Julien Fuchs: Full curriculum vitae

PROFESSIONAL ADDRESS
LULI Laboratory
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PERSONAL INFORMATION
Julien FUCHS (see orcid.org/0000-0001-9765-0787), French, born 28/09/1969

EDUCATION

2008	« Habilitation à Diriger des Recherches » (Université Paris-Sud, France)
1995/1998	Ph.D. in Physics (INRS Québec/LULI-CNRS/CEA)
1995	« Agrégation de physique »
1992	Optics Engineer (M. Sc.), « École Supérieure d'Optique » (Orsay, France)

CURRENT and PAST POSITIONS

1998/Present	LULI Laboratory of CNRS (École Polytechnique, France). « Directeur de recherche » (Senior scientist). *Leader of the "SPRINT" group* with 1 scientist, 2 post-docs, 4 PhDs.
2014/Present	Institute of Applied Physics, Russian Academy of Sciences (Nizhny Novgorod, Russia). *Leading scientist of a "megagrant" project* (2014-2016) with 21 scientists and 12 students.
2003/2004	University of Nevada, Reno (Reno, NV, USA). *Associate Research Professor*
2002/2003	General Atomics (San Diego, CA, USA). *Scientist in the Fusion group*

SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS
Since 2006, I have supervised 15 PhD students at Ecole Polytechnique (France) and I have currently four PhD students. I supervised 13 post-docs. I also supervise around 4 Master Students per year in internship, French but also foreigners.

TEACHING EXPERIENCE
2006/2014-Associate Professor at Ecole Polytechnique (France).

ORGANISATION OF SCIENTIFIC MEETINGS (only the most recent ones)
►Co-organizer of the Nuclear Photonics 2020 workshop, June 7-11, 2021, Japan (online); https://www.photon.osaka-u.ac.jp/NP2020Kurashiki/index.html
►Co-organizer of the Modern Problems of Laser Physics 2021, 22 - 29 August, 2021, Novosibirsk, Russia**;** https://mplp2021.laser.nsc.ru/
►Organizer of the **"**LaB2022" devoted to magnetized HEDP plasmas, Dec19-21, 2022, Paris (France).

COMMISSIONS OF TRUST
Referee for the following journals: Nature, Nature Physics, Nature Comm., Phys. Rev. Lett., Phys. of Plasmas, Plasma Phys. and Controlled Fusion, IEEE Trans. App. Phys. Lett., Optics Lett., J. of App. Phys., Phys. Rev. Special Topic-Accel. and Beams, Rev. of Sci. Inst.

MAJOR COLLABORATIONS
- Collaborations in France: CNRS, LNCMI (Toulouse), Sorbonne U., LERMA (Paris), CEA-DAM, CNRS, CELIA (Bordeaux).
- International collaborations: Palermo Observatory/INAF (Italy), Princeton U. (United States), Tel-Aviv U. (Israel), Stanford/SLAC (United States), University of Osaka (Japan), INRS-Québec, ELI-Beamlines (Prague), UCSD (San Diego, CA).

MAJOR SCIENTIFIC CONTRIBUTIONS
Having an optics engineer background, I was attracted to do a PhD in the domain of **ultra-intense lasers and applications**, which appeared to me as a domain at the frontiers of the current technology, with new opportunities to address many open physics questions. After finishing my PhD, which was centred on the very first investigations of the "fast ignitor" concept for inertial confinement fusion (ICF), I decided to spend a few years at the LULI laboratory to expand my knowledge of conventional **ICF physics**, introducing novel concepts and methods, *e.g.* plasma or polarization smoothing methods to reduce harmful growth of instabilities triggered by the propagation of high-power lasers in the plasma. I then realized that current methods of diagnosing ICF plasmas could profit from the bright sources of particles and radiation produced by ultra-intense lasers. This drove me to investigate the generation of such novel sources, in particular **compact and**

ultracold high-energy ion beams that offer unprecedented radiography possibilities for dense plasmas and fields within. I generalized this approach of developing new tools based on ultra-intense lasers by opening up the field of "**damageless optics**", *i.e.* optics & laser components (*e.g.* amplifiers) using dense plasmas in order to circumvent the damage threshold limitation of traditional optics. Using such technique would allow us accessing a whole new field: ultra-relativistic light-matter interactions. In parallel, during a sabbatical in the USA in 2002-2004, I collaborated with physicists working with Z-pinches, which prompted me to unlock what I saw as the rich, although little explored, physics opportunities offered by **magnetizing dense laser-plasmas**. Back at LULI, I took upon myself the overcome the technical challenges of creating a stable, strong external magnetic field source that could be coupled to laser produced plasmas. Finally, with the partnership of the LNCMI laboratory (France), a solution was found. The non-explosive device offers a very large-scale (>cm), long (> µs) and strong (up to 60 T) homogeneous magnetic field, *i.e.* world-wide unique in comparison with competing efforts in the USA, UK and Japan. It allowed us to perform significant advances in the domain of **laboratory astrophysics**. Lately, I designed, set up and qualified one of the two experiment rooms of the new **10 PW "Apollon"** laser facility, partly within the framework of the **ERC (European Research Council) Advanced project** "GENESIS" that I manage (2019-2024) on generating ultra-bright neutron sources.

FUNDING ID

Below, I list only the most recent research grants I have been **directly responsible and PI of.**

No.	Title	Budget (k€)	Funding source	Dates (beginning/end)	Objectives/Results
1.	PINNaCLE	540	ANR – France	2018-2022	Development of an ultra-high brightness neutron beamline on the 10 PW Apollon laser facility.
2.	GENESIS	3,500	ERC	2019-2024	Demonstration of the nucleosynthesis of heavy elements through the r-process in the laboratory
3.	ONDEA	100	IRSN/CNRS	2023-2024	Development of neutron diagnostics

Publications overview

I published 206 articles (see orcid.org/0000-0001-9765-0787), of which 96 in the last 10 years (in 54 of those I am senior or corresponding author), in peer-reviewed journals (40 Phys. Rev. Lett., 2 Science, 5 Nature Phys., 1 Nature), plus 82 conference proceedings. Citation counts based on "Google scholar" indicate: H-index: 56 (here, it has to be taken into account that the laser-plasma community is quite smaller than other communities in physics, *e.g.* condensed matter), citations: 13024, average citation per article: 21.56. See publication list for a full list of publications.

Granted patents

- Patent 2006 filed in Germany, then world-wide, *„Laserbestrahlter Hohlzylinder als Linse für Ionenstrahlen", Deutsche Patentanmeldung 10 2005 012 059.8 PILZ* (patent holders: T.Toncian, O .Willi, J. Fuchs and M.Borghesi).
- Patent 2008 filed in the USA, *"Targets and processes for fabricating same", PCT International Application* No. PCT/US2006/035267, filed on September 12, 2006 et United States Patent Application No. 12/066,479 March 11, 2008 (patent holders: J. ADAMS, T. COWAN, J. FUCHS, G. KORGAN, S. MALEKOS, N. RENARD, Y. SENTOKU)
- Patent 2012 filed in France, then extended to the EU, USA and China (n°1000167687 INPI) and extended to the EU, USA, China, « Procédé et dispositif de génération d'un faisceau de particules chargées focalisé de fort courant » (J. Fuchs, B. Albertazzi, H. Pépin et E. d'Humières)
- Patent 2013 filed in France (n°1000183285, INPI), « Dispositif de magnétisation de plasma laser par champ magnétique pulsé » (J. Fuchs, B. Albertazzi, J. Béard, O. Portugall and H. Pépin)

Industrial innovation and design

In the early 2000, I worked implementing (for the first time in France) adaptive optics on a high-power laser. This was made in the frame of a PhD thesis, following which the student created a startup (PHASICS) that has developed into a successful company (http://www.phasicscorp.com/) with now twenty employees. More recently, I participated in the creation (in March 2014) of another company "Light Stream Labs" (http://www.lightstreamlabs.com/), which aims to promote our expertise in the realization of laser-matter diagnostic and targets systems. I see mostly my role as counsel and guide in this activity.