

NEW SPACES

SPACE CENTRAL TO THE BIG CHALLENGES OF THE NEXT DECADE

Mioara MANDEA
Strategy Directorate
Head «Science Coordination» Department

JOURNÉES DES JEUNES CHERCHEURS
CNES

JUNE 4TH AND 5TH, 2024

OUR 4 STRATEGIC PRIORITIES

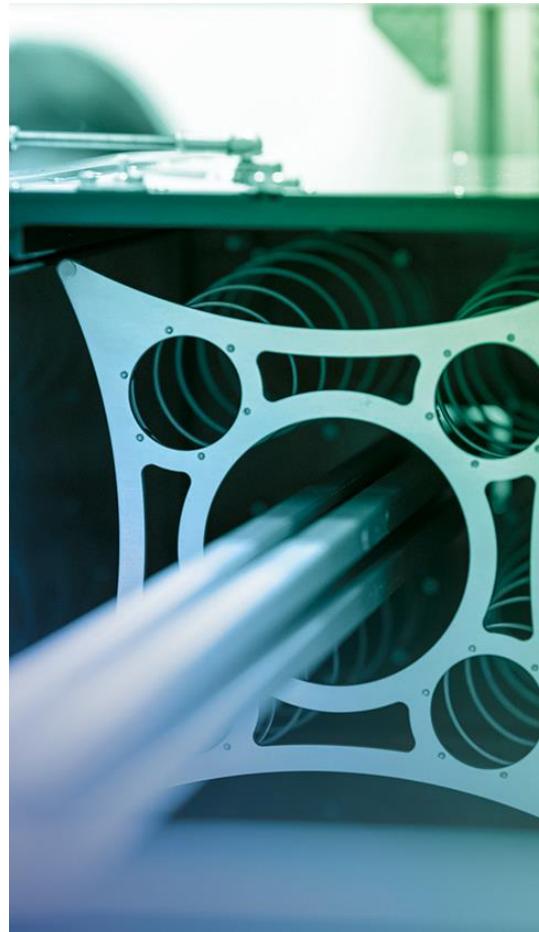
STRENGTHEN

our **strategic independence**



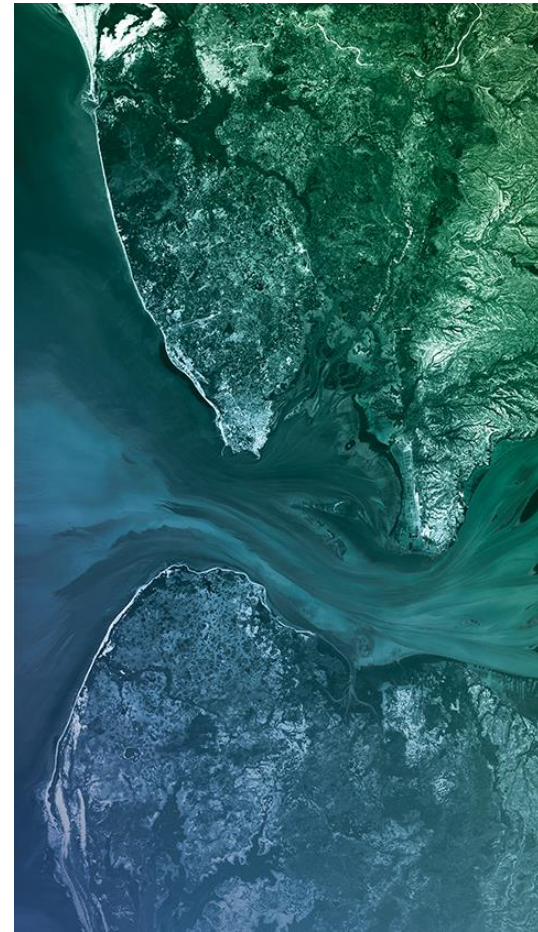
SUSTAIN

a **competitive** space ecosystem



WORK

towards a **sustainable world**



EXTEND

our **scientific excellence**



STRENGTHEN OUR STRATEGIC INDEPENDENCE

ARIANE 5



© CNES/ESA/Arianespace/
CSG video and photo dept./P.Baudon, 2022

ELA 4 / ARIANE 6



© CNES/ESA/Arianespace/
CSG video and photo dept./P.Baudon, 2022

THEMIS, CALLISTO, PROMETHEUS



© CNES, 2020

SYRACUSE



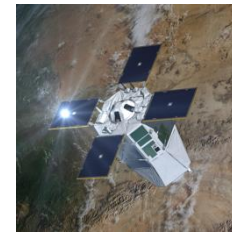
© Thales Alenia Space/E. Briot, 2016

CERES



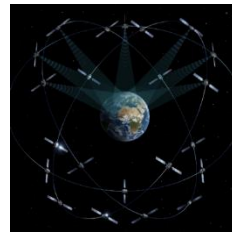
© CNES/Mira Production, 2020

CSO



© CNES/Mira Production/R.Parot, 2019

CONSTELLATIONS



© CNES/ill.P.carrii, 2022

SUSTAIN A COMPETITIVE SPACE ECOSYSTEM

FRANCE 2030

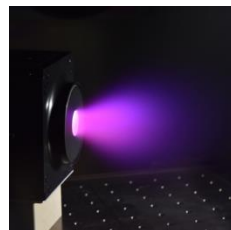


CONNECT' BY CNES



© CNES/E.Grimault, 2022

R&T / GSTP



© Comat

NESS



© CNES/T.De Prada, 2022

KINEIS



© CNES/II.O.Sattler, 2022

CO3D / SPACE
INSPIRE ONESAT



© Airbus

ARTES



© ESA-P.Carril

WORK TOWARDS A SUSTAINABLE WORLD

COPERNICUS / FUTUREO



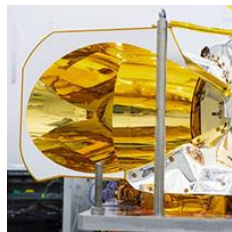
© Copernicus Sentinel Data, 2022

PLEIADES



© CNES/II.D.Ducros, 2018

MICROCARB



© CNES/E.Grimault, 2022

TRISHNA



© CNES/II.M.Regy, 2021

BALLOONS



© CNES/M.Clavery, 2022

SWOT



© CNES/II.D.Ducros, 2021

SCO



© Airbus DS, 2015

EXTEND OUR SCIENTIFIC EXCELLENCE

SVOM



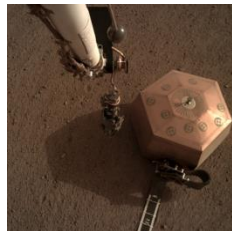
© CNES/E.Grimault, 2022

PERSEVERANCE



© NASA/JPL Caltech/MSSS, 2021

SEIS / INSIGHT



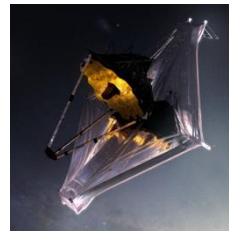
© NASA/JPL Caltech, 2019

GATEWAY / ARTEMIS



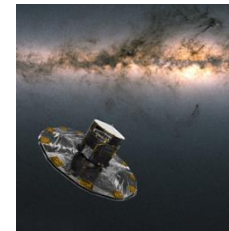
© ESA/D. Ducros, 2022

MIRI / JAMES WEBB



© NASA GSFC/CIL/A.
Manrique Gutierrez, 2021

GAIA



© ESA/ATG medialab/Gaia/DPAC

JUICE



© ESA-SIM Photography

THE FRENCH SPACE ECOSYSTEM



70,000
PEOPLE



ACADEMIA

54 curricula
100 lecturers
2,400 students/yr.



SCIENCE

154 laboratories
600 teams
200 PhD students
3,000 people



INSTITUTIONS

30 establishments
5,000 people



INDUSTRY

246 establishments
32,445 people



SERVICES

352 establishments
29,449 people

INTERNATIONAL REACH

CNES
is working with

44

countries around
the world

129

International agreements
currently effective*



** figures and map as of 1 January 2023*

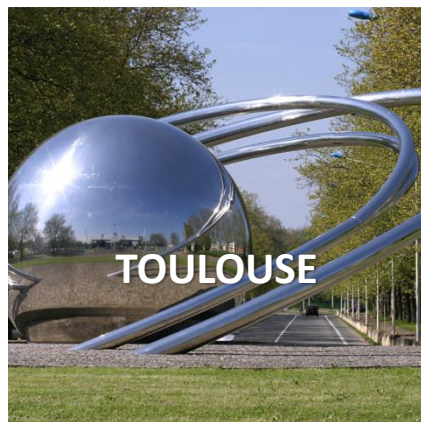
FOUR FIELD CENTRES

2,361
PEOPLE AT FOUR CENTRES



FRENCH GUIANA

Guiana Space Centre
(270)



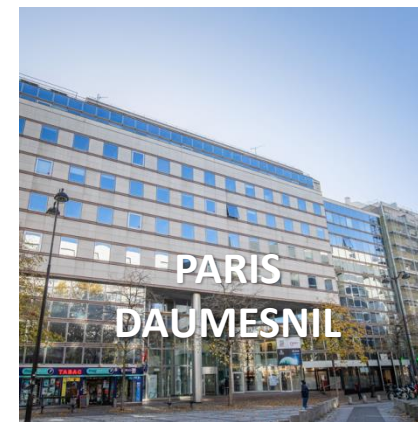
TOULOUSE

Toulouse Space Centre
(1716)



PARIS
LES HALLES

Head Office
(187)



PARIS
DAUMESNIL

Space Transportation
(188)

ORGANIZATION CHART



PHD AND POST-DOCTORAL GRANTS

Each year, CNES allocates more than hundred doctoral and postdoctoral research grants to students interested in space activities.

Strong support to early career researchers:

- Train young researchers and engineers in the space field
- Ensure a scientific environment of excellence and a strong capacity for innovation
- Support space research in the fields of user sciences (space transport systems, orbital systems, user sciences of space resources, human and social sciences).
- Strength the links between early career researchers, CNES and industry (Yearly Career Researchers Days – JC1-JC2; Paris Air Show, etc.)

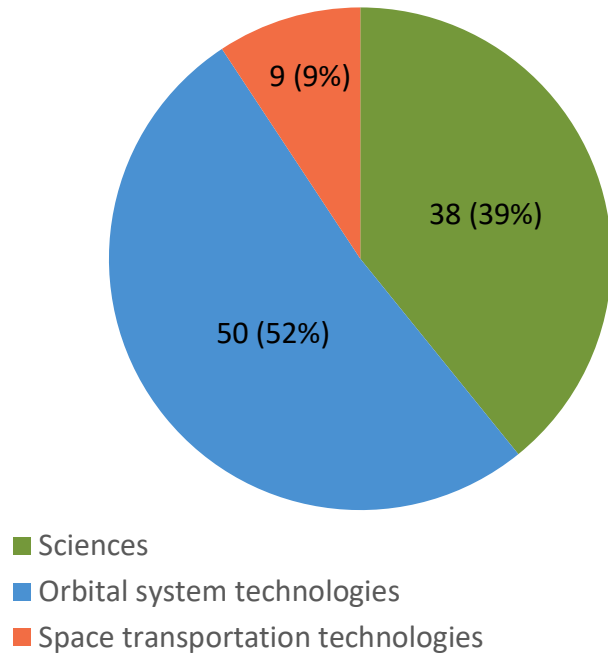
PHD AND POST-DOCTORAL GRANTS

Some figures:

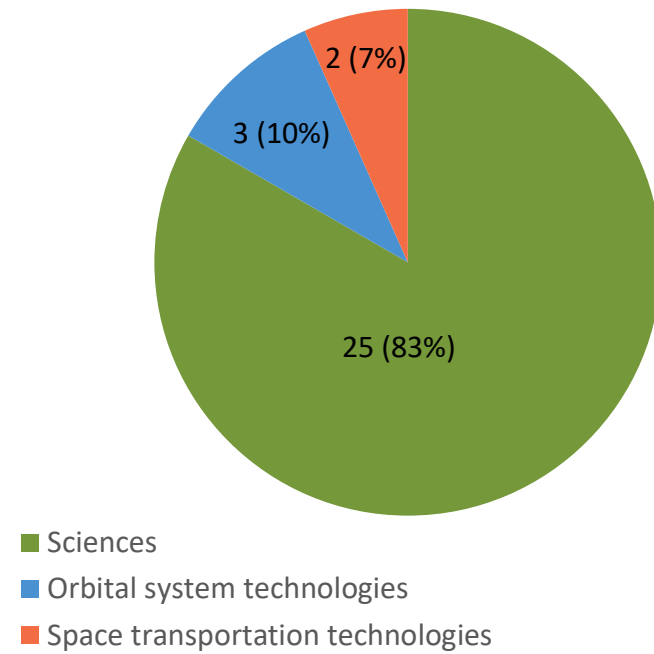
Since 1986 > 3000 ECS have received a CNES support

> 300 labs involved in the CNES PhD & post-doc programs

Promotion 2023 : 97 PhD



Promotion 2023 : 30 postdoctorate



LES JEUNES CHERCHEURS AU CNES EN QUELQUES CHIFFRES

4 priorités

FORMER les jeunes chercheurs
dans le domaine spatial

ASSURER un environnement
scientifique d'excellence et
une forte capacité d'innovation

SOUTENIR la recherche spatiale

RENFORCER les liens
entre les jeunes chercheurs,
la recherche académique,
le CNES et l'industrie



100 jeunes chercheurs

en moyenne chaque année

+ 3000



jeunes chercheurs

ont bénéficié du programme CNES depuis **1986**

60

laboratoires



hébergent des jeunes chercheurs
CNES chaque année



1 appel

à sujet/an
et **1 appel**
à candidature/an

7,5

millions d'euros

Coût annuel du programme



1000

candidatures reçues

chaque année

LES JEUNES CHERCHEURS AU CNES

EN QUELQUES CHIFFRES

25

Co-financeurs

(industriels, organismes de recherche et collectivités publiques)



6

domaines liés à la recherche spatiale :



- Sciences humaines et sociales
- Sciences microgravité
- Sciences de la Terre
- Sciences de l'Univers

→ **49,6%** des allocations délivrées par le CNES

- Technologies Systèmes Orbitaux

→ **41,7%** des allocations délivrées par le CNES

- Technologies et Transports Spatiaux

→ **8,7%** des allocations délivrées par le CNES

92%

de soutenance des thèses



3 ans et 3 mois

Durée moyenne



d'un doctorat

MANY THANKS

- **Kader AMSIF** – DS/DAP/SUE (partie sciences de l'univers)
- **Anne-Marie CERRATO** – DRH/PRH/AG
- **Bruno CUGNY** – DTN
- **Aurore DUPUIS** – DS/PF/TD
- **Émilie LABARTHE** – DTS/FIT/RAP
- **Jean-Marc LAHERRERE** – DTN/TPI
- **Sophie LE GAC** – DS/DAP/EOT
- **Laurent LEFLOCH** – DRH/PRH/AG
- **Mioara MANDEA** – DS/DAP/CS
- **Christian MUSTIN** – DS/DAP/SUE (partie exploration et exobiologie)
- **Aurélie STRZEPEK** – DS/PF/TD
- **Céline TISON** – Campus de la Donnée DTN/CD
- **Cécile VIGNOLLES** – DS/DAP/CS

Cathy BRIEU – DS/DAP/CS & our partener **Carte Blanche**

JC1 - YESTERDAY

Voici une réponse d'un doctorant de l'année dernière à la question « **ces journées JC vous semble-t-elle utile** » ?

« *Le point le plus important reste pour moi de **mettre du contexte sur les thèses**. Je n'ai pas beaucoup de contact avec mes encadrants CNES, mais ces journées sont motivantes en **voyant le projet global derrière**, et le contexte dans lequel nous travaillons. Elles aident **à donner un sens aux thèses individuelles**.* »

JC1 - TOMORROW

PROMOTION 2023: ANDREA MIA GHEZ

PROMOTION 2023: ANDREA MIA GHEZ

Like many children fascinated by the Apollo missions, Andrea Ghez dreamed of exploring other terra incognita beyond Earth. However, she had since become a Professor of Astrophysics at the University of California, having completed her PhD in 1992 at the California Institute of Technology (Caltech) under the direction of Gerald Neugebauer, one of the pioneers of infrared astronomy. In an interview in 2017, she revealed that she had considered a number of different career paths, including that of an astronaut and a dancer. Could she have foreseen that, a few years later in October 2020, she would receive one of the most prestigious scientific awards, the Nobel Prize in Physics for her work on black holes, especially the supermassive one that reside at the centre of the Galaxy? She thus became the fourth woman to receive this distinction since Marie Curie in 1903.

This award rewards her perseverance and scientific career beyond her dreams. Andrea Ghez's observations of stars orbiting the centre of the Milky Way soon suggested that a supermassive and invisible object, like a black hole, must reside there. It required several decades of research to identify the motions of the star cluster in order to determine the mass of the central black hole, named Sagittarius A*. After ten years of near-infrared observations using adaptive optics, Andrea Ghez and her team made their first estimate in 1998.

In 2012, she refined the mass estimate of this supermassive black hole (approximately 4 million solar mass), and in 2019 confirmed that the observations were fully compatible with the general theory of relativity. In 2020, she discovered mysterious objects orbiting the black hole, opening up new ways of research.

The woman who had aspired to become an astronaut or a ballerina has become a leading expert in the field of astrophysics, determined to unravel the mystery of the fateful ballet of stars at the centre of our galaxy, choreographed by a black hole!

NOUVEAUTÉS DU PROGRAMME DOCS/POSTDOCS : LES THÈSES 100% CNES


Par Bruno CUGNY
Expert politique technique

**More than 960 people
With many specific technical resources
(labs and simulation tools)**


ORGANIZATION TECHNOLOGY & DIGITAL DIRECTORATE

March 2024


DTN
Technology & Digital Directorate
Marie-Anne CLAIR




DAD
Deputy Directorate
Jean-Claude SOUYRIS



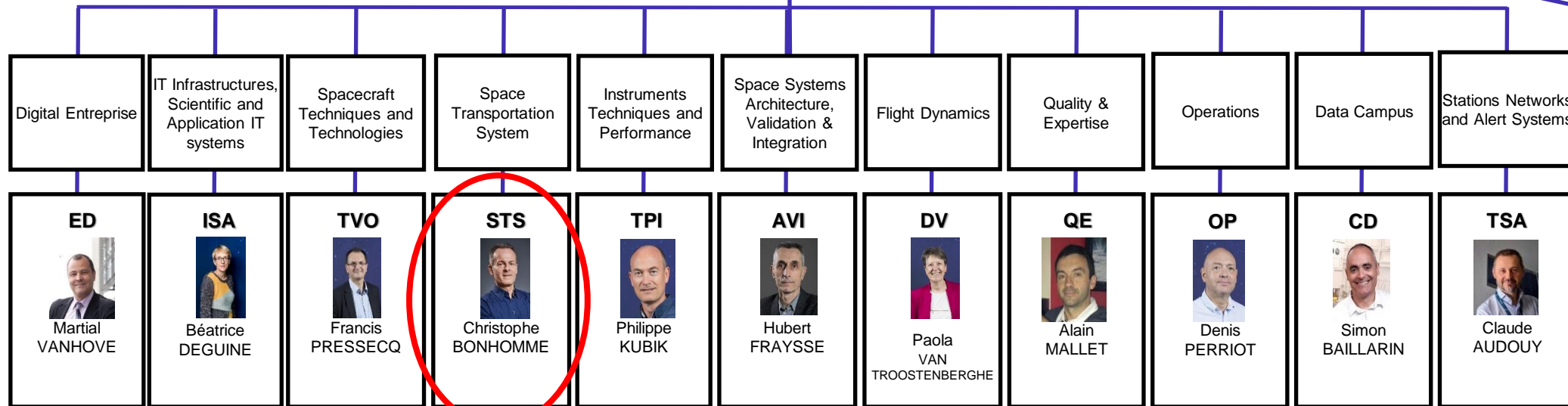
GEIPAN
Unidentified Aerospace
Phenomenon and
information Section



PTC
Core Technical Policy
Clémence PIERANCO



RMS
Skills and Resources
Thierry FLORIAN

Emilie Labarthe (Space Transportation)

Bruno CUGNY (Orbital System)

PHD AND POST-DOCTORAL GRANTS

Technological subjects : Orbital Systems and Space Transportation :
~40 thesis and 10 postdocs per year

- Allow the training of specific (or even new) skills and also participate in the dissemination of information between partners as well as increasing the skills of the actors involved (CNES, laboratories, industrial co-financers)
- Promote the development of multi-physics simulation tools and the development of unique experimental means or tests (thanks to additional R&T budgets) with our academic partners for the benefit of CNES and industry

PHD AND POST-DOCTORAL GRANTS

Some examples of themes covered, allowing the training of key skills (engineering sciences) which then irrigate the space ecosystem

- Mastery of technologies specific to the field of launchers and their environment, combustion modeling, motorization, new propellants, specific avionics, etc.
- Remote sensing (extraction of information for applications) with increasing use of AI techniques
- Instrumentation (including critical optical and microwave technologies, quantum technologies)
- Telecom/navigation (including critical microwave technologies, antennas, amplifiers, propagation, system optimization, etc.)
- Modeling of the spatial environment and its effects on components and materials
- Mechanical, thermal, batteries, materials, radiation/contamination, electronic/opto components,
Propulsion, flight dynamics, control laws...

PHD AND POST-DOCTORAL GRANTS

In 2023 decision to increase the number of PHD and Postdoc on CNES Sites (+10 in 2023 and +20 in 2024)

- Under specific conditions :
 - Link of the subject with CNES top priorities (technical, technological, strategic interest of the subject)
 - Candidates on CNES sites (Toulouse, Paris, Guyana), with CNES Supervisors significantly involved (compared to standard thesis)
 - Increased attention to the choice of supervisors and candidates !
 - Use of CNES simulation tools/computation means and/or access to specific databases and/or experimental means
 - 100% CNES funding : to quickly secure the thesis and not be linked to a specific industrial partner
- Doctoral school: Agreement from an external or CNES thesis director (HDR)
- CNES is in general co-supervisor of the thesis

ATELIER DE DISCUSSION – 10 H 30 – 12 H 30

L'objectif

Chaque participant présente brièvement son sujet de thèse ou son projet de postdoc lors des tables rondes. Ensuite, un sujet de thèse est sélectionné dans chaque groupe pour être présenté de manière ludique et compréhensible par tous à tous les participants.

Le sujet sélectionné ne sera pas présenté par le thésard concerné mais par un autre volontaire du groupe.

La mise en œuvre

1. Lors des tables rondes, chaque participant présente son sujet de thèse ou son projet de postdoc en 2/3 minutes. (35 min)
2. Ensuite, chaque groupe choisit un sujet de thèse à présenter à toute la salle. (5 min)
3. Une fois le sujet choisi, le groupe identifie la personne qui va présenter le sujet et prépare en 15 min une présentation orale de 3 min dans un esprit ludique et compréhensible par tous. (15 min).
4. Chaque groupe dispose de 3 minutes pour présenter le sujet de thèse sélectionné devant tous les participants. (45 min)
5. Après les présentations collectives, il pourra y avoir une session de questions-réponses afin de favoriser les échanges



FIND US ON
CNES.FR

