

PERSONAL INFORMATION Romain JL. FETICK +33 6 78 33 73 35 romain.fetick@lam.fr romain.fetick@onera.fr r.fetick@gmail.com

Date of birth 4th January 1993 | Nationality French

WORK EXPERIENCEOct 2020 – Present **Research engineer in optics**

Office National d'Etudes et Recherches Aéronautiques (ONERA), Paris - France

Development of adaptive optics control loops for the future Extremely Large Telescope (ELT).
Study of the impact of atmospheric turbulence and scintillation on imaging systems.May 2016 – Dec 2016 **Internship (end of master degree)**

Massachusetts Institute of Technology (MIT), Cambridge - USA

Simulation of neutron star sensitivity for the LIGO gravitational wave detector.

Apr 2015 – Aug 2015 **Internship (gap year of master degree)**

SETI Institute, Mountain View - USA

Control of millimetre scaled segmented mirrors to shape a laser wavefront.

EDUCATION AND TRAINING2017–2020 **PhD - Thesis: "Image processing for adaptive optics in astronomy"**

Aix Marseille Université - France

Development of image deconvolution methods for astronomy. Applications to images of asteroids shot with the ESO-VLT telescope.

Project: Leader of the PAPHYRUS project to design and install an adaptive optics system at Observatoire de Haute Provence. Study of the expected performances.2012–2016 **Aerospace engineering diploma**

ISAE Supaéro - France

Majors in space systems design, mission analysis and laser physics.

Project: Member of the ENTRYSAT cubesat project (CNES funding). Responsible of computing the received solar power. I attended the tests in thermal vacuum chamber.2015–2016 **Master of astrophysics**

Université Paul Sabatier - France

Master in astrophysics, heliophysics and planetology, obtained in parallel of my *ISAE Supaéro* engineering degree.2010–2012 **Preparatory school for national competitive exams**

CPGE Pierre de Fermat - France

"Classe Préparatoire aux Grandes Ecoles" program for national competitive exams.

Project: Study of the electronic backstreaming current into ionic engines. A small scale experiment has been performed in vacuum chamber.2010 **Bachelor degree in science**

Lycée international Victor Hugo - France

PUBLICATIONS AND TEACHING

- Publications**
 - Fetick et al, 2018, "Turbulent and AO PSF as convolutive orders", MNRAS
 - Fetick et al, 2019a, "Vesta seen by VLT/SPHERE", A&A
 - Fetick et al, 2019b, "Physics based model of the AO corrected PSF", A&A
 - Fetick et al, 2020, "Blind deconvolution in astronomy", MNRAS
 - Fetick, 2020, PhD thesis "Traitement d'image en OA", Aix Marseille Univ.
 - in the author list of multiple publications about the PAPHYRUS AO system and the ESO asteroid Large Program
- Teaching**
 - FOCUS summer school to master students at OHP
 - Following the PhD thesis of two students working on topics similar to my PhD
- Vulgarization**
 - Multiple talks about my PhD work to laboratories seminars and international conferences
 - Participation to the city science festival of Marseille, to promote astronomy for children
 - Seminar about adaptive optics in spanish to Colombian students

PERSONAL SKILLS

Mother tongue French

Other languages	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	C1	C1	C1
Spanish	B1	B1	B1	B1	B1

- Organisational / managerial skills**
 - Leader of the PAPHYRUS project (see PhD section above)
 - Representative of the PhD students for the LAM laboratory (2019-2020), I organized the "PhD day" for all students to give a presentation of their work
 - Member of the SUPAERO student union (2012-2013)
- Computer skills**
 - OS: Microsoft, Linux
 - Programming: Matlab, Python, C++
- Sports**
 - Martial arts (more than 15 years in club): judo, karate, kobudo
 - Scuba diving: FFESSM level N1 (-20m deep)
 - Hiking, biking, handball (2 years in club), yoga
- Hobbies**
 - Arduino personal projects: programming and electrical design
 - Amateur astronomy and astrophotographer
- Rewards**
 - Laureate 2010 of "Fondation La Dépêche" based on academic criteria for students with low family income to pursue higher education.
 - Best PhD prize 2020 of the Aix-Marseille Université doctoral school ED-352.

Thierry Fusco

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Adaptive Optics Scientist

At the forefront of research and developments in Adaptive Optics (AO) both in France and in Europe for more than 20 years, I carried out a thesis dedicated to the proposal of theoretical, numerical and operational concepts to overcome the two fundamental limitations of adaptive optics: partial correction and anisoplanatism. Since 2000, I mainly worked for the astronomical community in order to develop innovative **AO systems that have led to the first images of extrasolar planets on the VLT**.

I was at the heart of the integration, testing and commissioning of **NAOS the first OA of the VLT**. Then, I took responsibility for **SAXO, the extreme AO of SPHERE**. As AO scientist for the project, I managed to go from very first conceptual ideas to an operational implementation on the telescope in less than 12 years, making **SAXO the most efficient AO system in the world**. In parallel, I am deeply involved in image processing developments and I propose new concepts of wavefront sensors (Filtered Fourier Wavefront sensors) to **further improve the precision, sensitivity and final contrast of future planet finder instruments**.

Finally, I am involved in the new adaptive optics of GNAO (Gemini North new AO system) and the future **Giant European Telescope (ELT)**. As AO scientist of the **HARMONI** project, I am again in charge of its multiple adaptive optics modes and especially the SCAO one that will allow reaching the ultimate performance of the instrument and the telescope in order to **pave the way to new discoveries, in particular in the field of detection and characterization of extrasolar planets**

Main ERC Panel number : PE9_13 (and potentially PE9_2; PE9_3, PE10_14)

Diploma, Title, Awards

- 2020 : French Academy Scientific Award "Grand prix de Charles Defforey"
- 2020 : French Aeronautics and Astronautics Association "Scientific Excellence Price"
- 2019 : Senior Research Director, ONERA
- 2012 : Research Director, ONERA
- 2009 : Fabry de Gramont award (Société Française d'Optique)
- 2008 : Habilitation à Diriger les Recherches: "*Adaptive Optics and Post-processing for astronomy : new challenges and new solutions*"
- 2000 : Thesis in Physics from université de Nice – Sophia Antipolis : "*Partial correction and anisoplanatism in adaptive optics*". With honnors

Work Experience

- Since 2021 : Science Deputy Director of the ONERA's Optics Department (more than 200 collaborators)
- 2011 – Today : Invited researcher at Laboratoire d'Astrophysique de Marseille
- 2000 – Today : Researcher at ONERA, optics Department
- 2000 – 2001 : Postdoc at LESIA (Meudon) : NAOS (VLT first AO system) integration and tests

Research Activities

My research activities are characterized here by a unique position at the interface between astronomical applications and complex technological developments with a "system" and co-design approach (instrumentation - signal processing / associated images). This translates into 4 major, and closely related, items;

- **Instrumentation for high angular resolution**: development of new AO concepts for "high contrast imaging" and "large field imaging": from the theoretical concepts to sky validation and integration into operational astrophysical instruments
- **Wave-Front Sensing**: Improvement of existing concepts (weighted center of gravity for the Shack-Hartmann and Filtered Shack-Hartman, Phase diversity) and proposal of new concepts (LIFT, Fourier Filter wavefront sensors). From theoretical to on-sky experimental validations (see ANR WOLF)
- **Propagation and control of the wavefront**: characterization of the propagation channel, measurement and prediction of turbulent phenomena (laser propagation and pre-compensation, propagation in complex media...)
- **Signal and Images post-processing**: Myopic deconvolution (MISTRAL algorithm), PSF reconstruction. Theoretical developments and practical applications (close collaboration with astronomers for image processing for more than 20 years)

Publication

213 referee publications with 16 as 1^{er} author, 52 within the 3 first authors and 22 as last author.

+400 international conferences with proceedings, 41 as 1st author and 133 within the 3 first authors

H_{index} = 56 (Google scholar) / 41 (ADS), citations : 12685 (Google) / 6939 (ADS)

Scientific and instrumental responsibilities

Since 2022	Science deputy director of the Optics Department
2019 – 2023	PI of the WOLF,ANR : innovatie wavefront sensors for high contrast imaging
2015 – 2026	« <i>AO scientist</i> » for HARMONI, ELT first light Spectro-Imager
2006 – 2015	« <i>AO scientist</i> » for SPHERE, VLT planet Finder In charge of the SAXO project (Sphere AO for eXoplanet Observation)
2009 – 2011	PI of the ATLAS project: phase A study for a « Laser Tomographic AO » for the ELT
2006 – 2010	In charge of the pre-design of the EAGLE AO (MOAO) system (ELT project)
2004 – 2005	AO responsible for the VLT Planet Finder project (future SPHERE project)
2017 – 2020	In charge of the VASCO research project (Visible AO and Sky Coverage Optimisation)
2013 – 2015	In charge of the NAIADÉ research project (New Approach for Imaging with AO and Deconvolution)
2008 – 2011	In charge of the CASSIOPEE research project: internal coordination of ONERA efforts on E-ELT
2011 – 2013	Project scientist of ODISSEE : Low Orbit Satellite imaging from the ground
2001 – 2002	On sky commissioning of NAOS, the first AO system of the VLT
2000 – 2001	NAOS Integration and tests in lab.

Animation et administration of research

- President of ONERA Optics Department Scientific Council
- Member of Paris-Saclay “Institut de la Lumière » Council
- Member of ONERA Scientific Council
- Member of Scientific Council for the Labex FOCUS
- Member of Scientific Council for GIS-PHASE gathering High Angular Resolution team from ONERA and Paris, Grenoble and Marseille Observatories (2008 à 2014)
- Feature editor JOSAA (vol 21) et Applied Optics (vol 49) special issues on AO
- Chairman (2009) and co-chairman (2011 - today) for the international conference « *AO for ELT* »
- Chairman (2016) and co-chairman (2017 - today) for the international conference « *Wavefront Sensing in the ELT era* »
- SOC of SPIE conference « *Astronomical Telescope* » (2008 to 2018)
- SOC of « *AO workshop week* » (2018 - today)
- Expertise for NSF, HRC, STFC, ANR, H2020, Pole de compétitivités (France et Belgique) ...
- *Referee* for JOSAA, App. Opt., Opt. Let., A&A, MNRAS, Opt. Com., Opt. Exp., JATIS ...
- Participation to PhD and HDR defence (~3 per an).

Supervision of young researchers

- Supervision or co-supervision of 20 PhD
- Supervision of 11 postdocs

National and international collaborations

- Main collaborators: J-F Sauvage, L Mugnier, C Petit, JM Conan et V Michau (ONERA), B Neichel, J-L Beuzit, K Dohlen, K El-Hadi et A Costille (LAM), D Mouillet (IPAG), R Bacon (CRAL)
- Main international collaborators: STScI, ESO, LBT, ESO, INAF-Arcetri, INAF-Padova, Oxford Univ, Durham Univ, Porto Univ, UK-ATC

Dissemination

- CNRS movie «Un œil sur les exoplanètes» (<https://lejournal.cnrs.fr/videos/sphere-un-oeil-sur-les-exoplanetes>)
- Interview (France inter et France info, podcasts ONERA)
- Press : Le Monde, Le Figaro, Photoniques
- Participation to « journées du Ciel et de l’Espace »
- Participation to « ONERA, Journées de la Science »
- Conferences at « collège de France »
- Conferences « nuit des étoiles, Journées de la Science »
- Participation to « C’est pas sorcier » on the VLT