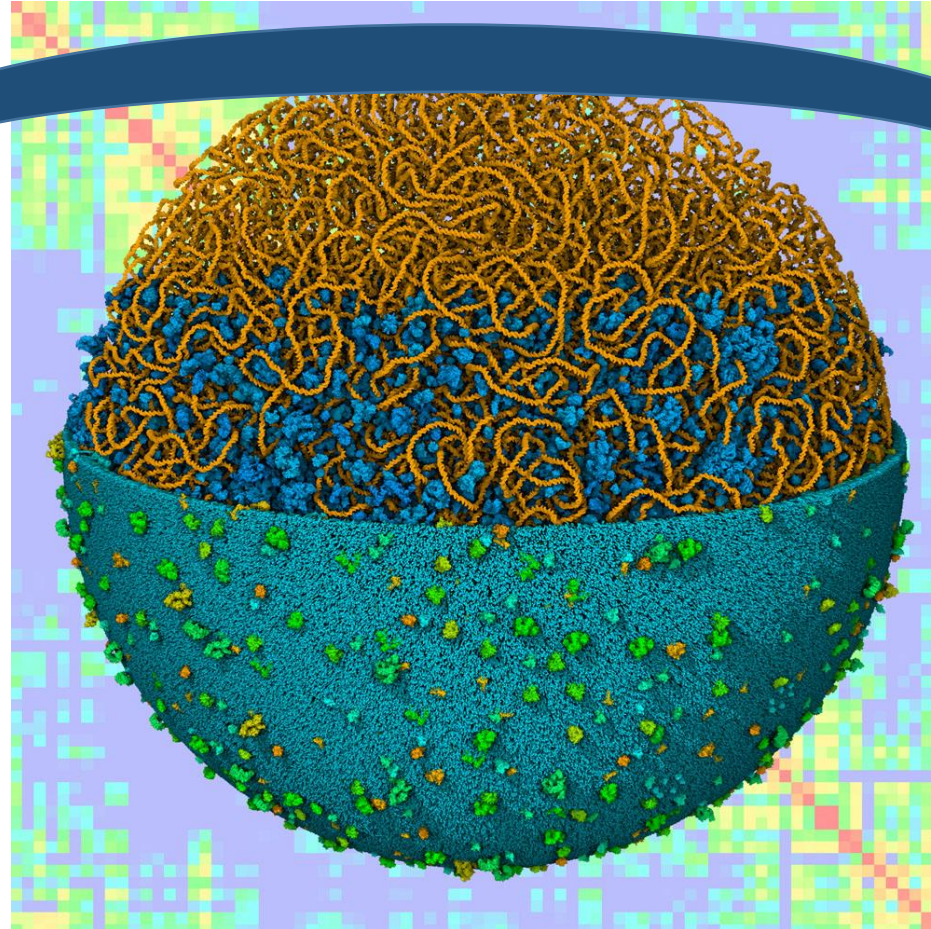


“Infinity imagined” by David Goodsell (2019)

3D integrative models
of **cellular environments** and entire cells,
to bridge the experimental gap between :

molecular structure

nanometer-sized



cellular function

micron-sized

cellular mesoscale

Review > Trends Biochem Sci. 2020 Jun;45(6):472-483. doi: 10.1016/j.tibs.2020.02.010.

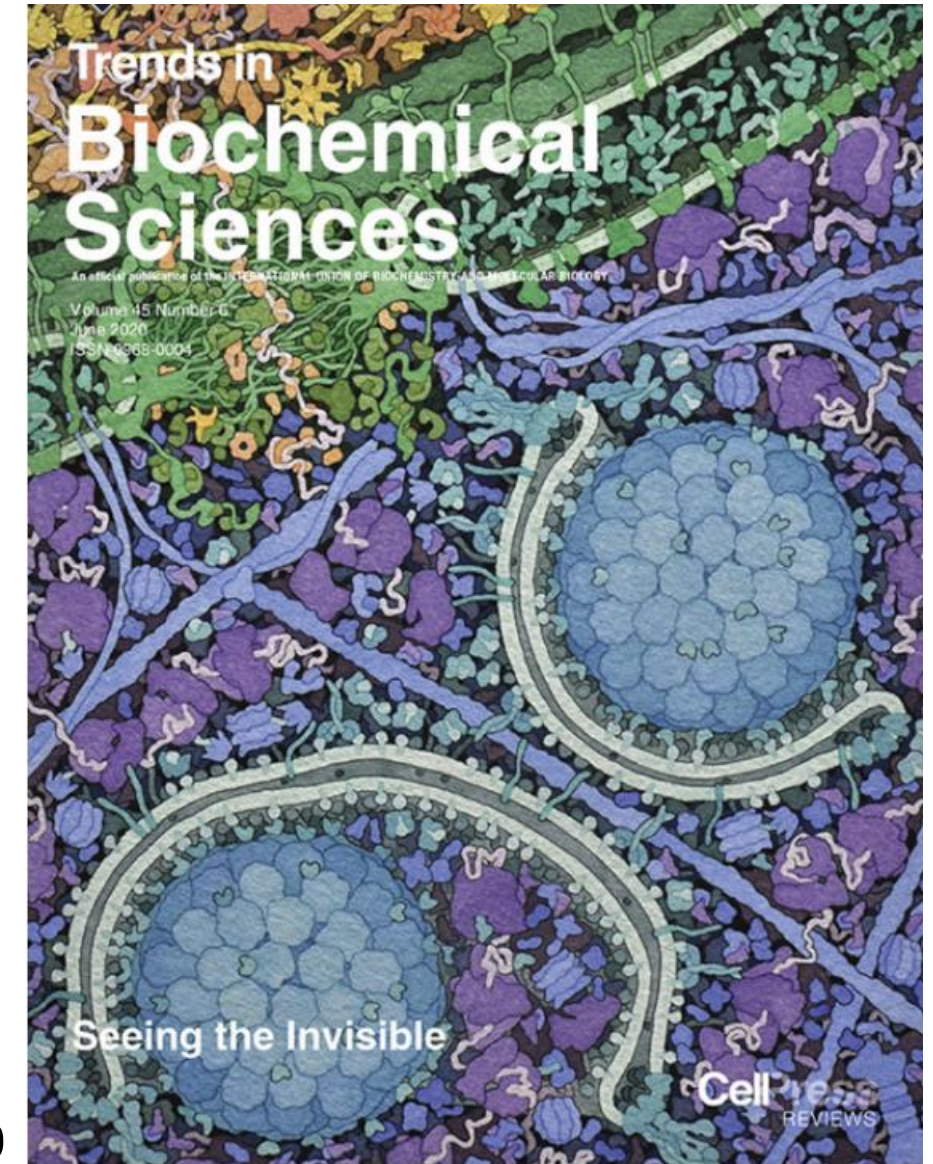
Epub 2020 Mar 21.

Art and Science of the Cellular Mesoscale

David S Goodsell ¹, Arthur J Olson ², Stefano Forli ²

Affiliations + expand

PMID: 32413324 PMCID: [PMC7230070](https://pubmed.ncbi.nlm.nih.gov/32413324/) DOI: [10.1016/j.tibs.2020.02.010](https://doi.org/10.1016/j.tibs.2020.02.010)



2020

Karine Bonneval

09-2024, Chenini Tunisie

Karine Bonneval
Artiste plasticienne



Karine Bonneval
Artiste globe trotter

Soil and Crop Science
Univ de Cornell, USA

ESE, NeuroPSI
Univ. Paris-Saclay

Ecole Polytechnique
Paris

PIAF, INRAE
Univ. Clermont Auvergne

ANR POLLUEN



chromatographie de pollen de hêtre et d'un sol, tests, 2023

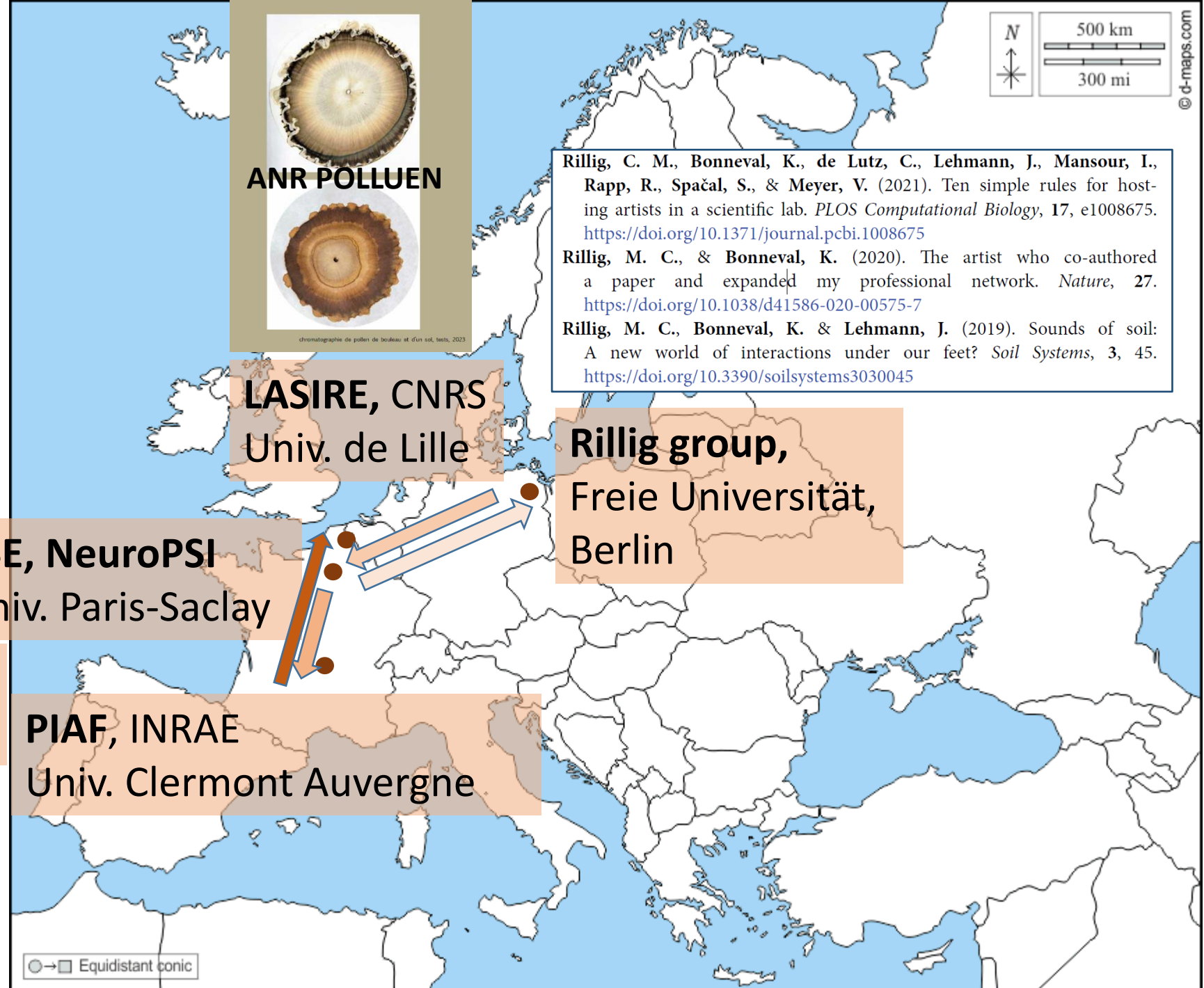
LASIRE, CNRS
Univ. de Lille

Rillig group,
Freie Universität,
Berlin

Rillig, C. M., Bonneval, K., de Lutz, C., Lehmann, J., Mansour, I., Rapp, R., Spačal, S., & Meyer, V. (2021). Ten simple rules for hosting artists in a scientific lab. *PLOS Computational Biology*, 17, e1008675. <https://doi.org/10.1371/journal.pcbi.1008675>

Rillig, M. C., & Bonneval, K. (2020). The artist who co-authored a paper and expanded my professional network. *Nature*, 27. <https://doi.org/10.1038/d41586-020-00575-7>

Rillig, M. C., Bonneval, K. & Lehmann, J. (2019). Sounds of soil: A new world of interactions under our feet? *Soil Systems*, 3, 45. <https://doi.org/10.3390/soilsystems3030045>



EDITORIAL

Ten simple rules for hosting artists in a scientific lab

Matthias C. Rillig^{1,2*}, Karine Bonneval³, Christian de Lutz⁴, Johannes Lehmann⁵, India Mansour^{1,2}, Regine Rapp⁴, Saša Spačal⁶, Vera Meyer^{7*}

1 Freie Universität Berlin, Institut für Biologie, Berlin, Germany, 2 Berlin-Brandenburg Institute of Advanced Biodiversity Research (BBIB), Berlin, Germany, 3 6 Chemin des Vignes, Pesselières, Jalognes, France, 4 Art Laboratory Berlin, Berlin, Germany, 5 Soil and Crop Sciences, College of Agriculture and Life Sciences, Cornell University, Ithaca, New York, United States of America, 6 Studio Agapea, Ljubljana, Slovenia, 7 Chair of Applied and Molecular Microbiology, Institute of Biotechnology, Technische Universität Berlin, Berlin, Germany

* matthias.rillig@fu-berlin.de (MCR); vera.meyer@tu-berlin.de (VM)

Introduction

Hosting an artist in a scientific lab is likely a new experience for many scientists in the natural and engineering sciences, and perhaps also for many artists, yet it can be a very beneficial experience for both parties [1]. “Art and science are in a tension that is most fruitful when these c

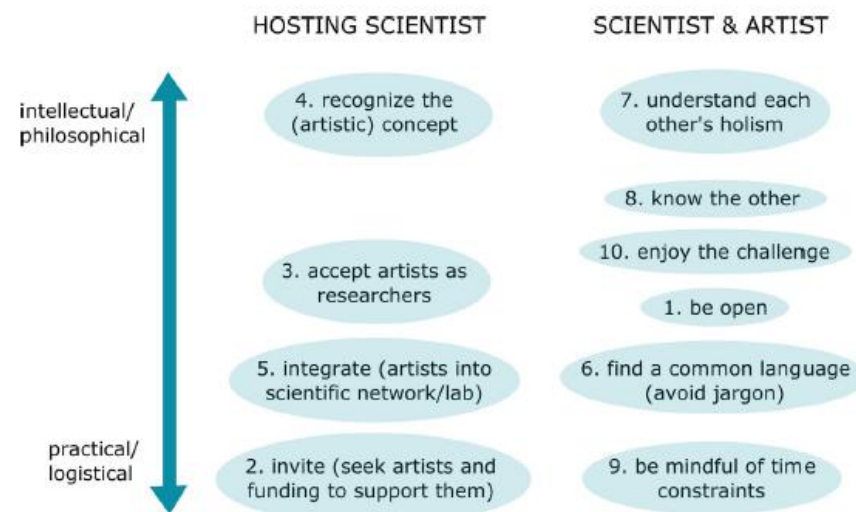


Fig 1. Summary of the 10 rules, arrayed from intellectual/philosophical to practical/logistical and divided into rules more applicable to the hosting science lab and rules relevant for both the hosting lab and the artist.

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Vers l'objectivation de l'intersubjectivité ?

Collaboration art

Écologie scientifique

Sciences humaines

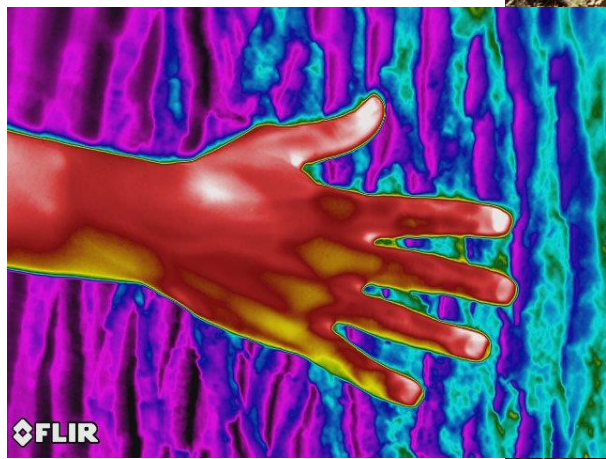
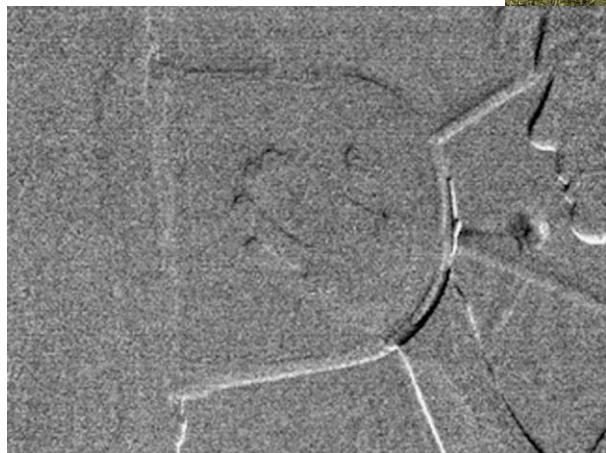
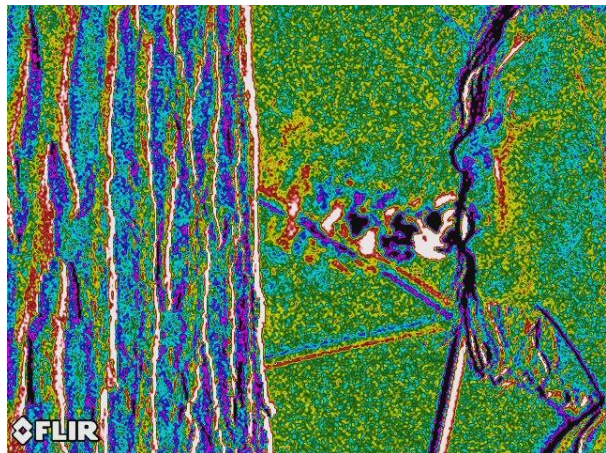
Écologie humaine



Diagram illustrating the carbon cycle in a tree. The tree is shown with green foliage and brown roots. A yellow arrow labeled "photosynthèse" points from the foliage to the trunk, and a red arrow labeled "corganique" points from the trunk back to the foliage. A yellow arrow labeled "transfert" points from the trunk down to a brown box labeled "croissance réserves". From this box, a red arrow points down to the roots. The roots are shown with orange arrows labeled "exsudats" pointing to "bactéries" and "mycorhizes". A red arrow labeled "CO₂" points from the foliage up to the top right. A small inset on the left shows a black and white drawing of a person standing next to a tree.

Dessin, Karine Bonneval

Dessin, Karine Bonneval



L'arbre et son environnement

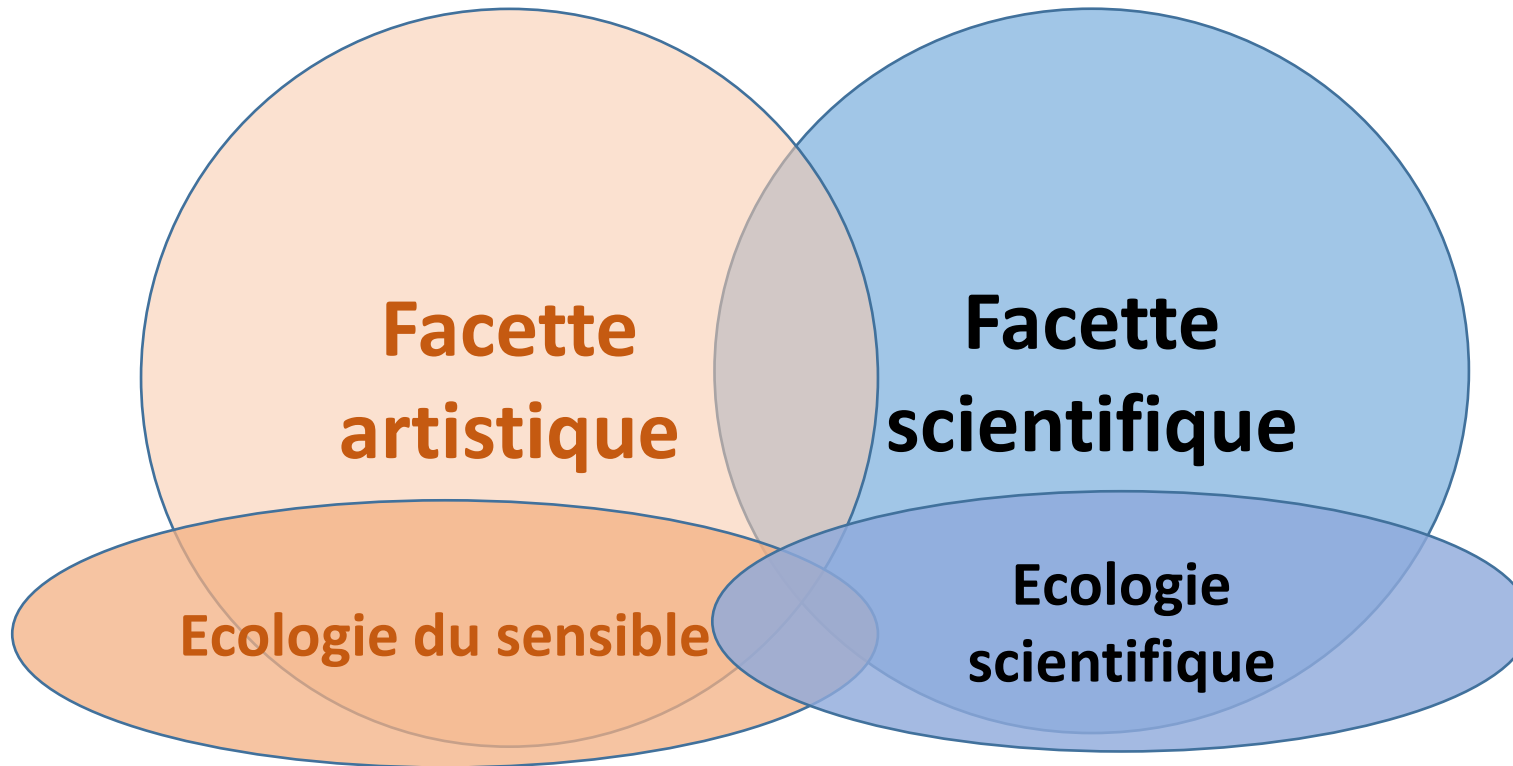
Quels échanges?...



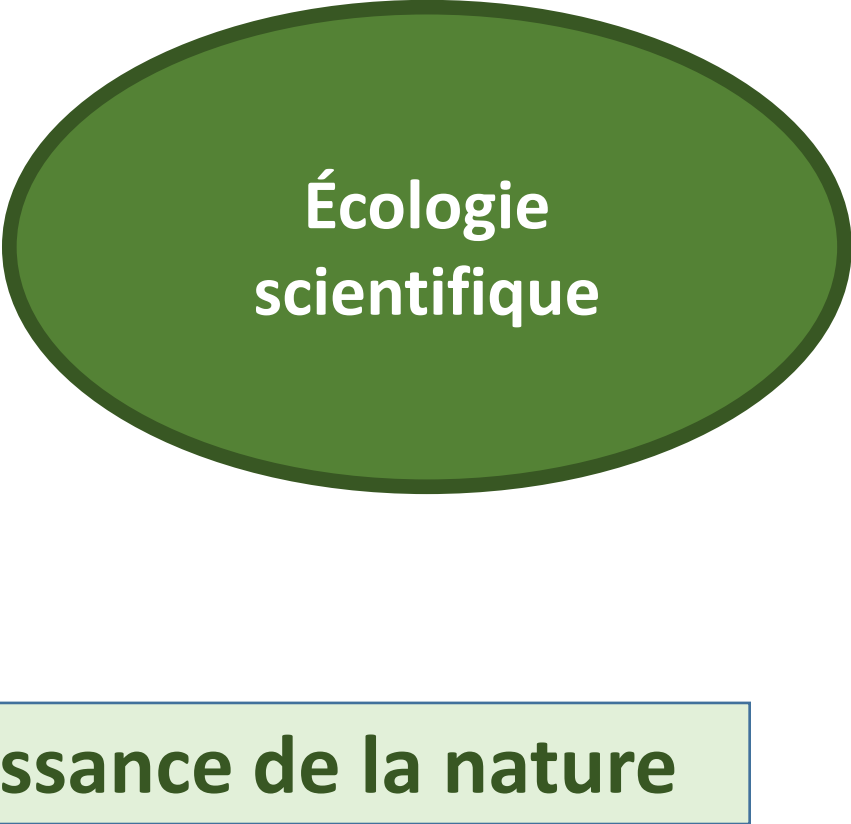
Station forestière ICOS, Barbeau

Penser et **ressentir** la nature

Dialogue rétabli entre rationalité et sensibilité



Ecologie végétale



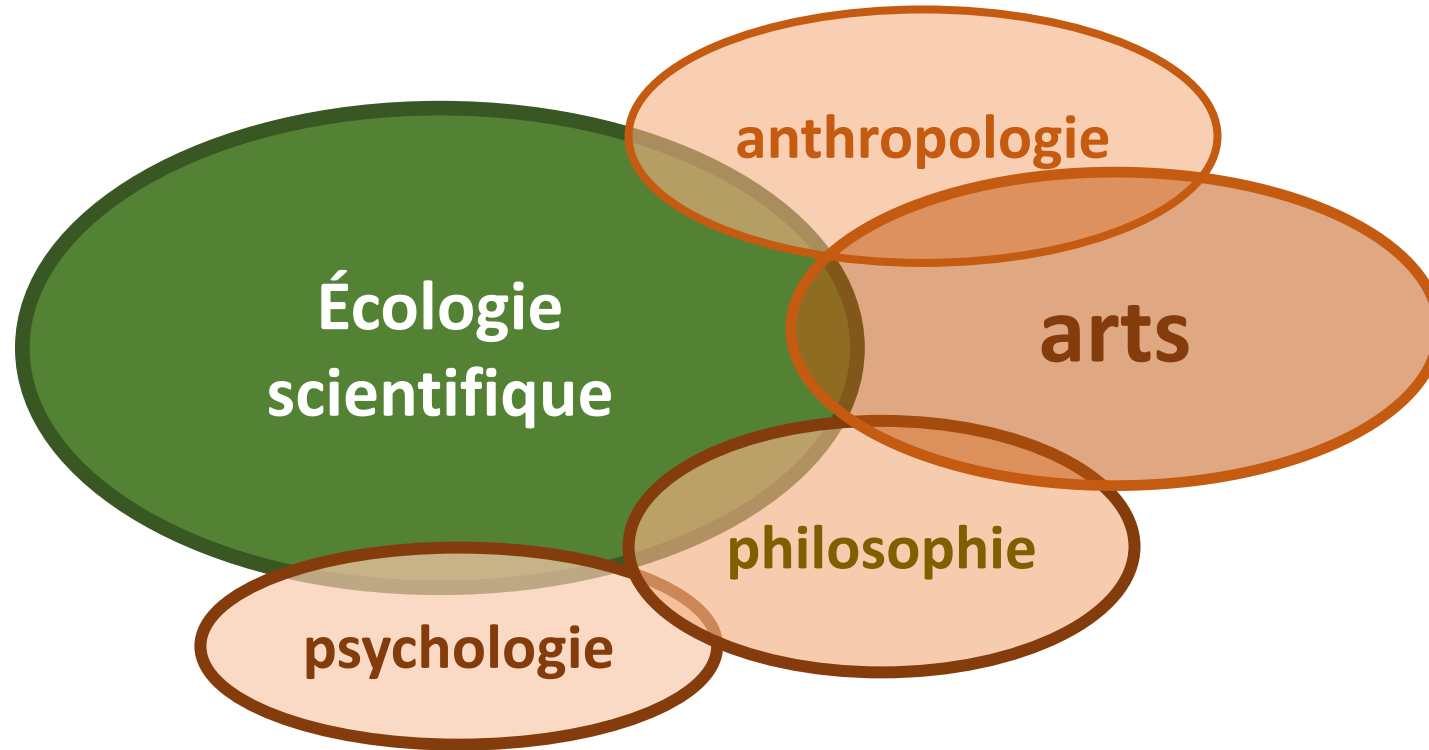
Écologie
scientifique

Connaissance de la nature

Ecologie végétale



Ecologie humaine



Connaissance de la nature

Connaissance de l'humain

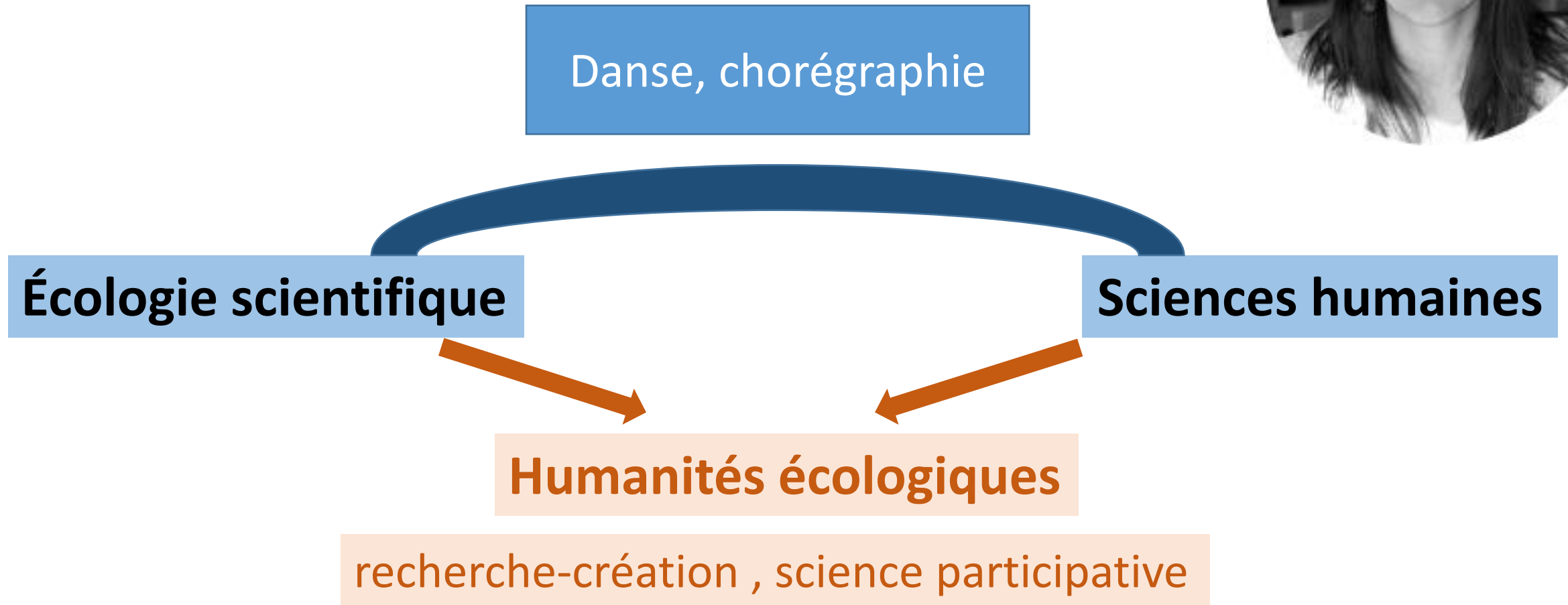
Danse, chorégraphie

Écologie scientifique

Sciences humaines

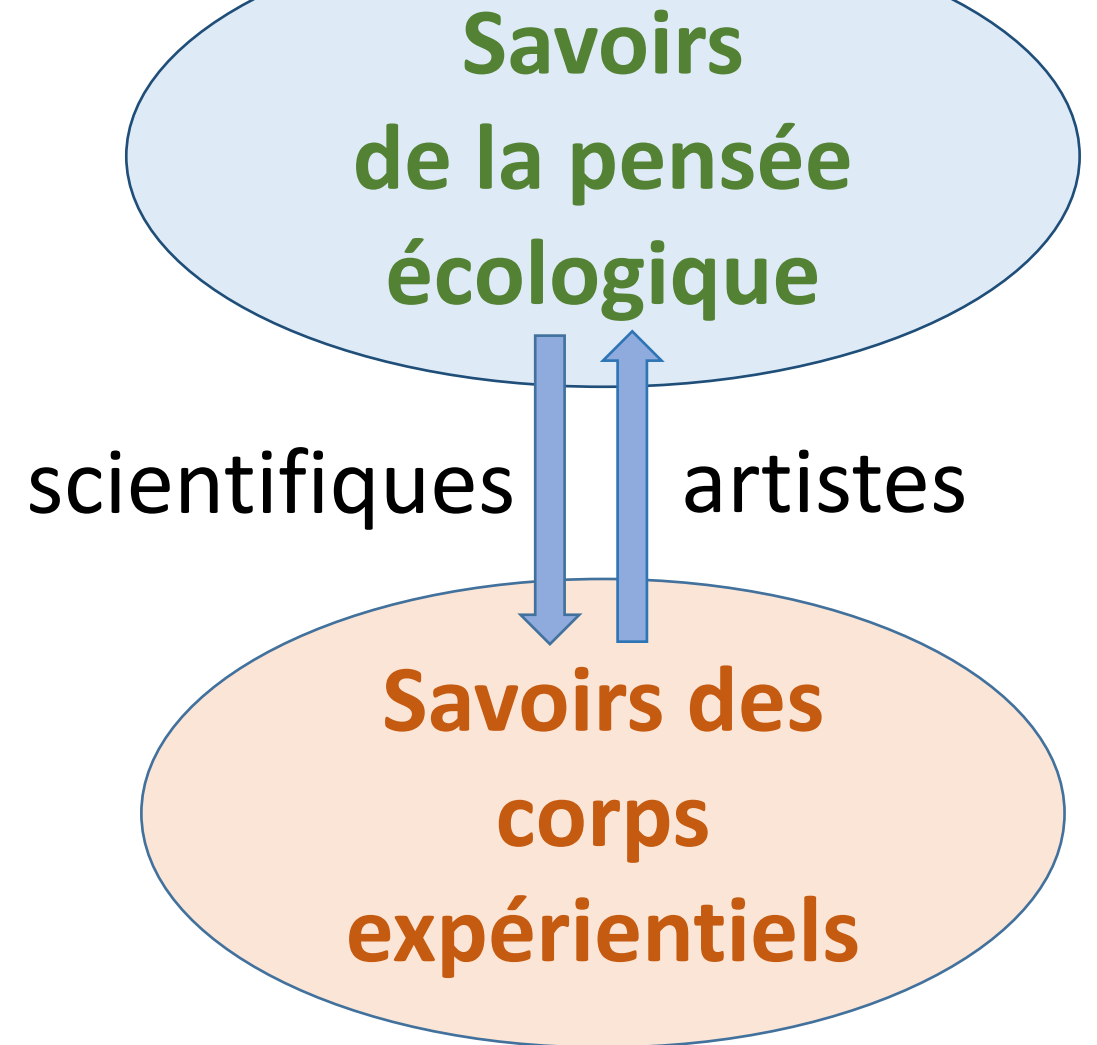
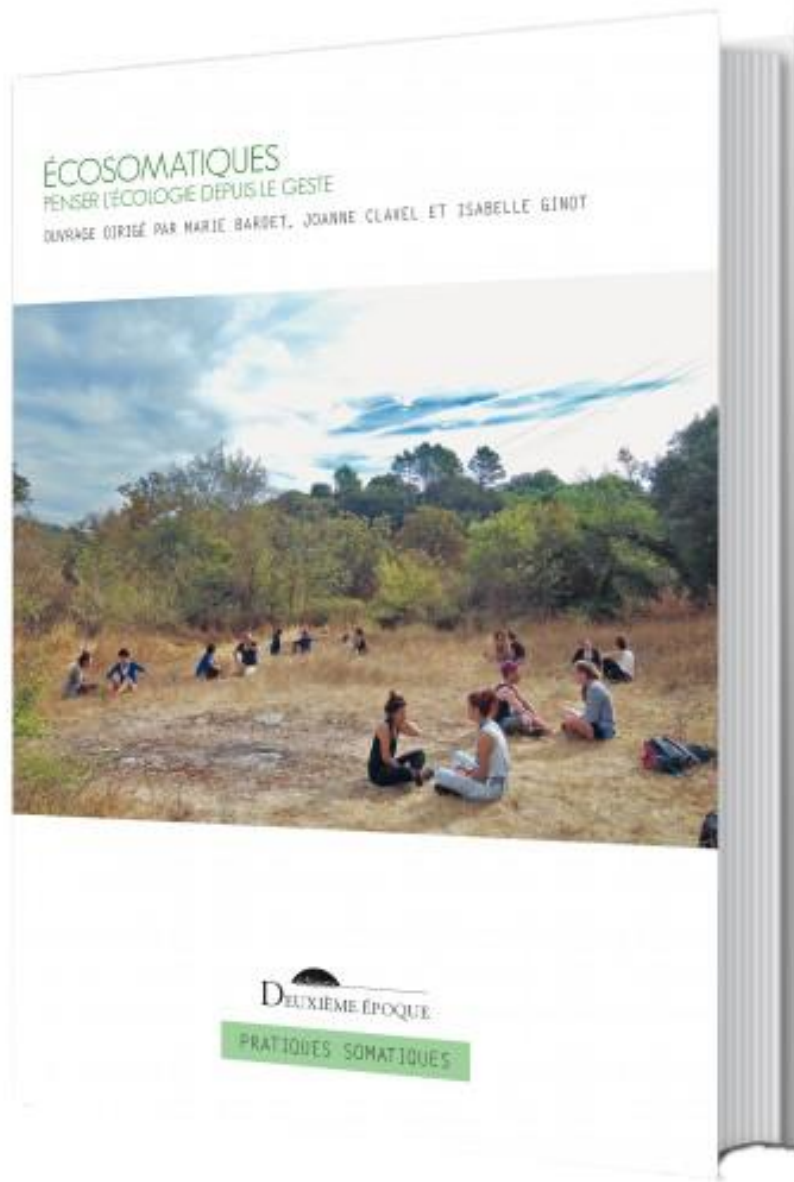


Joanne Clavel



Joanne Clavel

ECOSOMATIQUES



« **La science** manipule les choses et renonce à les habiter. [...] Il faut que la pensée de science [...] **se replace** [...] **sur le sol du monde sensible** [...], **dans notre corps** »

Merleau-Ponty M (1985) *L'œil et l'esprit*

Dans Pierron J-P (2023) « Pour une insurrection des sens » Voix de la Terre, Actes Sud

Sensitroph' Du rivage, percevoir la mer.



**La richesse des réseaux trophiques
marins**

**questions
de « nourritures » métaboliques**

**et de « lien à ce qui nourrit,
intérieurement et existentiellement »**

« les vertus **cognitives** et **existentielles** [...] des arts »

‘Relier les connaissances’

Le défi du XXI^e siècle, Edgar Morin (1999)

3. Explorateurs en front de sciences

Aux confins de la vie et conscience

Vers l'objectivation de l'intersubjectivité

L'artiste questionne

-la vie

-la conscience

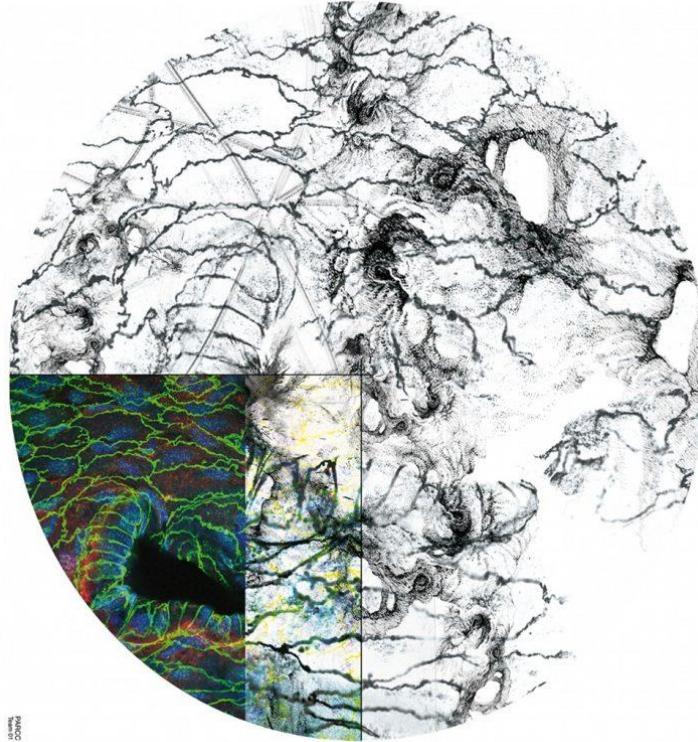
-l'identité

Iglika Christova:

A la recherche de l'unité du vivant



Rachel Carson



MICROCOSME



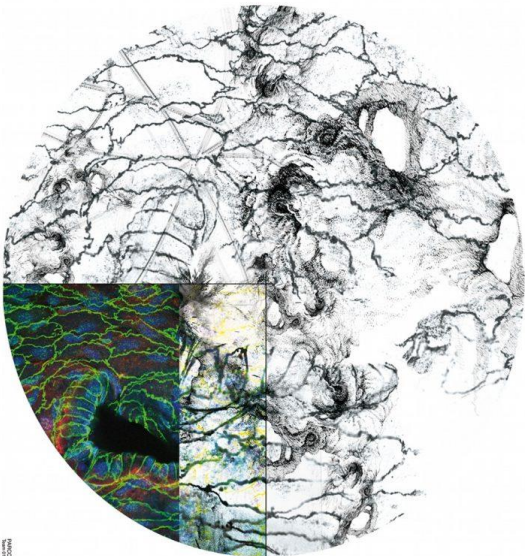
Iglika Christova

MICROCOSME

eau

arbre

humain

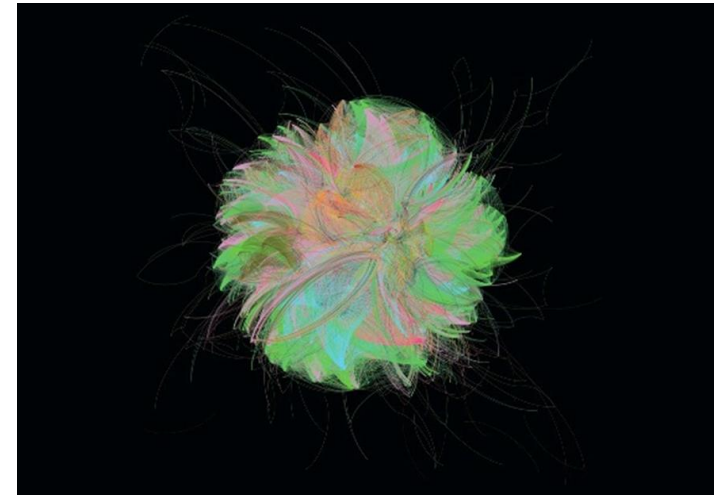


Du dessin d'observation au « dessin vivant »

François –Joseph Lapointe

biologiste et bioartiste,
Laboratoire d'écologie moléculaire et d'évolution
Université de Montréal

Qui sommes-nous?

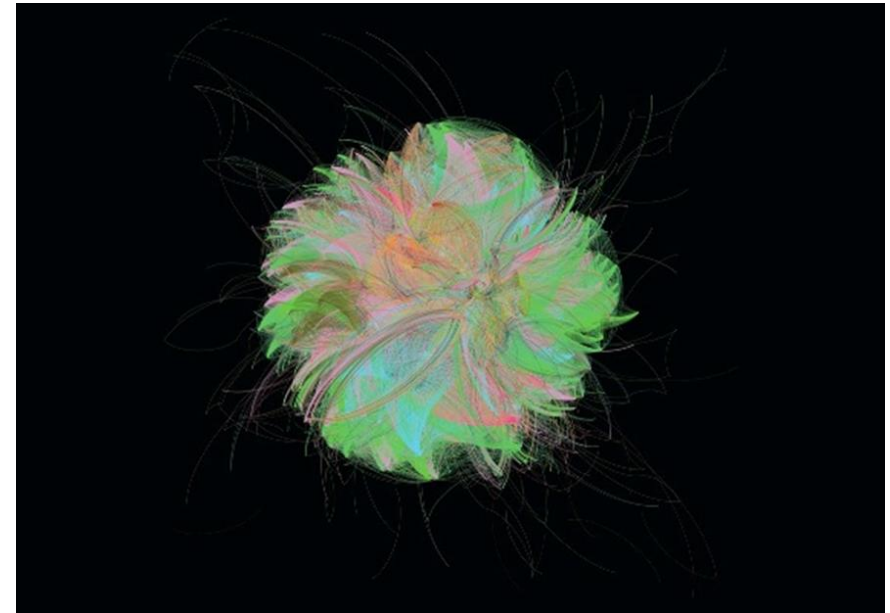


Selfies métagénomiques.

François –Joseph Lapointe

1 001 poignées de main

« Suis-je toujours le même après 1 001 *poignées de main* ? »



«*performances-expériences*»

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L'artiste questionne
la relation humain-non humain

Relation humain-végétal

*“Talk to Me is an artistic inquiry
into human and plant
communication [...] .”*



2014

Sciences du vivant: Interactions avec biologistes, bio-acousticiens...

Relation humain-végétal

“Talk to Me is an artistic inquiry into human and plant communication [...] .”



2014

Savoirs ancestraux
peuples non-occidentaux

Expérimentations



*Karine Bonneval,
Ecouter la terre*



RRR, 2019

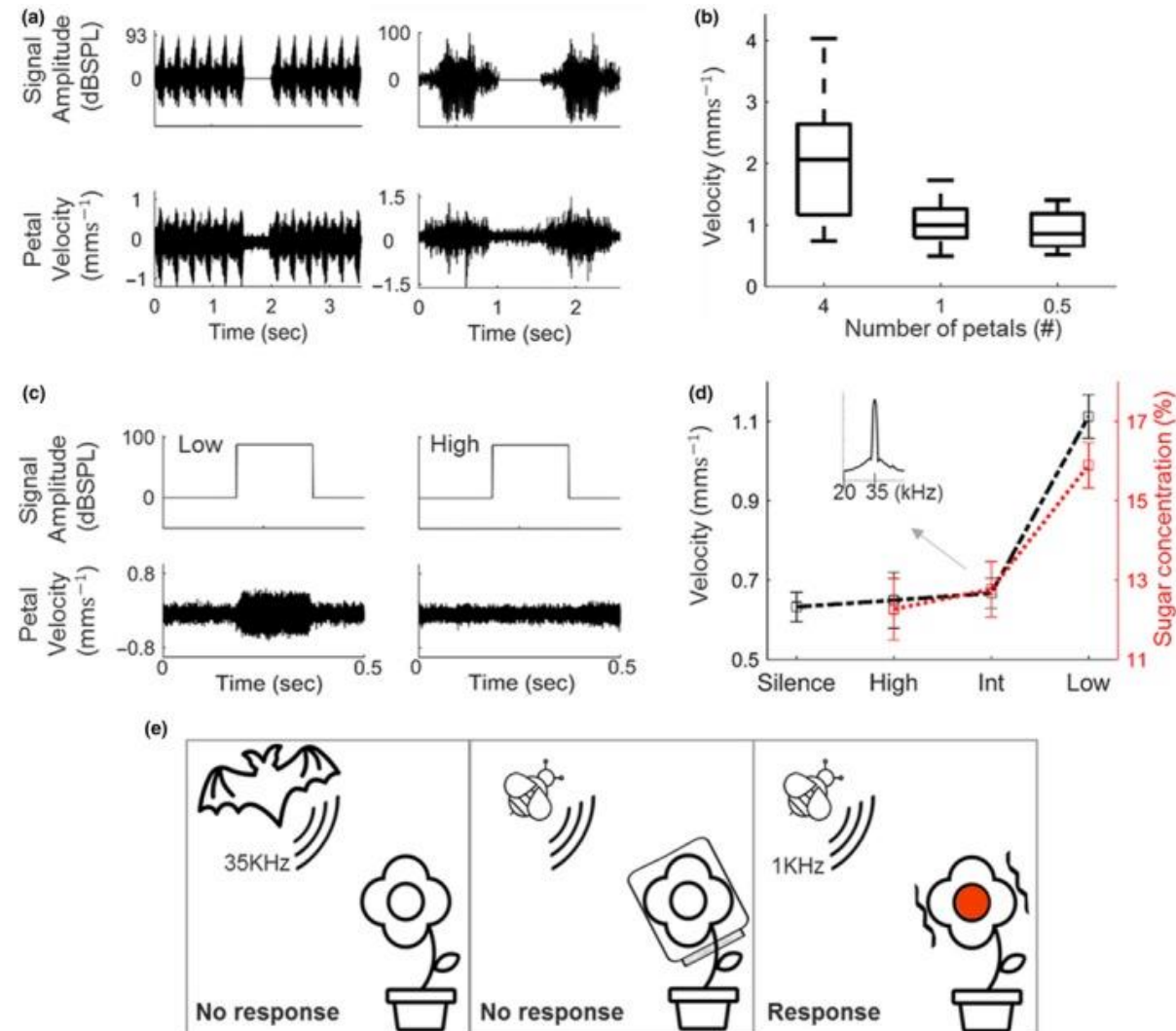
Sciences du vivant: Interactions avec biologistes, bio-acousticiens...

Sensibilité au son du végétal

Veits M, Khait I, Obolski U, *et coll.* *Flowers respond to pollinator sound within minutes by increasing nectar sugar concentration.*

Ecology Letters 2019, 22:1483-92.

<https://pmc.ncbi.nlm.nih.gov/articles/PMC6852653/>





Sound perception in plants

I. Khait ^a, U. Obolski ^{b,1}, Y. Yovel ^c, L. Hadany ^a

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<https://doi.org/10.1016/j.semcd.2019.03.006>

Abstract

Can plants perceive sound? And what sounds are they likely to be “listening” to? The environment of plants includes many informative sounds, produced by biotic and abiotic sources. An ability to respond to these sounds could thus have a significant adaptive value for plants. We suggest the term *phytoacoustics* to describe the emerging field exploring sound emission and sound detection in plants, and review the recent studies



Plant Signaling & Behavior



ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/kpsb20

A tuning point in plant acoustics investigation

Sara Allievi, Laura A...

To cite this article: Sara Allievi, Laura A...

To link to this article: <https://doi.org/10.1080/15592324.2021.1919836>

2023

Review

Sound perception in plants: from ecological significance to molecular understanding

Marie Liesbeth Demey ¹, Ratnesh Chandra Mishra ^{1,*} and Dominique Van Der Straeten ^{1,*}

In addition to positive effects on plant growth and resilience, sound alerts plants of potential danger and aids in defense. Sound guides plants towards essential resources, like water, through phonotropic root growth. Sound also facilitates mutualistic interactions such as buzz pollination. Molecularly, sound induces Ca^{2+} signatures, K^+ fluxes, and an increase in reactive oxygen species (ROS) levels in a mechanosensitive ion channel-dependent fashion. We review the

ecological significance of sound perception in plants and its molecular understanding.

Highlights

Sound vibrations caused by chewing herbivores are used by plants as a general cue to activate their defense machinery, prompting the suggestion that other ecological sound cues exist (e.g., in mutualistic plant-animal interactions).

Similar to animals, plant species may operate within a set frequency and sound intensity range. Sound frequencies and intensities outside this range may potentially have negative effects on plants.

Sound produced by humans (i.e., highway or industrial noise) can prevent plants from perceiving important environmental cues.

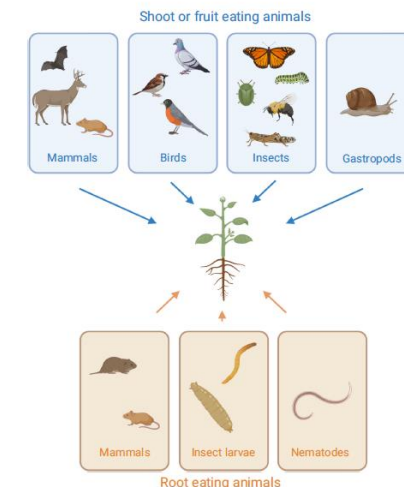


Figure 1. Plant-animal interactions where sound perception could be ecologically beneficial for plants. A distinction is made between above- and belowground animal sounds. Figure created with BioRender.com.

Phytoacoustics

Because they thrive and survive in the face of stimuli [1]. M...

Open Access Review

Ultrasound in Plant Life and Its Application Perspectives in Horticulture and Agriculture

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Abstract

Acoustic vibrations may induce different changes in plants that perceive them, and plants themselves can also emit acoustic signals. The aim of this review was to cover the past ten years of plant acoustic research and its shortcomings, with a focus on the reflecting, sensing, and emission of ultrasound by plants. Ultrasonication may alter plant growth and development, and an increasing number of studies are being carried out to investigate its effects on both in vitro plant culture and greenhouse or field plant production, as well as on the biochemical and molecular functions of plants. In this paper, we summarized the progress in the use of ultrasound in horticulture and agriculture with and development, either in vitro or in vivo, improving yield and crop quality and increasing its use as for special methodological applications, like sonication-assisted *Agrobacterium*-mediated research gaps, such as the lack of a precise mechanism for plant ultrasound emission, the role of some reactive radicals in ultrasound signaling, the effect of ultrasound on the epigenome, the plant-to-plant communication, and whether there is a specific, sound-perceiving organ, etc., were discussed. A predictive vision is described of how ultrasonication of plants and ultrasound detection technologies can be used in the future to develop green and sustainable agricultural and horticultural technologies. Furthermore, based on our current knowledge, a proposal is presented to combine them with machine learning and artificial intelligence for developing novel production technologies.

Keywords: ultrasonication; sound perception; sound emission; sonication-assisted *Agrobacterium*-mediated transformation; sustainability

+ Études en cours sur l'anthropophonie...

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Rosa Bonheur (1822-1899) , *Labourage nivernais*, 1849. Huile sur toile, 1,33 * 2,6 m. Musée d'Orsay, Paris



« Sensible(s) » - 2024 - Loona Daranlot (chorégraphe) et l'unité expérimentale de Saint-Laurent-de-la-Prée (INRAE)



DISCOW (2023-2024)

Interactions chorégraphiées avec des vaches
pour **repenser la subjectivité des animaux d'élevage**
et la **collaboration humain-animal**.



Loona Daranlot, chorégraphe danseuse

Equipe(s) de recherche

UMR Innovation (INRA/Montpellier SupAgro/ CIRAD)



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*Sébastien Mouret, Loona Daranlot, Anne Farruggia, Maria Fernanda de Torres, Pierre Roux, Michel Prieur, Laurence Denaix, Sebastien Cassen (2024) La danse pour révéler et interroger nos liens aux animaux d'élevage. **Rencontres Recherches Ruminants**, Institut de l'Elevage - INRAE, Paris, France. hal-04842671*

« Les arts **portent un vortex d'attention**
comme **un cercle vertueux** »

Pierron J-P (2023) « Pour une insurrection des sens » Voix de la Terre, Actes Sud

Conclusion

art-science

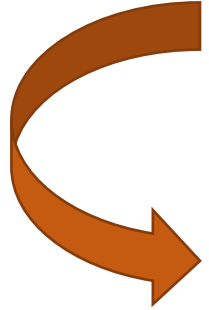


Des **rencontres fructueuses** pour les connaissances

En inter- ou intra-individuel

- qualité d'observation
- défis **expérimentaux**
- aide à l'élaboration conceptuelle
- circulation** d'idées
- nouveaux champs** d'étude

art-science



Des **rencontres fructueuses** pour les connaissances

- davantage de points communs qu'on pouvait le penser
- l'artiste a un **univers de recherche**
- temps pour faire connaissances

art-science



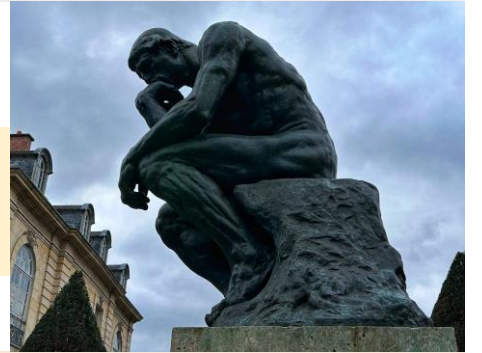
- la **transdisciplinarité**
- la **paradisciplinarité** de F-J Lapointe

art-science

« La science du XXe siècle a renoncé
à toutes ses ambitions philosophiques [...] »

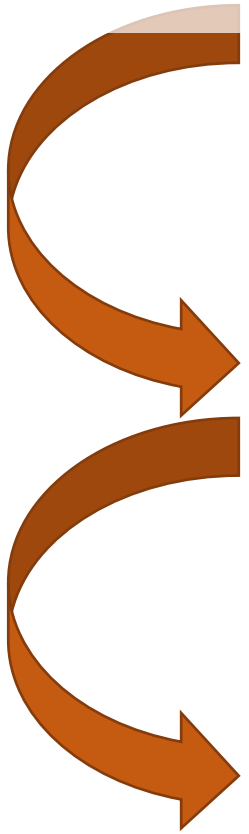
Paul Karl Feyerabend , cité dans Lucien X Polastron (2018), Philosophia naturalis, pp 134

L'art permet d'aller les retrouver...



Questions épistémologiques, ontologiques, éthiques

art-science



Reliance disciplinaire

dont sciences « naturelles » et « humaines »

Considération d'autres cultures

(nouvelles hypothèses)

Newton (1795–1805)
W Blake

ATTERIR...

Preuve de
science

Preuve
d'existence



Conseils de M Rillig :

Rule 1: Be open

Rule 10: Enjoy the challenge!

Rillig, C. M., Bonneval, K., de Lutz, C., Lehmann, J., Mansour, I., Rapp, R., Spačal, S., & Meyer, V. (2021). Ten simple rules for hosting artists in a scientific lab. *PLOS Computational Biology*, **17**, e1008675.
<https://doi.org/10.1371/journal.pcbi.1008675>

Fin.

Merci
de votre
attention.



Support, Lorenzo Quinn (2017) Biennale de Venise

