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7th International Conference on
GEOMETRIC SCIENCE OF INFORMATION
GSI'25
Saint-Malo, France
29th to 31st October 2025

André Lichnérowicz (Collège de France)

"Understanding the world depends on the forms we give it, and geometry is the grammar of these forms."

"A physical theory that cannot be formulated geometrically is an incomplete theory, because geometry gives us access to the intelligibility of reality."

« La compréhension du monde passe par les formes que nous lui donnons, et la géométrie est la grammaire de ces formes. »

« Une théorie physique qui ne se laisse pas formuler géométriquement est une théorie incomplète, car la géométrie nous donne accès à l'intelligibilité du réel. »

Société de l'électricité, de l'électronique et des technologies de l'information et de la communication

CLOSING SESSION

7th International Conference on GEOMETRIC SCIENCE OF INFORMATION GSI'25 Saint-Malo, France

29th to 31st October 2025

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Thanks to GSI'25 keynote speakers

KEYNOTES:

Prof. Nina MIOLANE
Assistant Professor, AI, UC Santa Barbara. Co-Director, AI Center, Bowers Women's Brain Health Initiative. Affiliate, Stanford SLAC
Topological Deep Learning: Unlocking the Structure of Relational Systems

Philip J. MORRISON
The University of Texas at Austin, Physics Department
Metriplectic Dynamics: A Geometrical Framework for Thermodynamically Consistent Dynamical Systems

Mário A.T. FIGUEIREDO
Instituto de Telecomunicações and Instituto Superior Técnico Universidade de Lisboa, Portugal
Extended Variational Learning via Fenchel-Young Losses

Rita FIORESI
FaBiT, University of Bologna, Italy
A Noncommutative perspective of Graph Neural Networks

Alice LE BRIGANT
Université Paris 1 Panthéon-Sorbonne
The L^p Fisher-Rao metrics a nd the alpha-connections

Frédéric BARBARESCO
THALES, Campus de Paris-Saclay, Palaiseau, France
Bicentenary of Thermodynamics and Sadi Carnot's Seminal Work: From Constantin Carathéodory's Contact Geometry Model to Jean-Marie Souriau's Symplectic Foliation Structure

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GSI'25 PUBLISHERS

| GSI'25 Proceedings |

Volume1: https://link.springer.com/book/9783032039170
Volume 2: https://link.springer.com/book/9783032039217
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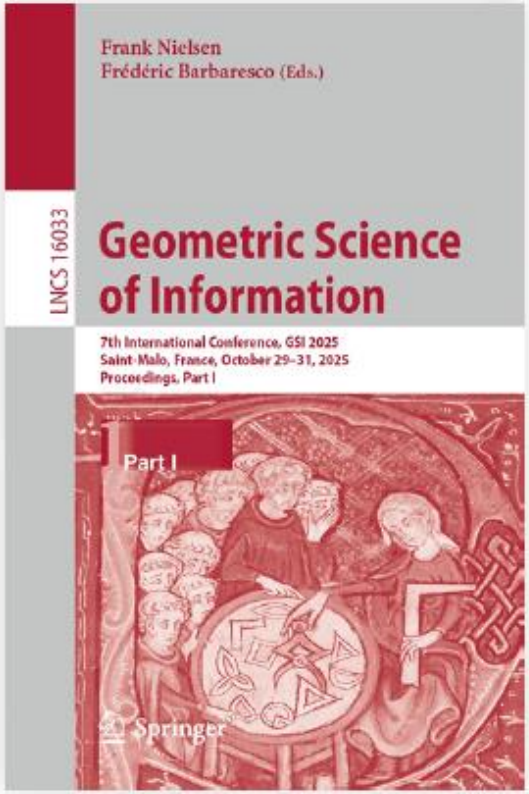
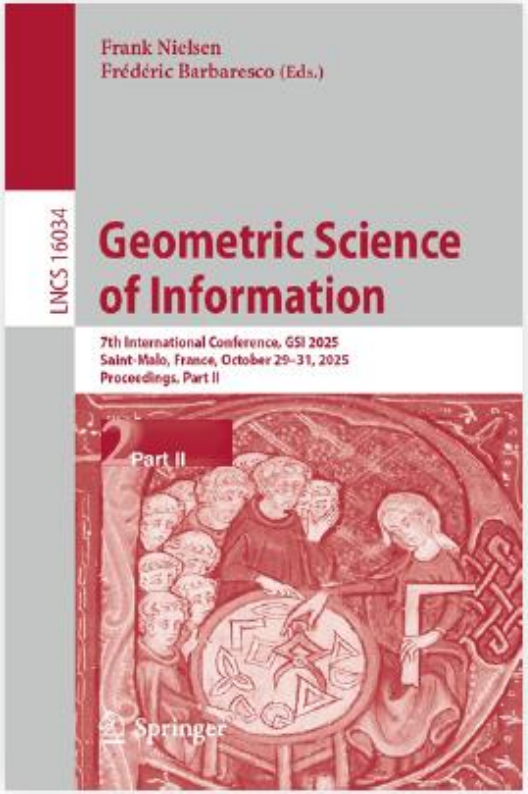
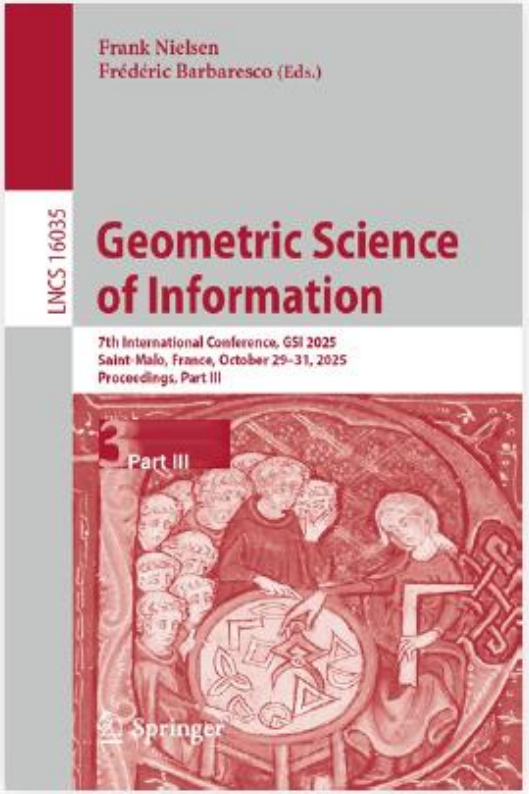
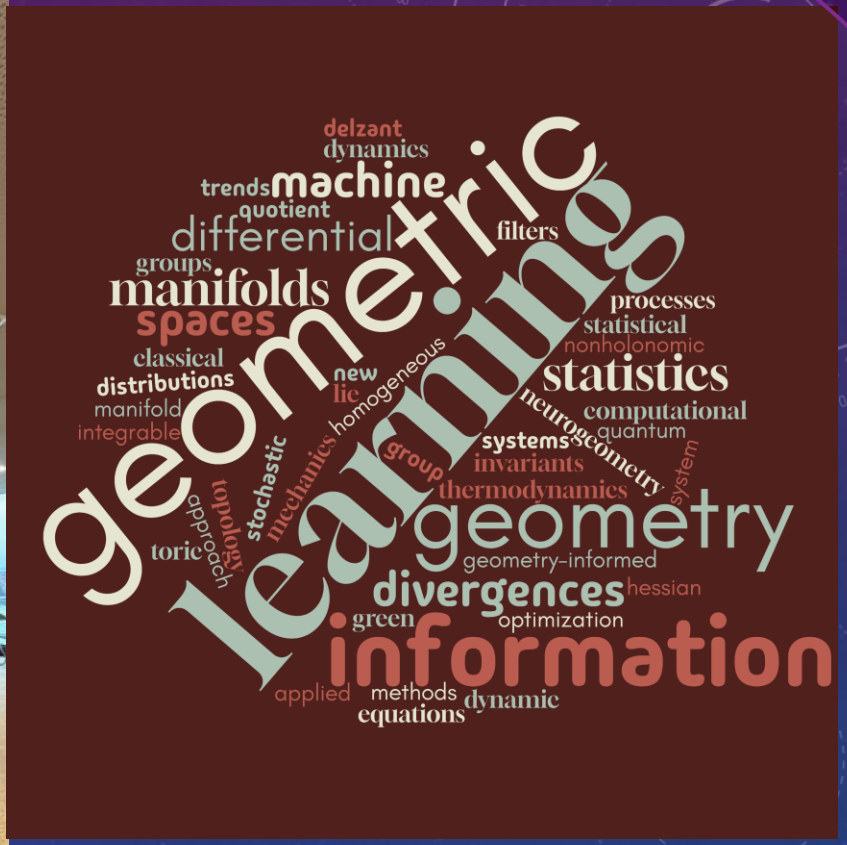






Souvenirs from Saint-Malo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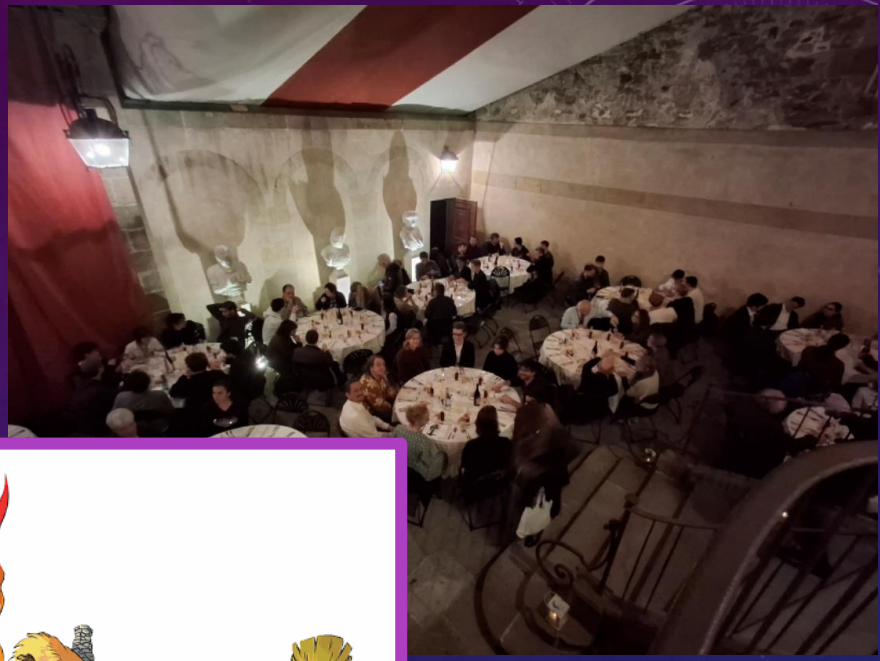
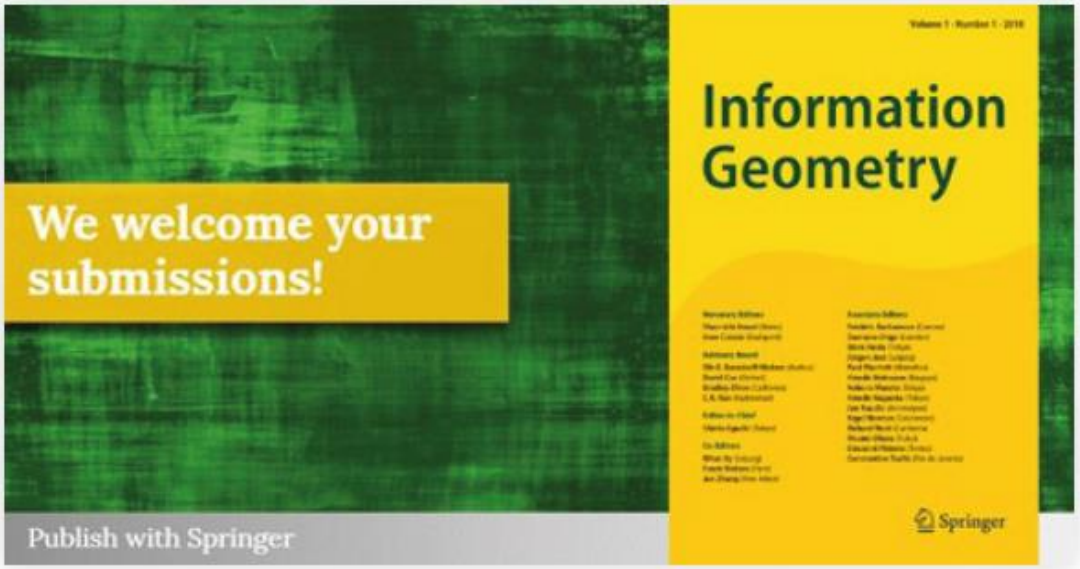


| GSI'25 Special Issue INGE |



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This special issue of Information Geometry (INGE) will include selected refereed papers presented at the 7th international conference on Geometric Science of Information (GSI'25) held in Saint-Malo, France, from 28th to 31st October 2025.

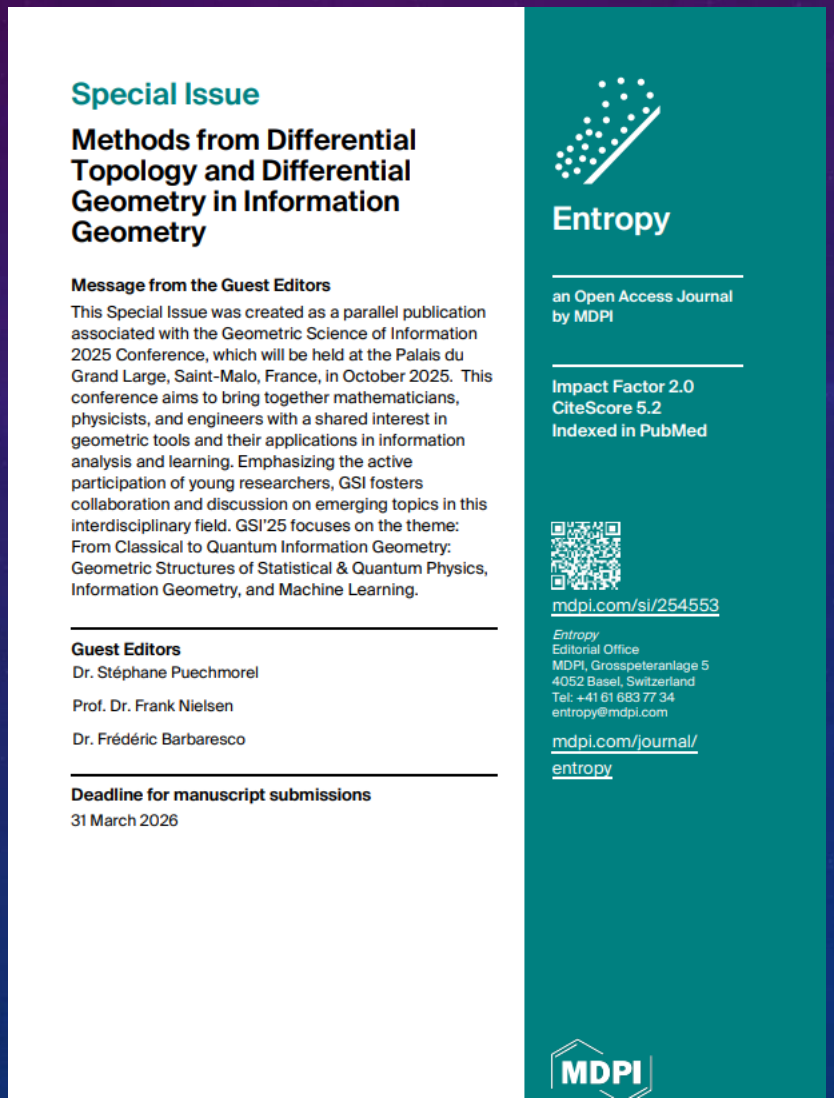
All papers will be refereed according to the high standards of INGE.

Paper Submission: Authors should submit their work to Information Geometry via the online platform: https://link.springer.com/journal/41884/submission-guidelines

Frederic Barbaresco and Frank Nielsen

GSI'25 MDPI Special Issue: Methods from Differential Topology and Differential Geometry in Information Geometry

https://www.mdpi.com/journal/entropy/special_issues/5OX49VP5BN



Special Issue

Methods from Differential Topology and Differential Geometry in Information Geometry

Message from the Guest Editors

This Special Issue was created as a parallel publication associated with the Geometric Science of Information 2025 Conference, which will be held at the Palais du Grand Large, Saint-Malo, France, in October 2025. This conference aims to bring together mathematicians, physicists, and engineers with a shared interest in geometric tools and their applications in information analysis and learning. Emphasizing the active participation of young researchers, GSI fosters collaboration and discussion on emerging topics in this interdisciplinary field. GSI'25 focuses on the theme: From Classical to Quantum Information Geometry: Geometric Structures of Statistical & Quantum Physics, Information Geometry, and Machine Learning.

Guest Editors

Dr. Stéphane Puechmorel

Prof. Dr. Frank Nielsen

Dr. Frédéric Barbaresco

Deadline for manuscript submissions

31 March 2026

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Special Issue: "Dynamics Beyond the Hamiltonian: Dissipation in Classical Metriplectic Systems and Quantum Non-Unitary Systems"

- **Guest Editor**: Dr. Massimo Materassi and Dr. Frédéric Barbaresco
- **Submission deadline**: 31 December 2025

mdpi.com/si/229747

Open for Submission!

Special Issue Information:

Non-dissipative dynamics may be algebrized via Poisson brackets, in classical Hamiltonian systems, and via commutator algebra, in closed quantum systems. Dissipation breaks down dynamics algebrization, as it cannot be reduced to Poisson–commutator algebra.

Metriplectic formalism (MF) algebrizes many classical dissipative dynamics: a semi-metric bracket increasing the system entropy represents dissipation.

Recent studies have paralleled classical dissipative structures and quantum non-unitary evolutions, while the use of coherent states has traced their macroscopic limit very transparently.

This Special Issue of Entropy intends to collect new applications and theoretical developments of beyond-Hamiltonian dynamics through differential geometric and algebraic tools, with particular reference to MF and non-unitary evolutions of quantum, and the relationship between the two. Submissions are encouraged concerning, but not limited to, the following:

- MF and non-equilibrium thermodynamics;
- Turning known theories into metriplectic systems;
- Open and dissipative quantum systems;
- Metriplectic systems in space physics, applied physics and technology and biophysics;
- Non-unitary quantum dynamics and non-Hermitian Hamiltonians.

Journal website: mdpi.com/journal/entropy **Contact**: entropy@mdpi.com

PHILIPPE AGHION NOBEL PRIZE IN ECONOMY 2025 FOR « THE THEORY OF SUSTAINED GROWTH THROUGH CREATIVE DESTRUCTION »

Sadi Carnot

Classical Thermodynamics

Engineer-Scientist 19th Century

GFLOPS/WATT

(Dissipation)

QUANTUM ENGINEERING

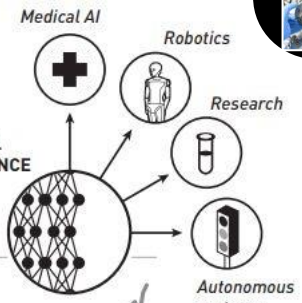
Quantum Sensors

Quantum Communications & Network

Quantum Computing

GFLOPS

(Entropy)



Pierre Rouchon

Quantum Thermodynamics

Engineer-Scientist 21th century

WATT-HOUR

(Energy)

WATT

(Power)

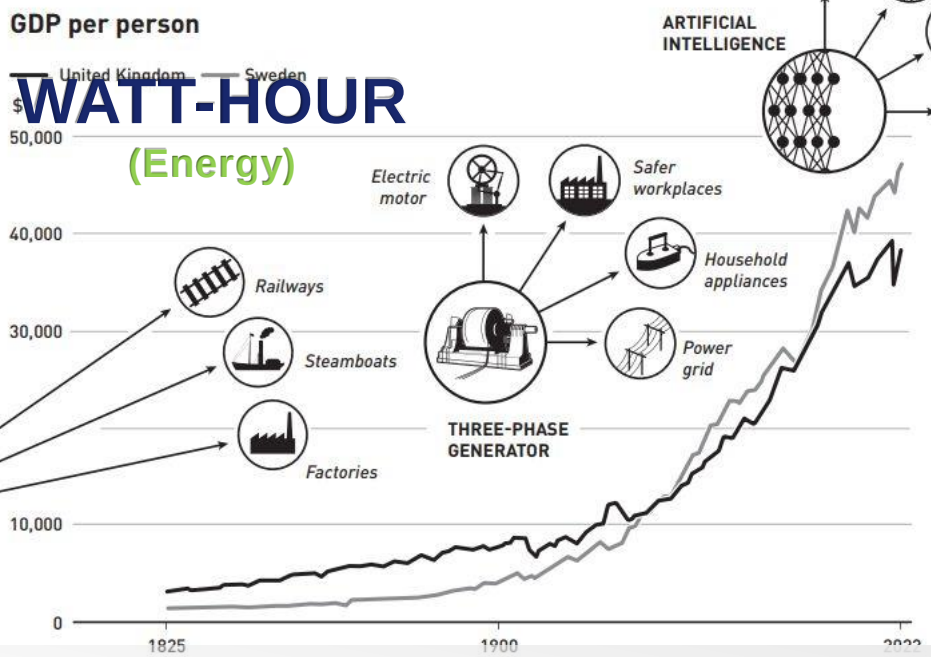


Figure 4. Over the past 200 years, annual growth has been around 1.5 per cent in Sweden and the United Kingdom. Technological innovations and scientific progress have built upon each other in an endless cycle. Data: Maddison Project Database 2023 with underlying sources from Broadberry et al. (2015), Krantz (2017), Schön and Krantz (2015).

Sadi Carnot, archetype of the French scientist-engineer

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Experimental Quantum Communications

Pr. Alain Aspect
(Paris-Saclay Univ., France)
The two quantum revolutions : from concepts to applications

Olivier Ezratty
(Freelance quantum engineer, France)
The interplay between Quantum Engineering and Quantum Science

Pr. Marco Genovese
(INRIM, Italy)
Quantum Sensors

Pr. Frank Phillipson
(TNO, Netherlands)
Quantum Computing Applications

Pr. Pierre Rouchon
(Mines-Paris Univ., France)
Quantum error correction and feedback

Richard Versluis
(TNO/TU Delft, Netherlands)
Quantum Enabling Technologies Engineering

Pr. Oscar Diez
(European Commission Representative, DG Connect, EU)
The European Commission's Vision for Quantum Engineering: Challenges and Opportunities in EU-Funded Projects

Pr. Vicente Martin
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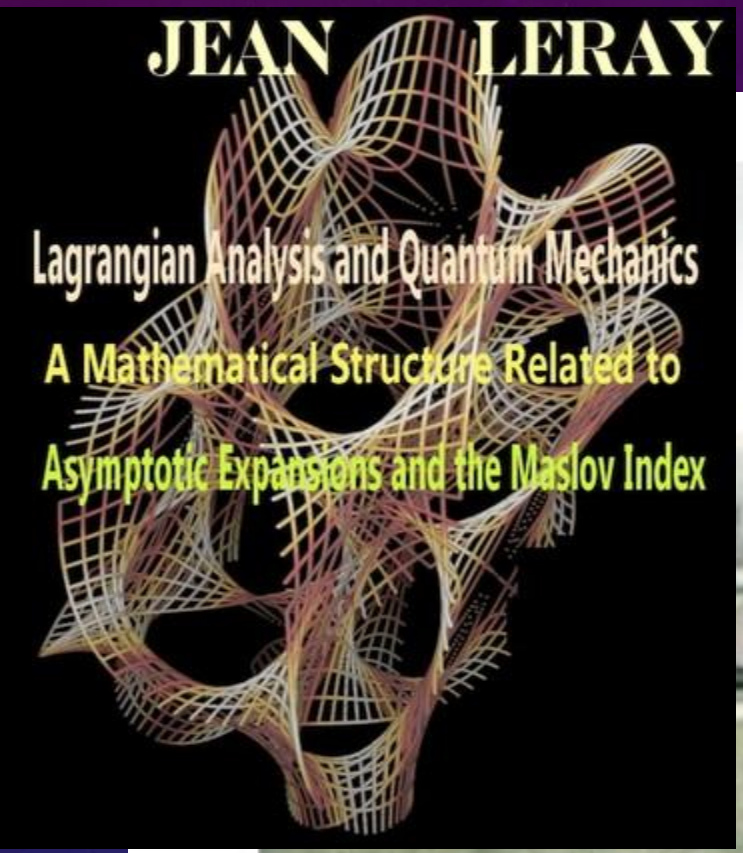
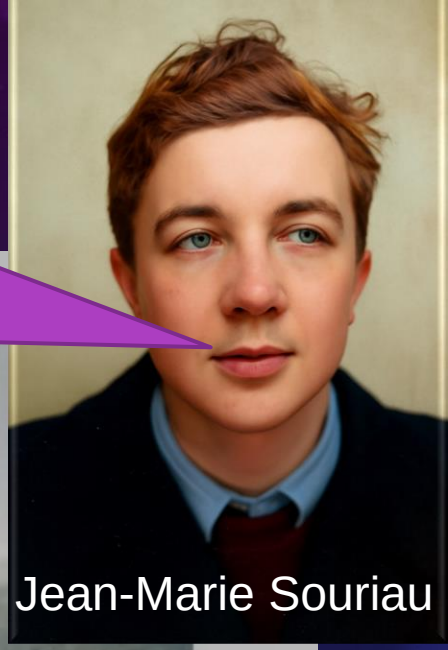
120 years birthday



Geometry is the Grammar of Nature « De Rerum Natura »

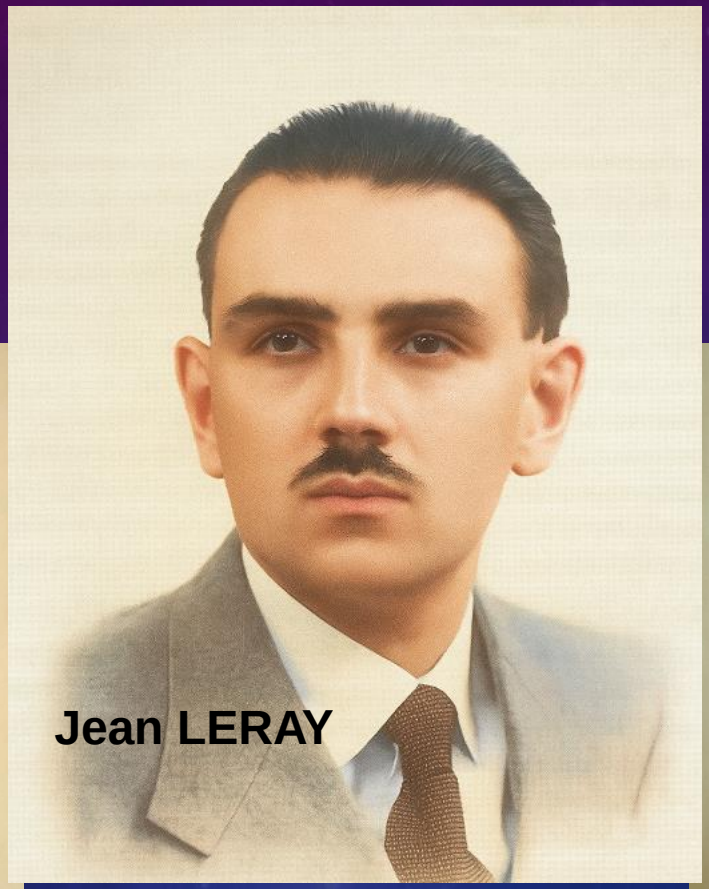

Jean-Marie Souriau

Jean Leray - Parc de Sceaux (1985)

GEOMETRIC STRUCTURES OF QUANTUM INFORMATION

C*-Algebra and Enveloping Algebra

Jacques DIXMIER



Jean LERAY

Lagrangian Analysis & Quantum Mechanics

Geometry Quantization & Quantum States Geometry

Jean-Marie SOURIAU

Paper Awards

2025

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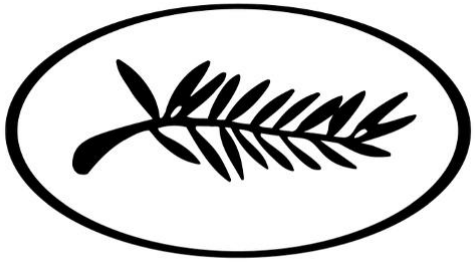

25

Official Selection GSI 2025

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9. A probabilistic view on Riemannian machine learning models for SPD matrices

Thibault de Surrel, Florian Yger, Fabien Lotte, Sylvain Chevallier

10. A Geometric Deep Learning Approach to Forecast the Time Series of Covariance Matrices

Michele Palma, Andrea Bucci

20. Minimum of Divergences with Relaxation: a Hilbertian Alternative to Duality Approach

Valérie Girardin, Pierre Maréchal

21. Global Positioning on Earth

Mireille Boutin, Rob Eggermont, Gregor Kemper

25. Learning Riemannian Metrics for Interpolating Animations

Sarah Kushner, Vismay Modi, Nina Miolane

34. Maximum likelihood estimation for the λ-exponential family

Xiwei Tian, Ting-Kam Leonard Wong, Jiaowen Yang, Jun Zhang, Sarah Kushner, Vismay Modi, Nina Miolane

35. Torsion of α-connections on the density manifold

Lorenz Schwachhöfer

48. Log-Euclidean Frameworks for Smooth Brain Connectivity Trajectories

Olivier Bisson, Xavier Pennec, Yanis Aeschlimann, Samuel Deslauriers-Gauthier

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59. Universal kernels via harmonic analysis on Riemannian symmetric spaces

Cyrus Mostajeran, Franziskus Steinert, Salem Said

60. Orientation Scores should be a Piece of Cake

Finn Sherry, Chase van de Geijn, Erik Bekkers, Remco Duits

64. On Invariant Conjugate Symmetric Statistical Structures on the Space of Zero-Mean Multivariate Normal Distributions

Hikozo Kobayashi, Takayuki Okuda

67. Confidence Bands for Multiparameter Persistence Landscapes

Ines Garcia-Redondo, Anthea Monod, Qiquan Wang

69. Universal Collection of Euclidean Invariants between Pairs of Position-Orientations

Gijs Bellaard, Bart M. N. Smets, Remco Duits

77. Note on harmonic exponential families on homogeneous spaces

Koichi Tojo, Taro Yoshino

85. Information Geometry on the l^2-Simplex via the q-Root Transform

Levin Maier

86. Geodesic flow of a statistical manifold associated to Souriau's thermodynamics

Jérémie Pierard de MaujouyDaisuke Tarama

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94. Intrinsic LDA for 3D Shape Classification via Parallel Transport

Maria Victoria Ibáñez-Gual, Jorge Valero-Zorraquino, Amelia Simó, Vicent Gimeno i Garcia

97. Geometry of Cells Sensible to **Curvature** and Their Receptive Profiles

Vasiliki Liontou

99. Eigengap Sparsity for Covariance Parsimony

Tom Szwagier, Guillaume Olikier, Xavier Pennec

103. Statistical models built on sub-exponential random variables

Barbara Trivellato, Paola Siri

109. A Historical Perspective on the Schützenberger-van~Trees Inequality: A Posterior Uncertainty Principle

Olivier Rioul

114. A new symmetry group for Physics to revisit the Kaluza-Klein theory

Géry de Saxcé

136. Tree inference with varifold distances

Elodie Maignant, Tim Conrad, Christoph von Tycowicz

140. Lie-Adaptive Inversion of Signature via Pfeffer-Seigal-Sturmfels Algorithm

Remi Vaucher

145. Reduction of exact symplectic manifolds and energy hypersurfaces

Julia Lange, Bartosz Zawora

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Aleae Geometria et mechanicae

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"THE PIROUETTE:
I who spin under the hand of another am safe neither in the evening nor in the morning because the one under whose hand I spin returns so suddenly that he waits neither today nor tomorrow."

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