

# Francis Pagaud

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## Work experiences

- Nov 2024 – Present **Post-doctoral researcher in fluid mechanics and hydrogen combustion** CAPS, ETH Zürich, Switzerland  
Study low-Mach aeroacoustic instabilities, hydrogen flame thermoacoustic instabilities and plasma-assisted combustion.  
• Conduct LES and modal decomposition of aeroacoustic instabilities.  
• Process plasma-induced kernel growth in ultra-lean hydrogen-air mixtures.  
• Compose MSCA Fellowship proposal on hydrogen annular thermoacoustic instabilities
- Sep 2021 – Aug 2024 **Ph.D. student in Plasma Physics** Laboratoire de Physique à l'ENS de Lyon  
Investigate plasma-surface interactions, identify waves and instabilities and understand energy transport in a rotating plasma column.  
• Design and exploitation of new electrostatic probes to measure plasma properties.  
• Control the plasma rotation using a hot emissive cathode to locally inject electrons.  
• Model plasma-cathode interactions and solve the heat budget equation numerically to understand the behaviour of a cathode immersed in a plasma.  
• Look at plasma fluctuations using probes, high-speed imaging and modal decomposition.  
• Upgrade and automate via LabView the hardware device to a two-plasma column Von Kármán flow configuration to analyze the turbulent transport in a strongly-sheared plasma.  
• Communicate with novice and specialized audience through weekly meetings and weekly Ph.D. students fluid mechanics seminars.  
• Collaborate on experimental helicon wave physics with Swiss Plasma Center, Lausanne, Switzerland with a 2-weeks visit. **Awarded a mobility grant.**
- Apr 2021–July 2021 **Internship in Plasma Physics** Swiss Plasma Center, EPFL, Switzerland  
Build a plasma source, design compensated and double Langmuir probes and characterize plasma properties and plasma-antenna coupling.
- May 2019–July 2019 **Internship in Soft Matter** Imperial College London, England  
Study ultrastable lipidic foams stabilized by adsorbed wax crystals. Elaboration of a rigorous protocol, pendant drop experiments, high-speed imaging of ultrasound-driven oscillating bubbles.
- Sep 2018–Apr 2019 **International Physicist Tournament** ENS de Lyon, France  
Create a scientific approach around a list of 17 multidisciplinary experimental physics problems as captain and crewmate of a team of master students. Exploration of the physics at stake and debates with other teams. Ranked 1<sup>st</sup>/11 nationally, 2<sup>nd</sup>/20 internationally.
- June 2018–July 2018 **Internship in Biophysics** PMMH, ESPCI Paris, France  
Explore the cell migration under local stress of the acto-myosin, supposed to be the one adopted by cancerous cells. Widefield and fluorescent microscopy camera imaging and analysis.



## Education

- Sep 2021–Aug 2024 **Ph.D. thesis** Université Claude Bernard Lyon 1, France  
Fluid mechanics, electromagnetism, waves, instabilities, transport.  
**Awarded a CDSN doctoral grant.** Mentor: Nicolas Plihon  
*Graduation date: 01 July 2024*
- Sep 2018–July 2021 **Physics Master's degree** ENS de Lyon, France  
Fundamental physics Master's degree oriented towards experiments.  
*Summa Cum Laude*
- Sep 2019–July 2020 **Agrégation degree in physics & chemistry** ENS de Lyon, France  
Highly competitive French examination for teaching at high school or university levels. Rank: 2<sup>nd</sup>/1069.
- Sep 2017–July 2018 **Normalian school curriculum, physics Bachelor degree** ENS de Lyon, France  
Bachelor in fundamental physics and applications. *Magna Cum Laude.*
- Sep 2015– July 2017 **Prep school for "Grandes Écoles"** Lycée Victor Hugo, Besançon, France

## Languages

**French** ★★★★★  
**English** ★★★★★  
(CAE grade : 197/210)  
**German** ★★★★★  
(B2 level)  
**Spanish** ★★★★★

## Hobbies

Rugby  
Outdoor sports (running, trekking...)  
Cinema  
Literature

## Skills

- Instrumentation
- Modal analysis
- Image analysis (POD, 2D-FT, bicoherence...)
- Modelling, simulations (LES)
- Communication
- Manuscript writing and revision
- Supervision of trainees
- Public speech
- Autonomy

## Topics of interest

- Experimental physics
- Plasmas
- Waves and instabilities
- Transport
- Combustion

## Publications

1. **F. Pagaud**, V. Dolique, S.P.H. Vincent, B. Trotabas, R. Gueroult and N. Plihon (2025) "Plasma potential control in a magnetized plasma column using thermionic emission", *Plasma Sources Science and Technology*, 34 (6), [10.1088/1361-6595/ade476](https://doi.org/10.1088/1361-6595/ade476)
2. **F. Pagaud** (2024) "Control and stability of magnetised plasma columns: plasma-cathode interactions and helicon plasma operation", *Université de Lyon*, [theses/tel-04679798](https://theses.tel-04679798)
3. **F. Pagaud**, V. Dolique, N. Claire and N. Plihon (2023) "Emissive cathode immersed in a plasma: plasma-cathode interactions, operation and stability", *Plasma Sources Science and Technology*, 32 (11), [10.1088/1361-6595/ad0b2f](https://doi.org/10.1088/1361-6595/ad0b2f)
4. S. Saha, **F. Pagaud**, B. P. Binks and V. Garbin (2022) "Buckling versus crystal expulsion controlled by deformation rate of particle-coated air bubbles in oil", *Langmuir*, 38, [10.1021/acs.langmuir.1c03171](https://doi.org/10.1021/acs.langmuir.1c03171)
5. N. Plihon, G. Legrand, **F. Pagaud**, A. Chemin, J. Ferrand and N. Taberlet (2021) "The physics of Magnus gliders", *American Journal of Physics*, 89 (9), [10.1119/10.0004981](https://doi.org/10.1119/10.0004981). Journal cover.
6. **F. Pagaud** and L. Delance (2021) "Driven oscillations of a curved object under a laminar jet of water", *Emergent Scientist*, 5 [10.1051/emsci/2020002](https://doi.org/10.1051/emsci/2020002)

## Teaching experiences

- Feb 2025 – Present **Teaching assistant, thermodynamics course - 12h/year** ETH Zürich  
Supervision of exercise sessions, tutoring and exam correction for 2<sup>nd</sup> year Bachelor students.
- Sep 2023 – Jan 2024 **Teaching assistant, fluid mechanics course - 24h/year** ENS de Lyon, France  
Supervision of exercise sessions and tutoring for Master students.
- Sep 2021 – July 2024 **Teaching assistant, general physics course - 40h/year** ENS de Lyon, France  
Examination of oral sessions and supervision of practical work on electromagnetism, optics, thermodynamics and mechanics for Master students preparing "Agrégation".
- Sep 2021–July 2023 **Physics examiner of oral sessions- 24h/year** ENS de Lyon, France  
Weekly oral examination for 1<sup>st</sup> year of undergraduate prep schools students in a scientific school curriculum.
- Sep 2019–July 2020 **Physics examiner of oral sessions - 20h/year** Lycée La Martinière Monplaisir, Lyon, France  
Weekly oral examination for 2<sup>nd</sup> year undergraduate physics and technology students.
- Sep 2017–July 2019 **Physics tutor for disadvantaged high school pupils** ENS de Lyon, France

## Conferences

<b>GDR EMILI 2023</b> (Nancy, France)	October 2023	Oral	Operation and stability of a emissive cathode in a high-density plasma <b>Best oral presentation prize</b>
<b>EPS Plasma 2023</b> (Bordeaux, France)	July 2023	Oral & Poster	Operation and stability of a emissive cathode in a high-density plasma
<b>RJP Lyon 2023</b> (Lyon, France)	June 2023	Oral	Operation and stability of a emissive cathode in a high-density plasma
<b>EPS Plasma 2022</b> (Online)	July 2022	Poster	Plasma potential control using an emissive cathode <b>Best poster prize</b>
<b>MagNet US 2022</b> (Online)	June 2022	Poster	Plasma potential control using an emissive cathode