

# SPACE NEWSLETTER

MARCH 2021



UNI@VERSO LO SPAZIO

*University Mediterranea of Reggio Calabria*



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*University Mediterranea of Reggio Calabria*



Greetings to all,

Exciting events have taken place over the last few months and we have set ourselves many ambitious goals for the future. Recent sounds and images from Mars, captured by Perseverance, fuel our desire to understand our Universe better.

Our knowledge of space brings us together and encourages us to explore our origins, our history and to look to a future beyond all borders. In fact, in this edition, we explore how space data and applications can change our perceptions in different contexts, such as, in Earth Observation, Avionics, Archaeology and Space Navigation.

In February, we celebrated the International Day Of Women And Girls In Science. For this reason, we will tell the stories of two outstanding women who are creating exceptional progress in the space sector. These two role-models teach us the importance of creating "space" for the new generation of women in the space sector.

As in every edition, we invite students to become active participants, encouraging them not to set limits, even though the challenges may seem huge and several obstacles may pop up along the way. The graduates from the University Mediterranea who are contributing to the space sector will also feature for the first time in this edition and all forthcoming editions.

We are aware that each proposed article is a small step in the ongoing efforts to provide a platform that will shine a light on the contributions being made in the Mediterranean Region in the space sector. We hope you will continue to accompany us on this journey so that you can be part of this exciting new adventure.

Above all, we hope the contents of this newsletter will encourage us all to look towards the new horizons that await us.

Stay safe and healthy.

Sending you our warmest regards,

*Space Newsletter Editorial Staff*

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**"I would like to give a message to young women. Do not be afraid to pursue a career in scientific research, even in the so-called "hard sciences". You have no "genetic" limitations; there are only the residues of obsolete forms of society and education, and non-explicit and deceitful cultural delays."**

**Lucia Votano, Italian physicist**

*To all women and girls who are striving to make their contribution to the space industry and academia: Happy International Women's Day and International Day Of Women And Girls In Science.*

The Editorial Staff





# THE SPACE-3Ps OF THE ITALIAN G20: PLANET, PEOPLE, PROSPERITY

## SPACE ALSO SUPPORTS THE ITALIAN PRESIDENCY OF THE G20

by Gabriella Arrigo,  
Director of International Affairs at the Italian Space Agency

On 1 December 2020, for the first time, Italy took over the G20 Presidency from Saudi Arabia. The Forum, created in its current format in 2009, is the body that brings together the Heads of State and Government of the 20 countries with the most important economies globally speaking, with the aim of discussing economic and financial cooperation.

The G20 countries make up 60% of the world population, more than 80% of global GDP and about 75% of international trade. On 19 and 20 July 2021, the Italian Space Agency (ASI), in collaboration with the Industry's Associations, will invite the Heads of Space Agencies of the G20 countries

to Rome accompanied by the industrial representatives of the respective countries for the Space Economy Leaders Meeting 2021. Space Economy will contribute to strengthening the support that this economic sector provides to the global economy, through the declination of the 3Ps in Space and Planet, Space and People, Space and Prosperity.

The organization has started, the team is ready, the program is being defined with the agencies of the troika countries (Saudi Arabia, Presidency 2020, and Indonesia, Presidency 2022) and the support of the United Nations Office of Space Affairs (UNOOSA), the OECD Space Forum and the European Space Agency (ESA).

Particular attention will be given to young people, Africa and the Mediterranean countries. Interventions, testimonies and experiences in space activities and technologies will serve in the promotion of cooperation and the space economy. The first day will be institutional in nature, the second will be industry oriented with B2B and sector visits.

“Our ambition is to create an autonomous and authoritative *space route* within the G20 that can support and accompany its future evolution, with the establishment of a Space Advisory Group and a Space Industrial Track of Italian origin”.

# NSE EXPOFORUM 2020: AN INNOVATIVE USER-FRIENDLY FORMAT TO BRING SPACE CLOSER

by Maria Cristina Falvella,  
President of E. Amaldi Foundation

The New Space Economy ExpoForum has become the international yearly date where the economic impacts of the space sector can be reported. The event, organized by E. Amaldi Foundation and Fiera di Roma with the support of the Italian Space Agency, aimed at promoting and creating new market opportunities and economic developments based on space technologies and applications. Despite the many challenges of the past year, NSE 2020 ran its second successful edition in digital format and hosted 1372 participants from 48 Countries, 130 speakers, 13 technical sessions, 16 side-events and 64 virtual stands.

The conference focused on the surge of interest in new Space on the part of the institutional and private sector over the last 12 months and discussed future prospects by introducing new potential stakeholders and initiatives. Designed to address both space companies and non-space entrepreneurial initiatives, NSE addressed the most interesting trends of the Space sector influence in our everyday life by creating new dynamics and catalyzing an acceleration in bringing together participants, stakeholders and international organizations. According to the estimates drawn up by Morgan Stanley, the turnover

of about 350 billion dollars recorded by the global space industry could exceed one trillion by 2040. This rise will be due to an increasing number of non-space actors, willing to invest in the short-medium-term, thereby generating a new global public-private ecosystem. It also represents an opportunity for growth and innovation for Italy, which has always invested in Space. NSE 2020 and a chance to gather ideas with a view to fostering technology transfer and extending the use of space applications and technologies through a full programme of plenaries, highlight lectures, workshops, exhibitions, announcements and awards. E. Amaldi Foundation is already building on the results of NSE 2020 for the next year's edition: Rome 9-11 December 2021, see you there!



**NSE** NEWSPACE  
ECONOMY  
EUROPEAN EXPOFORUM

*New Space Economy European ExpoForum,  
11-12 December 2020, Digital Edition.*

# COSMO-SKY-MED SECOND GENERATION, THE BIRTH OF A NEW POLAR STAR

by Axel Oddone,  
Head of COSMO-SkyMed and Satellite Data, e-GEOS

In the collective imagination, the word “constellation” usually conjures up the idea of clusters of stars that seem to depict animals and mythological characters, sparkling in the night sky and arousing admiration and reflection.

The scientific community, space experts and technicians as well as those who study space, know that even the groups of satellites orbiting around the Earth are called constellations. With this in mind, it can be said that the first of the four satellites that will compose the COSMO-SkyMed Second Generation (CSG) constellation, which became fully operational in January, represents the new Polar Star for radar satellites.

The follow-up system of the COSMO-SkyMed constellation, owned by the Italian Space Agency (ASI) and the Italian Ministry of Defence, guarantees a significant improvement on the first generation in terms of performance, image quality, interoperability and efficiency of services. e-GEOS is the exclusive commercial reseller of first and second generation COSMO-SkyMed, the most advanced worldwide Synthetic Aperture Radar (SAR) constellation, a system providing us with a huge amount of data both during the day and at night.

The four satellites composing the COSMO-SkyMed constellation continuously observe our Earth under all weather conditions in order to monitor the environment and all infrastructures, and to support activities such as farming, mining, vessel identification, environmental changes and emergency activations. In e-GEOS we receive, analyze and process these precious data and convert them into information, which is made available through reports, maps, turnkey products and provides solutions for several activities. COSMO-SkyMed Second Generation enhances imaging models, providing the highest resolution, the best radiometric quality, the biggest image size, and the choice of dual polarization, which are unique in the civilian radar market.

CSG guarantees the continuity and improvement of the supply of SAR services through updated high-quality data and innovative products which are available on our Digital hub CLEOS, “the platform of platforms”. As an example of the thematic exploitation of CSG data, ASI and e-GEOS, being carried out under the scientific coordination of the University Mediterranea of Reggio Calabria, a PRIN

research project on coastal monitoring activities in Southern Italy has been proposed, which includes the use and adaptation of “CosteLab”, integrated and enhanced with the AI functionalities of the CLEOS platform. Costelab is an example of a thematic platform dedicated to coastal areas (sea and land), which can host techniques and procedures for processing satellite data and data in situ, allowing efficient access to the archives and direct interaction with the user who can actively operate, as in a “lab”, according to their requirements. Using a systematic or on-demand method, the platform allows the processing and analysis of multi-mission and multi-sensor data, with particular attention to Sentinel and COSMO-SkyMed data. Institutional Users can request first and second generation COSMO-SkyMed data through the [ASI web portal](#). While Commercial users can request COSMO-SkyMed data through the e-Geos website. On the same website, they can discover more about CLEOS and e-Geos wide range of space-based and space-related services and solutions.

# COSMO-SkyMed Second Generation

## Best SAR data on the market

**e-GEOS** is the exclusive global commercial provider for COSMO-SkyMed mission, both first and second generation systems.

- Best resolution in ground range (0.5 m)
- Azimuth resolution 0.3 m
- Best Combination of resolution and observed area extension
- Best Radiometric quality
- Shadow/dark areas analysis enabled by very low noise floor
- Dual Polarization for all imaging modes
- QuadPol mode
- Special mode for acquisition of 2 images at once

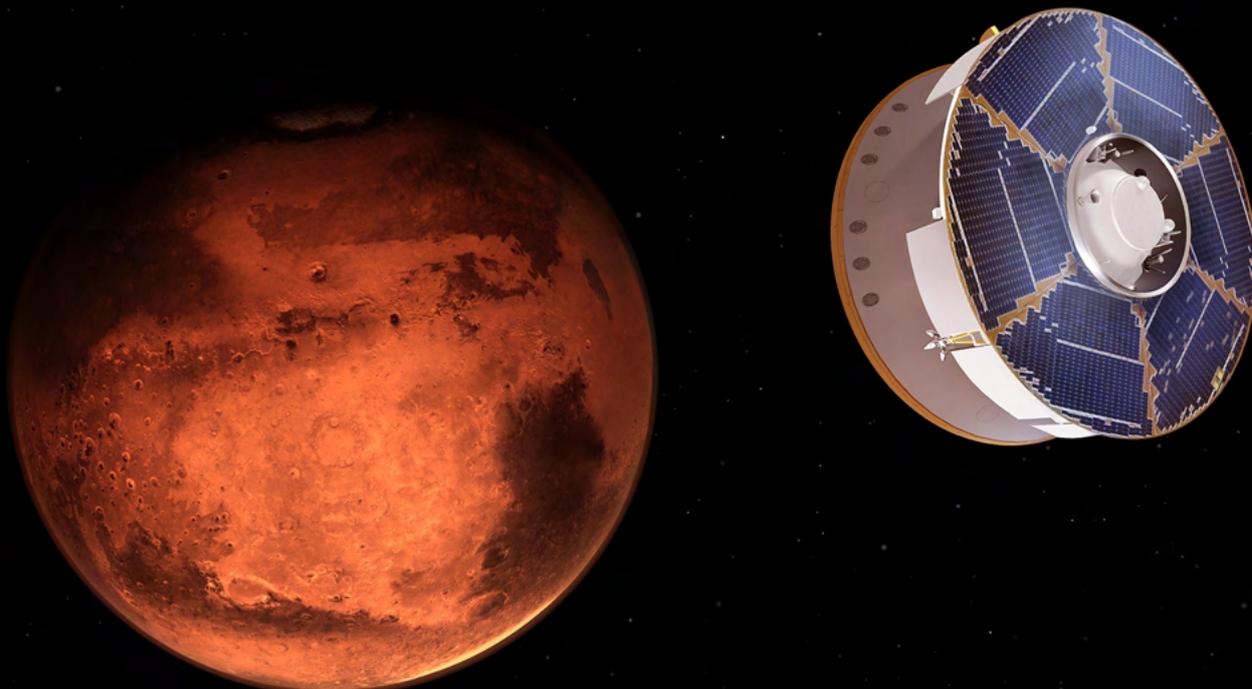
Paris, France, COSMO-SkyMed Second Generation image © ASI. Processed and distributed by e-GEOS

The COSMO-SkyMed Second Generation System is funded by the **Italian Space Agency** and the **Ministry of Defence**. The contribution of the national industry, including the Leonardo Group, to the development of this country's excellence is fundamental. In particular, **Thales Alenia Space**, a joint venture between Thales (67%) and Leonardo (33%) is responsible of the End-to-End system and of the manufacturing of the radar satellites, while **Telespazio**, a joint venture between Leonardo (67%) and Thales (33 %) is responsible of the Ground Segment, logistics and operations. Leonardo also contributes to the program providing stellar attitude sensors, photovoltaic panels and electronic units for the electrical power subsystem.



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An illustration of the Perseverance rover approaching Mars  
Credits: NASA

# SPACE MISSIONS FOR 2021 IN A NUTSHELL

by Alessandro Giglietta,  
MSc Student in Computer Engineering and Telecommunication Systems, University Mediterranea of Reggio Calabria, Italy

Even though 2020 was a tough year due to the pandemic, it was a good one for international space exploration. Indeed, many noteworthy achievements were made, such as the launching of astronauts to the International Space Station in a brand new capsule (by SpaceX) or the recovery of samples from the moon (by China) and the asteroid Ryugu (by Japan). But 2021 promises to be an equally exciting year with many science missions and space launches.

Starting with the red planet, three different missions have already been launched. The United Arab Emirates' Hope orbiter will help to study the atmosphere of this planet. Then, China's Tianwen-1 (orbiter, lander and rover) and NASA's Mars 2020 with the rover

Perseverance, landed on Mars to search for signs of microbial life and to study the geology of the planet.

Speaking of China's plans, the next phase of the Tiangong program will take off this year, with the launching of the first module of what will be the Chinese space station, the most ambitious project ever envisaged by this country. On the other hand, NASA's plans this year appear to be equally exciting. The first stage of the Artemis program (with the aim of landing the first woman and next man on the moon by 2024) will begin in November, with the uncrewed launch of the Orion spacecraft and the SLS (Space Launch System) rocket. Another NASA project is the taking off of the James Webb Telescope on

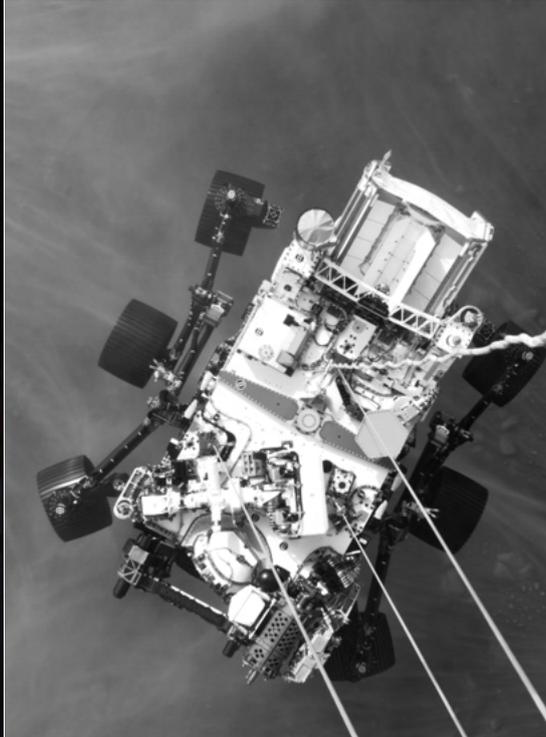
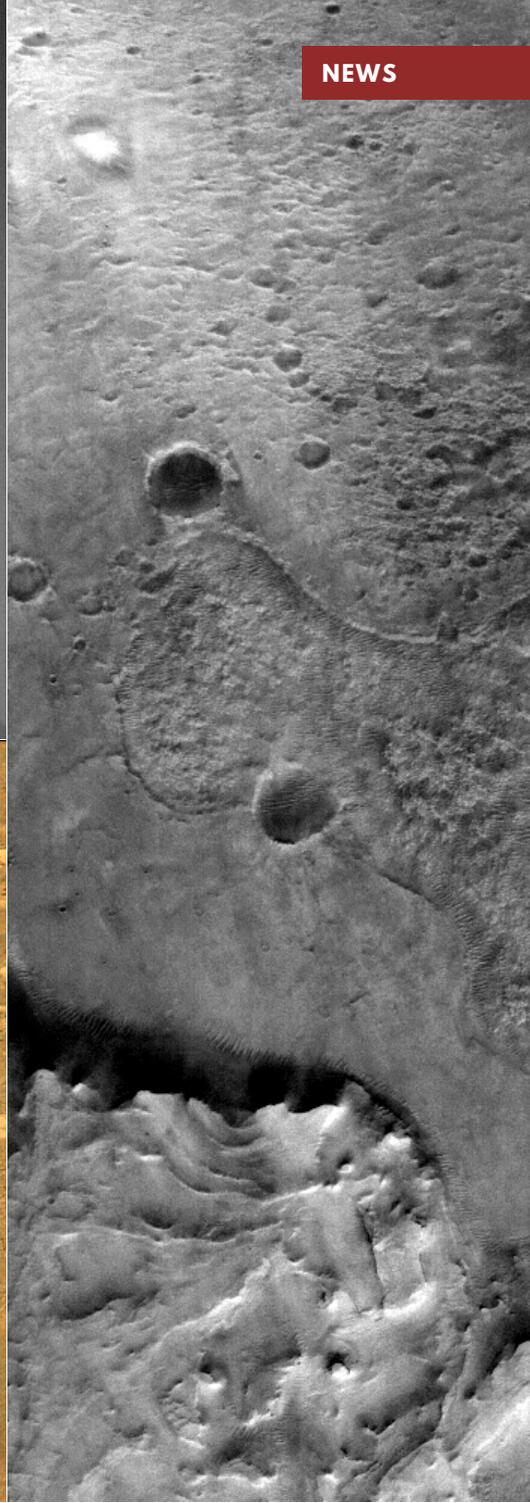
October 31st, which is of significant scientific importance as it will replace the Hubble telescope. One last NASA project that deserves to be mentioned is the Double Asteroid Redirection Test (DART) which in July will study the kinetic effects of a spacecraft impact against an asteroid, with the aim of studying planetary protection.

**Watch NASA's  
Perseverance  
Rover Land on  
Mars here!**



# Greetings from Mars

NEWS





**"I believe that a great passion is the most important ingredient along with perseverance and commitment."**

## **LUCIA VOTANO**

*Lucia Votano, born in Villa San Giovanni, is an Italian physicist who has mainly devoted her research to Particle and Astroparticle Physics. She is the co-author of more than three hundred papers published in international and prestigious journals. As an experimental physicist, she has been active at Frascati INFN Laboratory (LNF), CERN-Geneva, DESY-Hamburg, INFN Gran Sasso Laboratory, performing physics studies as well as constructing and running large detector systems. She played a leading role in the neutrino oscillations' direct discovery with the OPERA experiment. After holding the position of Director of the Research Division of the Frascati National Laboratories for two terms, she was elected Director of the Gran Sasso National Laboratory (LNGS), being the first woman to occupy this position. Lucia Votano is currently a member of the team participating in the JUNO experiment under construction in South China and devoted to neutrino physics.*

## How and when did you decide to devote yourself to research and Physics in particular?

«Ho frequentato il liceo classico Campanella di Reggio Calabria negli anni '60, ero tra le più brave della classe, mi piaceva molto la filosofia ma ero curiosa di tutto. Ero certa che avrei scelto all'Università una materia scientifica senza però aver chiaro quale, nonostante il professore di matematica e fisica, nei cinque anni di liceo, ci avesse insegnato poco e male le due materie.

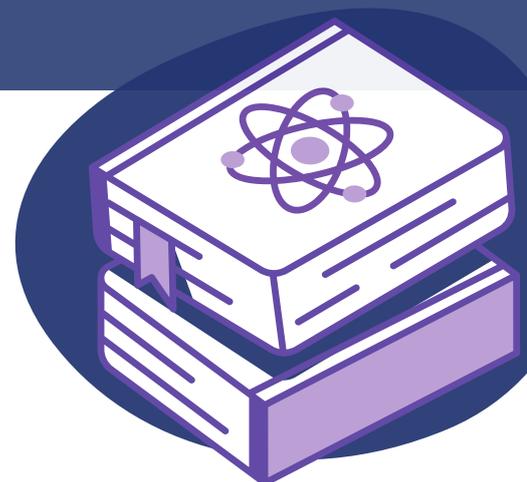
Nella mia propensione verso le materie scientifiche credo di aver sentito l'influenza di mio padre, che da medico radiologo passava molte sere a informarsi sulle novità riguardanti la medicina e che mi spiegò, con grande trasporto, l'importanza di alcune scoperte tra cui il DNA. La sua passione per la ricerca, professione che probabilmente rimpiangeva di non aver potuto seguire, ha trovato in me un fertile terreno. Sulla mia scelta definitiva ha poi pesato anche una giovane supplente alla quale mi ero rivolta per prendere lezioni private di matematica e fisica in prossimità dell'esame di maturità, consapevole della mia scarsa preparazione. Quest'insegnante mi aprì un mondo nuovo: mi fece capire che la fisica non è un insieme di leggi da studiare, magari a memoria, ma un affascinante percorso conoscitivo della natura.

Mi sono poi iscritta alla facoltà di Fisica di Roma, dove erano ancora vivi gli echi della grande scuola di via Panisperna e ho avuto la fortuna di avere come professore di Fisica generale Edoardo Amaldi insieme a tanti altri grandi nomi della Fisica. Desideravo con tutte le mie forze continuare l'attività di ricerca e sono rimasta a lavorare ai Laboratori di Frascati, dove avevo svolto la tesi di laurea sperimentale. Da lì è iniziata la mia attività di ricerca nel campo della fisica delle particelle elementari e astro-particellare.»

«I attended the "Campanella" classical high school in Reggio Calabria in the 60s, ranking among the best students in the class. I really liked philosophy, but I was curious about everything. In spite of the poor quality of mathematics and physics teaching received at high school, I was strongly determined to join a scientific faculty at University.

I believe my bent for Sciences was influenced by my father who, as a radiologist, spent many evenings keeping himself updated to the latest medical findings and who enthusiastically explained to me the importance of certain discoveries including DNA. His passion for research, a profession he probably regretted not having been able to practice, found fertile ground in me. My final choice was also affected by a young substitute teacher I resorted to for Mathematics and Physics lessons in view of my final school exam, aware as I was of my poor preparation. This teacher opened a new world to me: she made me understand that Physics is not a set of laws to be studied, perhaps by heart, but a fascinating cognitive path of nature.

I then enrolled in the Faculty of Physics in Rome, where the echoes of the great school in *Via Panisperna* were still alive. I was lucky enough to have Edoardo Amaldi as professor of General Physics along with many other great names in Physics. I strongly desired to continue in the world of research and, after my experimental degree thesis carried out at the Frascati Laboratories, I stayed on to work there. My research activity in the field of elementary particle and Astro-Particle Physics began there.»



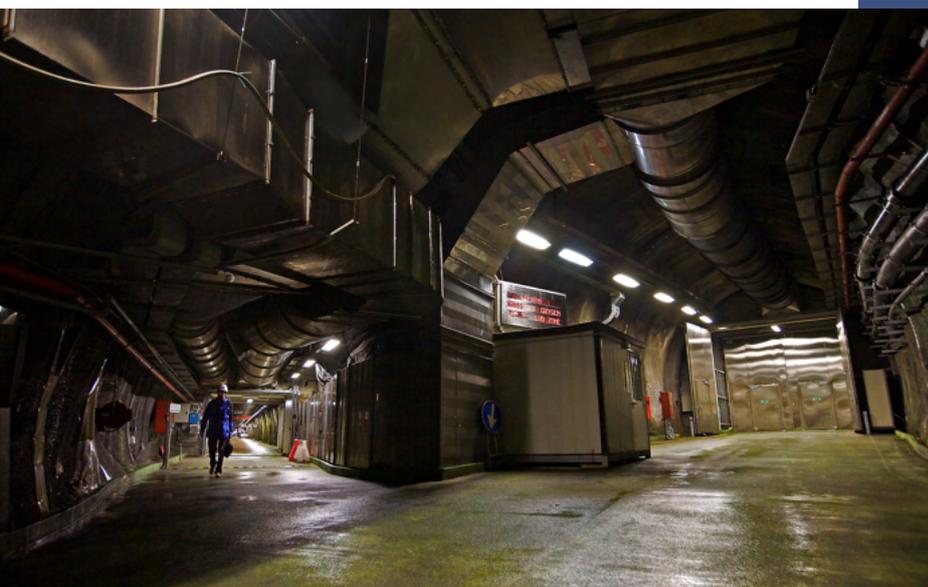


Lucia Votano presso i laboratori esterni del Laboratorio del Gran Sasso.

«Ho partecipato a importanti esperimenti nei maggiori laboratori europei: il CERN di Ginevra, DESY ad Amburgo, per poi convergere sul Laboratorio del Gran Sasso, di cui sono stata anche Direttrice dal 2009 al 2012. Il Laboratorio del Gran Sasso (LNGS) dell'Istituto Nazionale di Fisica Nucleare (INFN), è il più grande e il più importante laboratorio sotterraneo del mondo: è sede di circa venti esperimenti internazionali alla frontiera della conoscenza nel campo della fisica astro-particellare. Nelle ricerche che vi si svolgono, si fondono assieme sia l'osservazione del mondo infinitesimo delle particelle subatomiche sia quella dell'Universo: le principali linee sono lo studio dei neutrini e la caccia alla misteriosa materia oscura che costituisce l'ordito dell'Universo. Il laboratorio è un'istituzione nazionale d'eccellenza frequentata da circa 1000 scienziati di cui la maggior parte provenienti da Paesi di tutto il mondo. Infine, in questi ultimi anni per continuare a inseguire i neutrini ho scelto di partecipare all'esperimento di ultima generazione di nome JUNO, in fase di costruzione in un laboratorio della Cina meridionale.»

«I have participated in important experiments in the main European laboratories: CERN in Geneva, DESY in Hamburg, and then in the Gran Sasso Laboratory, of which I was also Director from 2009 to 2012. The Gran Sasso Laboratory (LNGS) of the National Institute of Nuclear Physics (INFN) is the largest and most important underground laboratory in the world. It hosts about twenty international experiments which lead in the world the field of Astro-Particle Physics. In the research carried out there, both the observation of the infinitesimal world of subatomic particles and that of the Universe merge together: the study of neutrinos and the hunt for the mysterious dark matter that constitutes the warp of the Universe. The laboratory is an Italian Institution and point of excellence, attended yearly by about 1000 scientists most of whom come from countries from all over the world.

Finally, in recent years, in order to continue chasing neutrinos, I have chosen to participate in the latest generation experiment called JUNO, under construction in a laboratory in Southern China.»



Galleria ingresso del Laboratorio del Gran Sasso.

# What are the current challenges in the field of Experimental Astro-Particle Physics?

«Una delle maggiori sfide conoscitive ruota intorno allo svelamento del lato oscuro dell'Universo.

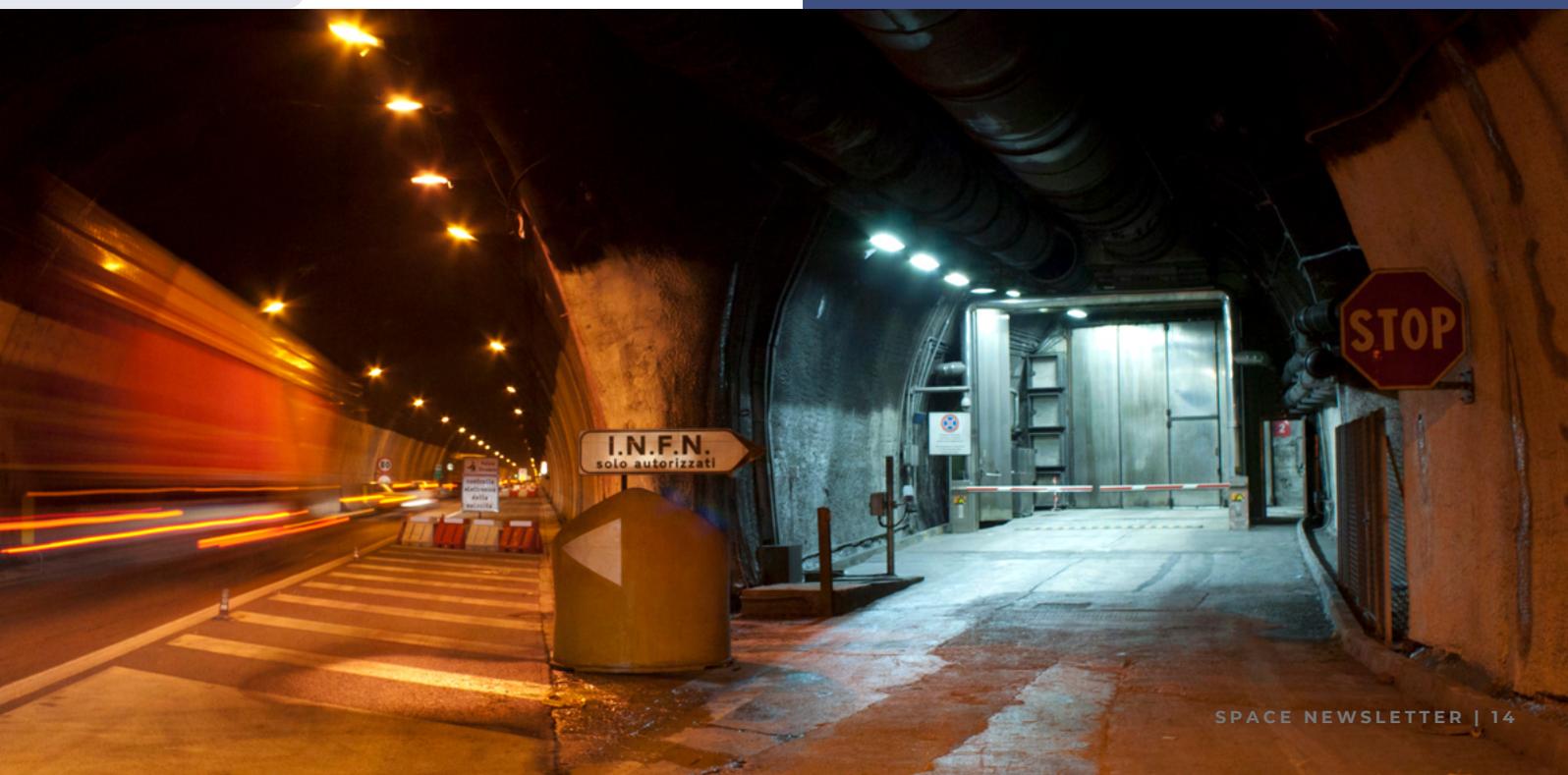
La scienza moderna ci dice che gli elementi che costituiscono le stelle, le galassie sono gli stessi di cui sono fatti il nostro corpo, le piante, tutti gli organismi sulla Terra, compreso il virus Sars-Cov-2. Siamo tutti fatti di atomi.

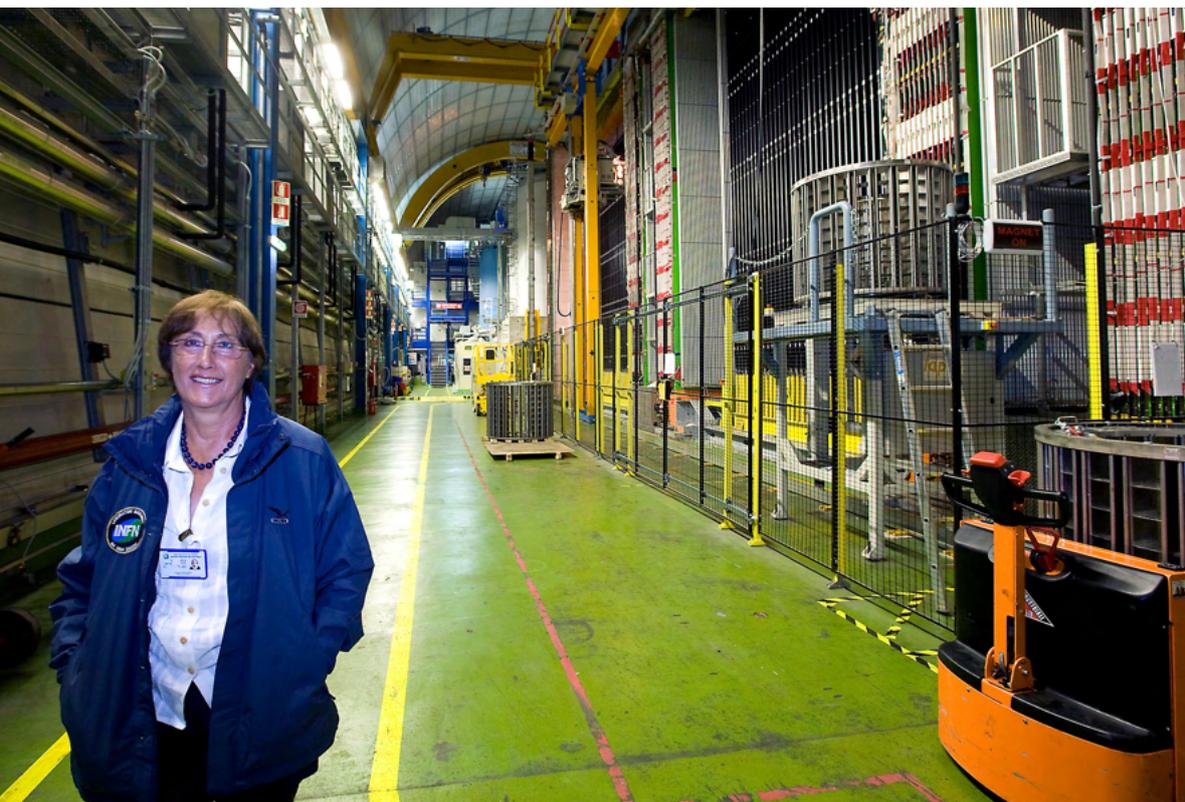
Tuttavia, dagli anni '30 del secolo scorso si sono accumulate solidissime prove sperimentali dell'esistenza di un lato oscuro dell'universo, chiamato così sia perché non è visibile direttamente come le stelle, non emette e non assorbe la luce o le altre componenti dello spettro elettromagnetico, sia perché la sua natura è avvolta nel mistero. Sappiamo che esiste ma non ne conosciamo la composizione. Siamo però in grado di valutare quale porzione occupa dell'intera massa ed energia dell'universo: la materia ordinaria di cui noi e le stelle siamo fatti rappresenta solamente il 4.9% del totale. La maggior parte (circa 68.3%) del lato oscuro è sotto forma di un'energia cui attribuiamo l'origine dell'espansione accelerata dell'universo. Il rimanente 26.8% circa consiste di nuove particelle, la materia oscura, non appartenenti a quelle già note, cioè alla materia barionica fatta di quark.»

«One of the greatest cognitive challenges revolves around the unveiling of the dark side of the Universe. Modern science tells us that the elements that make up the stars and the galaxies are the same as our bodies, plants, all organisms on Earth are made of, including the Sars-Cov-2 virus. We are all made of atoms.

However, since the 1930s, very solid experimental evidence has been accumulated testifying to the existence of a dark side of the universe, so called both because it is not directly visible as the stars, it does not emit or absorb light or other components of the electromagnetic spectrum, and because its nature is shrouded in mystery. We know it exists, but we don't know its composition. However, we can evaluate which portion it occupies of the entire mass and energy of the universe: the ordinary matter we and the stars are made of represents only 4.9% of the total. Most (about 68.3%) of the dark side is in the form of an energy to which we attribute the origin of the accelerated expansion of the universe. The remaining approximate 26.8% consists of new particles - dark matter, not belonging to those already known, that is to the baryonic matter made of quarks.»

Galleria ingresso del Laboratorio del Gran Sasso.





Lucia Votano accanto all'esperimento OPERA.

«L'altra grande sfida della fisica riguarda proprio i neutrini di cui mi occupo da alcuni decenni.

I neutrini fanno parte delle particelle elementari, cioè dei mattoni fondamentali che costituiscono la materia. Sono tra le più diffuse dell'universo, solo dal sole ne arrivano 60 miliardi ogni secondo, per ogni centimetro quadro della nostra pelle; interagiscono pochissimo con la materia e possono attraversarla indenni come fantasmi.

Nonostante i tanti progressi rimangono ancora molti misteri su di essi, il principale riguarda la natura e i valori delle loro masse.

In fisica classica la massa è una quantità fondamentale, una proprietà della materia apparentemente facile da intuire. Eppure, nella fisica moderna il concetto ha subito uno sconvolgimento totale e oggi ci appare piuttosto come una manifestazione dell'interazione di campi quantistici.

Sappiamo che le particelle elementari del Modello Standard (MS) diventano massive nell'interazione con il bosone di Higgs, scoperto al CERN nel 2012.»

**"Neutrinos are part of the elementary particles, that is, the fundamental building blocks of matter."**

«The other great challenge of physics concerns the neutrinos, which I have been dealing with for some decades. Neutrinos are part of the elementary particles, that is, the fundamental building blocks of matter. They are among the most widespread particles in the universe, 60 billion of which, coming only from the sun, every second reach a square centimeter of our skin. They interact very little with matter and can pass through it unscathed as ghosts.

Despite the great progress that has been made, there are still many mysteries about them, the main one concerning the nature and values of their masses. In classical Physics, mass is a fundamental quantity, a property of matter that is apparently easy to understand. Yet in modern Physics the concept has undergone a total upheaval and today it appears to us rather as a manifestation of the interaction of quantum fields.

We know that the elementary particles of the Standard Model (MS) become massive in the interaction with the Higgs boson discovered at CERN in 2012.»

«Il MS prevedeva che i neutrini fossero a massa nulla come il fotone (il quanto della luce), ma alla fine del secolo scorso è stato scoperto che essi oscillano, cambiano la loro identità viaggiando nello spazio e nel tempo, trasformandosi ciclicamente tra uno e l'altro dei tre tipi (o sapori) conosciuti, e ciò è possibile solo se i neutrini hanno una massa non nulla e tra loro diverse.

Rimane quindi da capire quale sia il meccanismo che conferisce le masse ai neutrini, come queste siano ordinate, e perché essi siano tanto più leggeri rispetto ai quark. Recentemente i neutrini sono poi diventati i principali indiziati per la scomparsa dell'antimateria dall'Universo. Siamo ragionevolmente sicuri che all'istante del Big Bang la materia contenesse un ugual numero di particelle e antiparticelle. Materia e antimateria quando interagiscono tra loro si annichilano in pura energia, pertanto se la perfetta simmetria fosse proseguita nel tempo, avrebbe dato origine a un universo senza strutture materiali.

Le stelle e le galassie nell'universo a noi visibile sono invece fatte di materia e non ci sono antistelle o antigalassie.

Nella teoria detta della leptogenesi si ipotizza l'esistenza di neutrini estremamente pesanti, non interagenti, che in uno stadio dell'universo molto prossimo al Big Bang hanno generato, nei loro decadimenti in altre particelle, un piccolissimo eccesso di materia rispetto all'antimateria che ha dato origine all'universo come oggi lo conosciamo, mentre tutto il resto si annichiliva in un bagliore primordiale.»

**"Matter and antimatter when interacting with each other annihilate in pure energy, therefore if the perfect symmetry had continued over time, it would have given rise to a universe without material structures."**

«The MS foresaw that neutrinos were as massless as the photon (the quantum of light), but at the end of the last century, it was discovered that they oscillate, change their identity by travelling in space and time, transforming themselves cyclically in one and the other of the three known types (or flavors), and this is possible only if the neutrinos have a non-vanishing masses different from each other.

Therefore we still need to understand what mechanism confers masses on neutrinos, how they are ordered, and why they are so much lighter than quarks. Recently, neutrinos have become the main suspect for the disappearance of antimatter from the Universe. We are reasonably sure that at the moment of the Big Bang, matter contained an equal number of particles and antiparticles. Matter and antimatter when interacting with each other annihilate in pure energy, therefore if the perfect symmetry had continued over time, it would have given rise to a universe without material structures.

The stars and galaxies in the universe visible to us are instead made of matter and there are no anti-stars or anti-galaxies.

The so-called theory of leptogenesis hypothesizes the existence of extremely heavy, non-interacting neutrinos, which in a phase of the universe very close to the Big Bang, while decaying into other particles, generated a minimal excess of matter compared to the antimatter that gave rise to the universe as we know it today, while everything else was annihilated in a primordial glow.»

## What is the purpose of your new experiment and why in China?

«Juno, (Jangmen Underground Neutrino Observatory), è un gigantesco esperimento che darà la caccia ai neutrini tentando di carpirne i segreti più reconditi, come l'ordine delle masse. Si trova a 43 km dalla città di Kaiping, nella Cina meridionale, è in fase di costruzione e diventerà operativo il prossimo anno.

Vi collaborano 71 università ed enti di ricerca da 16 Paesi diversi tra cui, oltre alla Cina, Russia, Usa, molti Paesi europei e altri asiatici.

Circa il 95% del costo totale, pari a circa 300 milioni di dollari, è finanziato dall'Accademia Cinese delle Scienze e gli scienziati cinesi che vi partecipano sono circa il 60% del totale.

È un grande investimento e il segno di come la ricerca scientifica si stia progressivamente spostando in Asia: dei circa 2000 miliardi di dollari annui spesi nella ricerca a livello mondiale, il continente asiatico ne investe il 41%, l'America del Nord e il Canada 29-30% e l'Europa solo il 21-22%.

La Cina è già diventata la seconda potenza scientifica e tecnologica al mondo (e di conseguenza economica e politica), e tallona gli Stati Uniti molto da vicino. L'Europa detiene ancora dei primati scientifici, rischia tuttavia di perdere sempre più terreno a livello globale a meno di decidere di puntare molto di più e in maniera coesa sulla ricerca scientifica.»



Ricostruzione pittorica dei Laboratori sotterranei del Gran Sasso.

«Juno, (Jangmen Underground Neutrino Observatory), is an extremely large-scale experiment that will hunt down neutrinos trying to steal their innermost secrets, such as the order of the masses. Located 43km from Kaiping City in Southern China, it is under construction and will become operational next year.

71 universities and research institutions from 16 different countries are collaborating in this project, including, Russia, the USA, many European and other Asian countries, besides China.

About 95% of the total cost, or about \$ 300 million, is funded by the Chinese Academy of Sciences and Chinese scientists participating constitute about 60% of the total.

It is a great investment and the sign of how scientific research is progressively moving to Asia: of the approximately 2 trillion dollars a year spent on research worldwide, the Asian continent invests 41%, North America and Canada 29-30% and Europe only 21-22%.

China has already become the second largest scientific and technological power in the world (and consequently economic and political) and is closely behind the United States. Though Europe still holds scientific records, it risks losing more and more ground globally, unless it decides to focus much more and coherently on scientific research.»



## What advice would you give to young people interested in pursuing a career like yours?

«Credo che alla base di tutto sia necessaria una grande passione cui bisogna aggiungere costanza e impegno. Occorre poi essere pronti a muoversi fuori dell'Italia, non solo perché da noi le opportunità di ricerca sono diminuite negli ultimi due decenni, ma soprattutto perché la competizione a livello internazionale è una caratteristica intrinseca del nostro campo di ricerca. I grandi esperimenti sono sempre impostati come Collaborazioni di Istituzioni di tutto il mondo.

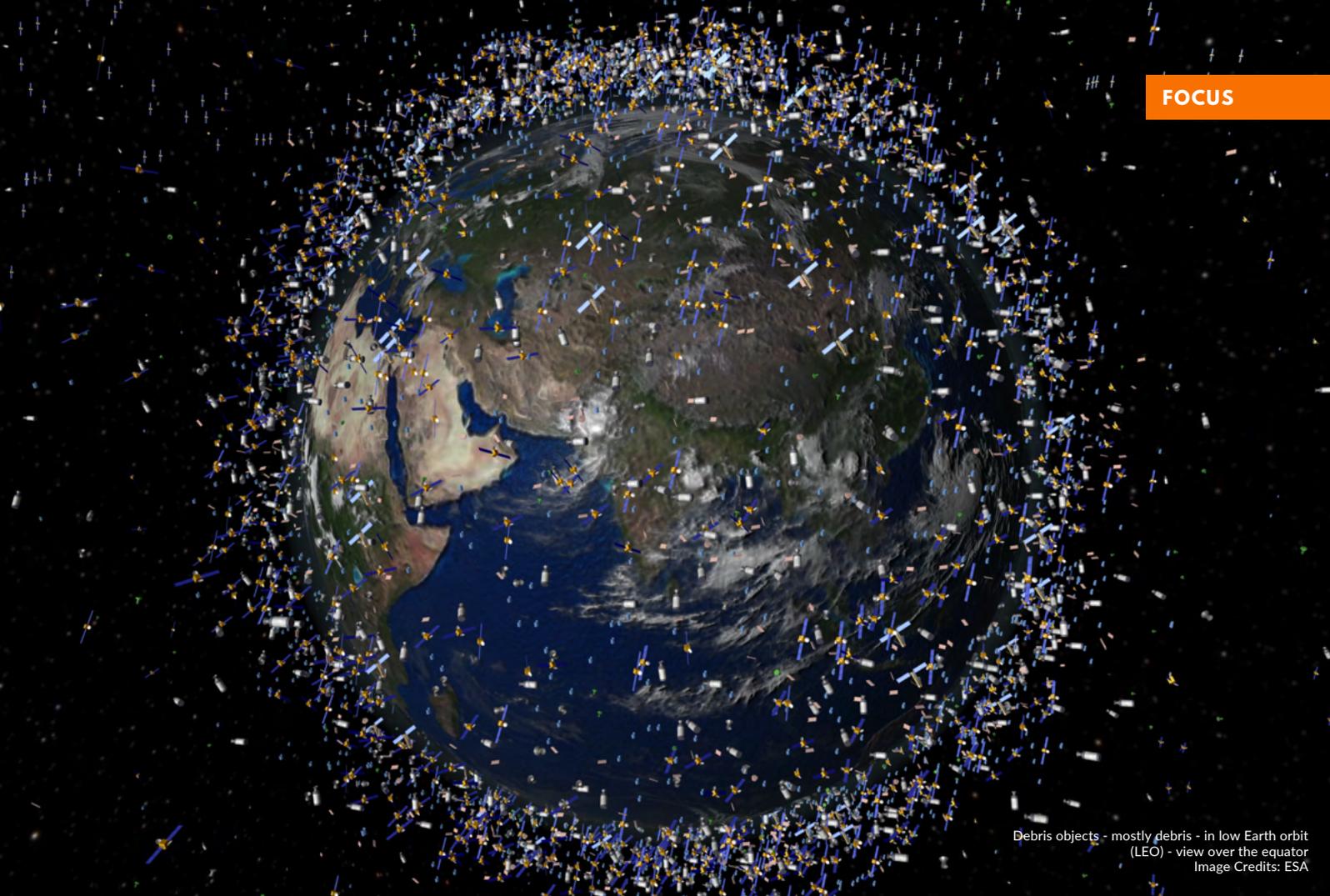
Infine vorrei dare un ultimo messaggio alle giovani donne. Non abbiate timore di intraprendere la carriera della ricerca scientifica anche nelle cosiddette "hard sciences", non avete limitazioni "genetiche", ci sono solo residui di una società e un'educazione ormai superate, ritardi culturali forse più subdoli che espliciti. Inoltre c'è carenza di supporto alle donne lavoratrici. Non è quindi sempre facile conciliare l'impegno nella ricerca e la famiglia, ma la mia generazione ha dimostrato in modo non più episodico che ciò è possibile.

Mi preoccupa molto invece la scarsa frequentazione della Cultura scientifica da parte del nostro Paese e la scarsa consapevolezza che il declino dell'Italia, questo continuo arrancare buon ultimi dietro gli altri paesi europei e ancor prima del Covid-19, sia proprio il frutto della continua decrescita di considerazione e investimenti nella Cultura in generale, ma soprattutto nella Scienza e nella Ricerca.»

«I believe that great passion is the most important ingredient along with perseverance and commitment. We also need to be ready to move outside Italy, not only because research opportunities have decreased in the last two decades, but above all because international competition is an intrinsic feature of our research field. Large-scale experiments are always set up in the form of Collaborations of Institutions from all over the world.

Finally, I would like to give one last message to young women. Do not be afraid to pursue a career in scientific research, even in the so-called "hard sciences". You have no "genetic" limitations; there are only the residues of obsolete forms of society and education, and non-explicit and deceitful cultural delays. Furthermore, the support for working women is lacking. It is therefore not always easy to reconcile the commitment to research and the family, but my generation has established a new pattern and shown that a dual commitment is possible.

On the other hand, I am deeply worried about the very limited interest in Scientific Culture on our country and the lack of awareness that the decline of Italy, this continuous trudging behind the other European countries even before Covid-19 pandemic, is precisely the result of the continuous decline of consideration and investment in Culture in general, but above all in Science and Research.»



Debris objects - mostly debris - in low Earth orbit (LEO) - view over the equator  
Image Credits: ESA

# DIFFERENTIAL GAMES FOR SPACE RESEARCH

by Massimiliano Ferrara,  
Full Professor in Mathematical Economics, University Mediterranea of Reggio Calabria, Italy

In many scientific fields, differential games are problems related to the analysis of conflict and strategical interactions in the model of a dynamical system [1]. In particular, in a pursuit-evasion game, one or more pursuers try to capture one or more evaders that try to avoid capture. Contests of pursuit and evasion are among the most widespread, challenging, and important optimization problems that confront mobile agents. But dynamic, stochastic, continuous-space, continuous-time, or discrete-time discrete-space games are usually difficult to handle.

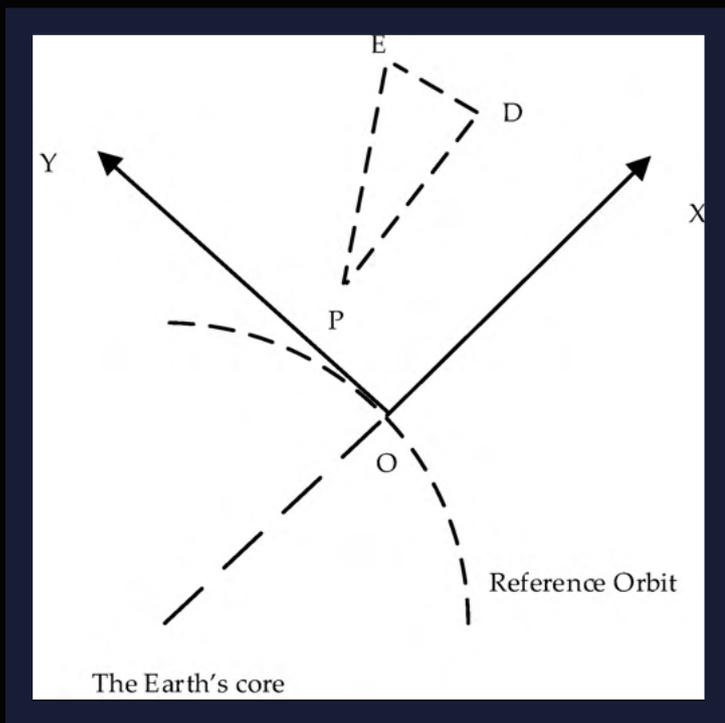
Agents that pursue or evade must maintain complex sensory-motor coordination with respect to both a physical environment and a hostile opponent. Because of its extensive applications, such as searching buildings for intruders, traffic control, military strategy, surgical operation, and industrial management, a lot of research has been developed in various directions during the last three decades, not only for what concerns the specific fields of application. In time, these methods, the related mathematical tools

and models have been intensively studied focusing on all the aspects concerning “dynamics” in a broad sense. Since 2015, my Research Group has been involved in this interesting research frame that is closely connected to space research. In fact, the orbital pursuit-evasion problem has recently attracted increasing attention in space research [2,3,4,5].

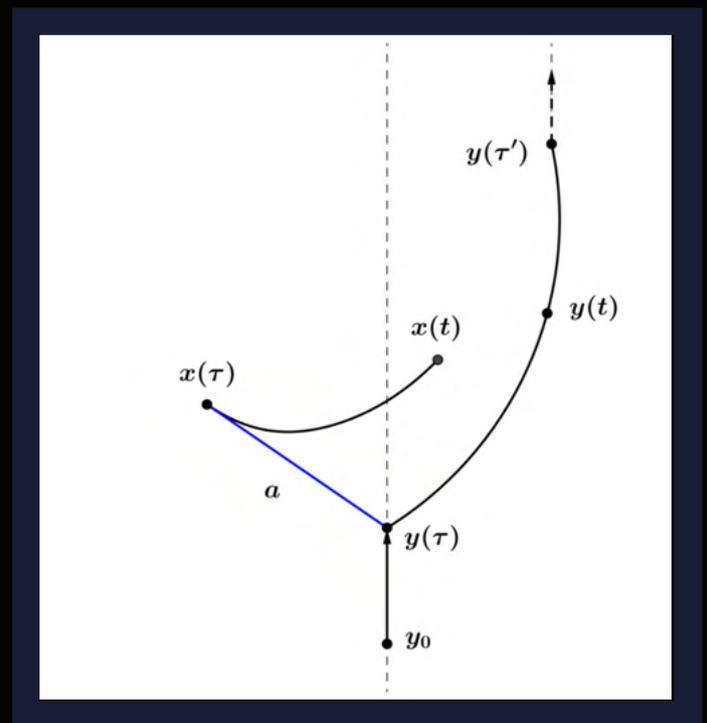
This problem can be formulated as a differential game, which aims to obtain the optimal control strategy of the pursuer and/or the evader in the worst-case scenario, so as to realize the interception of the evader or the evasion from the pursuer. Another issue with a fascinating scenario is the game-theoretical control approach for orbital pursuit-evasion for satellite interception and collision avoidance [6].

By using a coupled zero-sum differential pursuit-evasion (PE) game, the pursuer minimizes the satellite interception time and the evader tries to maximize interception time for collision avoidance. A trust-based decentralized sensor manager performs sensor-to-target assignment and nonlinear tracking. The interception-avoidance (IA) game approach provides a worst-case solution, which is the robust lower-bound performance case.

This IA algorithm is devoted to studying: the pursuer will rotate its orbit to the same plane of the evader, and second, the two spacecrafts will play a zero-sum PE game. Numerical simulations demonstrate the performance using the NASA General Mission Analysis Tool (GMAT) simulator. In this direction, in time some scientific contributions were produced with a strict correlation with the contents just presented, see for more [7,8].



An example for Space Issues.



A pursuit-evasion scheme (by M.Ferrara).

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7. Ferrara M.; Salimi M., Differential Games of optimal pursuit of one evader by many pursuers. In *International Journal of Game Theory*, n. 48, 2019, pp. 481-490.
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# MARIA CRISTINA FALVELLA



*Dr. Maria Cristina Falvella is an astrophysicist with 30 years of experience in space science and leading space programmes. She has studied and taught at the Sapienza University of Rome and the ENS in Paris. Her activities range from space programs to industrial policy dossiers. Former Chair of the Industry Policy Committee of the European Space Agency, she has represented Italy in discussions over the space agenda at the highest level in Europe, contributed to building international collaborations and brought forward and mentored Italian talents in the space sector.*

«Guardare il cielo mi ha sempre affascinato. Ero curiosa di capire cosa poteva rendere così speciale quello spettacolo. Mi sono laureata in astrofisica e il mio tutor mi ha proposto di puntare al futuro, alla ricerca spaziale. Mentre la maggior parte degli studenti preferiva lavorare negli osservatori di alta montagna (il mio primo obiettivo) o fare ricerche sui palloni stratosferici dall'Antartide, io ho scelto lo spazio.

Sono stata una studentessa molto ligia, quella che oggi i giovani chiamerebbero un "geek". Non ho avuto modelli familiari da seguire in campo scientifico e ho dovuto mettere alla prova me stessa e il mio interesse per questo argomento. Intraprendere una carriera nel settore spaziale non era scontato quando ero ragazza. Mi sono laureata all'Università Sapienza di Roma e subito dopo ho avuto l'opportunità di andare in Francia, all'École normale supérieure e all'Osservatorio Astronomico di Parigi. Un'altra sfida, visto che parlavo tedesco e inizialmente pensavo a una specializzazione in Germania. Da allora la collaborazione con l'Osservatorio Astronomico non si è mai interrotta.

Trovare la mia strada nel settore spaziale ha richiesto molta dedizione e impegno. Cose come mancare alle feste per studiare e utilizzare le vacanze per le summer schools sono parte del prezzo da pagare per non rimanere indietro. È stato comunque un periodo molto intenso e indimenticabile, non mi sono mai chiesta se ne valesse la pena, l'interesse per gli argomenti su cui lavoravo mi ha motivata a dedicare tutte mie energie per ottenere il massimo. In generale credo che non sia tanto importante cosa si scelga di fare ma la passione che si mette in quello che si fa.»

«Looking up at the sky has always fascinated me. I have always had an intrinsic curiosity in understanding what was out there. I got a degree in Astrophysics and my Tutor proposed that I should look to the future, to the space science missions. While the majority of students preferred to work in High mountain observatories (my first objective) or in stratospheric balloons research from Antarctica, I decided to go for space.

I was always a good student, what today young people would call a "geek". My family has no affiliation whatsoever to science. So, for a very long time I had to prove myself and my interest in this subject. More importantly, I wanted to pursue a career in this sector, and believe me when I say this was not a given when I was growing up. I began my academic career in Rome at Sapienza University and then went on to study in France, which was another challenge for me, since I actually wanted to go to Germany. However, life had other plans for me and so I did a postdoc at ENS in Paris and started an ongoing collaboration with the Astronomical Observatory of Paris.

The very early phase of my career took a lot of hard work. Missing parties, going to summer school instead of holidays, it was all part of the deal because this is a hard subject. However, the fascination for and the interest in the subject made it all worthwhile and encouraged me to put all my efforts into accomplishing the best that I could. Whatever you choose to do, you have to be passionate about it.»

## "You also need to take advantage of every opportunity that presents itself because you never know who or what will be the turning point in your career or in your life for that matter."

«Ho sempre pensato che il mio lavoro mi avrebbe dovuto accompagnare e affascinare per tutta la vita: nei giorni felici, in quelli più difficili, in quelli con la pioggia o con tanti altri problemi. Impegnarsi in un lavoro che si ama è un privilegio, una motivazione ad andare sempre avanti, a non fermarsi davanti agli ostacoli, sempre attratti da quello che verrà dopo.

In ogni percorso gli imprevisti sono occasioni da cogliere al volo, punti di svolta nel lavoro come nella vita. Io sognavo una carriera da ricercatore ma nel 1991 ho partecipato a un bando dell'Agenzia Spaziale Italiana (ASI) che ha definitivamente cambiato le mie prospettive offrendomi tantissime nuove opportunità. Ho potuto approfondire tutti i diversi aspetti del settore spaziale in un contesto di grande rilievo a livello globale e arricchire la mia esperienza professionale e umana. Ho imparato molto dalle persone che ho conosciuto nel corso della mia carriera: modelli, mentori, semplici colleghi e soprattutto nuovi amici sparsi in giro per il mondo.

In ASI ho avuto il privilegio di contribuire a molti progetti interessanti coordinando più di 50 progetti su palloni stratosferici, piccole piattaforme spaziali, moduli abitabili per la Stazione Spaziale Internazionale e missioni scientifiche in collaborazione con le agenzie spaziali più prestigiose del mondo. Lavorare alla missione dell'ESA Planck è stata probabilmente l'esperienza più gratificante di tutte. Era stata l'oggetto della mia tesi, quando nessuno era pronto a scommettere sulla sua fattibilità tecnica. Vedere un progetto spaziale evolvere dall'ideazione alla realizzazione è rarissimo e molto gratificante. La missione di Planck è stata anche la prima occasione per me di affrontare le tematiche legate alla politica industriale e alle scelte strategiche a livello europeo.

Un'altra cosa che amo molto è insegnare. Per me è una costante occasione di approfondimento e aggiornamento, lo spazio evolve in fretta e ogni anno ci sono cose nuove da raccontare. Inoltre, parlare con gli studenti è come viaggiare nel futuro: con le loro idee tracciano il profilo della realtà di domani.»

«Work is something you have to do everyday. This includes bad days, good days, rainy days, when you are exhausted, when other things in your life are messed up. The only way you can carry on is if, despite all the efforts, you are still fascinated by what will come next.

You also need to take advantage of every opportunity that presents itself because you never know who or what will be the turning point in your career or in your life for that matter. At first, I thought I wanted to do science. In 1991, I joined the Italian Space Agency which probably is the luckiest break I have had since I have developed most of my career there.

I consider any opportunity I have been given a very rewarding experience because they all contributed to shaping the person I am today. It takes competence and hard work to build a career. However, a lot of what you learn is given to you by bystanders and the inspiring people you meet along the way.

I have had the privilege of contributing to many very interesting projects while coordinating, on behalf of ASI, more than 50 programs on stratospheric balloons, small space platforms, habitable modules for the International Space Station and scientific missions. Working on ESA Planck mission was probably the most rewarding experience of all. I had worked on this for my thesis, when nobody was ready to bet on its technical feasibility. Seeing a space project evolving from feasibility to operation level is definitely a privilege and most certainly very rewarding. The Planck mission was also my first opportunity to manage both industrial policy and strategic issues at a European level.

Teaching students is also incredibly fascinating and probably provides the most influential resources of all. In fact, speaking with students is like travelling into the future. The ideas of today and what students dream of are the realities of tomorrow.»



«La mia avventura però non è ancora finita. Recentemente sono stata nominata Ispettore Generale e potrò mettere a servizio dell’Agenzia Spaziale Italiana tutta la mia esperienza professionale in ruolo molto diverso dai precedenti e che mi offre la possibilità di avere una totale visibilità delle attività in corso ma anche una prospettiva nuova sul loro svolgimento, quasi un lavoro diverso ogni giorno.

Sono anche il Presidente della Fondazione E. Amaldi, che promuove e sostiene la ricerca applicata finalizzata al trasferimento tecnologico per permettere ai potenziali utenti non appartenenti al settore spaziale di considerare lo spazio una utility in grado di supportare la crescita e lo sviluppo. La sempre maggiore disponibilità di tecnologie abilitanti e dati satellitari e il loro utilizzo innovativo unito a costi di elaborazione sempre più bassi apre infatti le porte all’innovazione, alle tecniche ICT e AI per fornire servizi sempre più efficienti e mirati a un bacino sempre più ampio di utilizzatori.

Non so cosa mi riservi ancora il futuro ma posso dire che siamo in un momento molto interessante che vede lo spazio trasformarsi da dominio riservato alla ricerca di punta a infrastruttura a servizio della società. Poter contribuire a questa trasformazione, a qualunque titolo, non può che essere entusiasmante. C’è inoltre molto spazio per i giovani che hanno determinazione e voglia di individuare nuovi profili professionali, che lavorano con l’ausilio di competenze multidisciplinari, in grado di rispondere con soluzioni innovative alle necessità di domani. Le possibilità in principio sono illimitate, quindi la creatività e la competenza saranno fattori chiave per emergere insieme ovviamente alla passione per questa nuova dimensione del settore spaziale. Il resto può essere insegnato.»

**"Determination and hard work are definitely promising qualities in anyone who wants to work in the space sector. Probably, the most important quality is being passionate about the job and interested in the subject itself, the rest can all be taught."**



«My career is being further enhanced, I have recently been appointed the General Inspector of the Italian Space Agency which mostly involves providing an independent outlook on the Agency’s projects and programmes. It is a very interesting position to be in because, in a way, I have a front seat in all the exciting activities carried out. The broad range of tasks and applications make this also a very diverse role, so it is almost a new role every day.

I am also the President of E. Amaldi Foundation which promotes and supports applied research aimed at transferring technologies and new space economy. I count on it to encourage non-space users to consider space a daily utility which can support growth and development. The greater availability of enabling technologies, space data and their innovative use combined with ever cheaper processing costs, opens indeed the door for innovation, ICT and AI techniques to deliver more and more efficient and focused services.

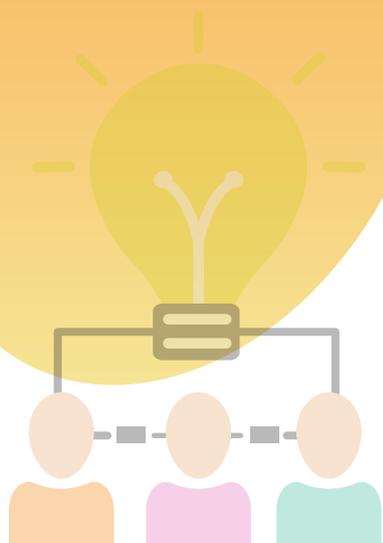
As for what is next, truthfully, I do not know. This is a very interesting time for the space sector and for its application in our everyday lives. Being part of it, one way or another, can only be exciting.

Determination and hard work are definitely promising qualities in anyone who wants to work in the space sector. Probably, the most important quality is being passionate about the job and interested in the subject itself, the rest can all be taught.»

«In particolare, La New Space Economy è molto attraente e si sviluppa in un settore, lo spazio, non ancora indicizzato. Grazie alla ricerca spaziale e all'impegno di tanti ricercatori, oggi lo spazio fa registrare un crescente e consistente impatto a livello economico e sociale. Gli esempi sono innumerevoli e di diverso grado di rilevanza nei settori energia, clima, ambiente, salute, alimentazione, trasporti, logistica, ecc.

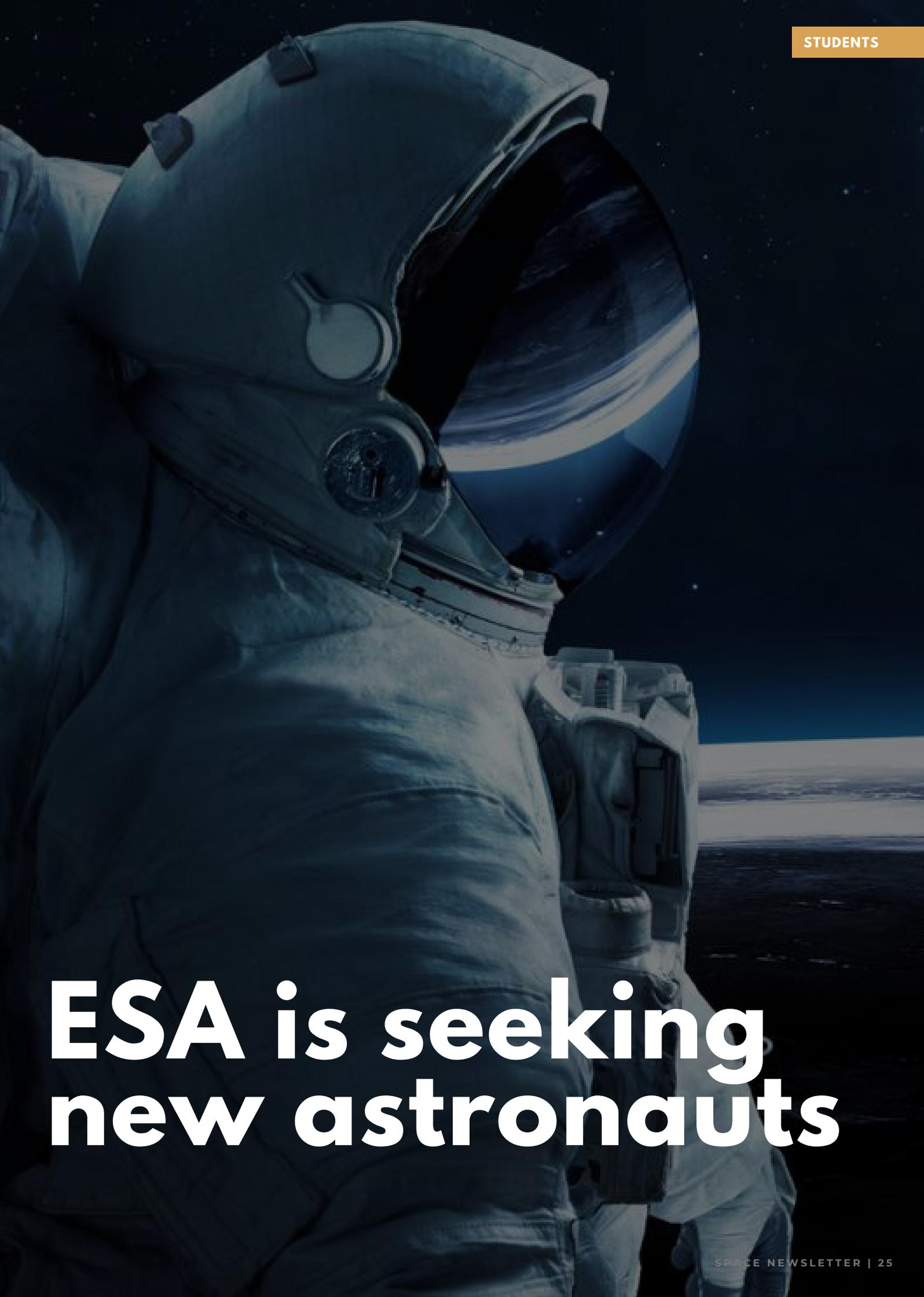
La New Space Economy rappresenta un radicale cambio di paradigma che trasforma lo Spazio nel settore più completo a sostegno della società, un volano per l'innovazione e la crescita sostenibile. Spero che le generazioni più giovani sappiano cogliere l'importanza di questo cambiamento culturale, che si rifletterà anche nell'istruzione e nella formazione di alto livello, non solo di carattere tecnico-scientifico, per favorire una visione trasversale dei verticali tradizionali e fuzionale alle grandi sfide globali.»

**"Space is today an enabler infrastructure that can serve many different users and needs and foster innovative sustainable solutions for food, agriculture, smart cities, disaster management, climate change, mobility, etc."**



**"The New Space Economy represents a radical change of paradigm that transforms Space into the most complete sector as a support for society, a driver for innovation, training and in the development of new qualified areas of work."**

«In particular, the New Space Economy is a thrilling topic. While we were exploring Space and people in their lab coats spent days fascinated by what happens outside the atmosphere, we have created a multitude of technologies and daily collected an enormous amount of data which are now directly relatable to help our society. This truly is a land of opportunity for investments and development that can solve many of our current issues while at the same time exploiting information which is already accessible to us. Examples are countless and of different levels of tangibility. Space is today an enabler infrastructure that can serve many different users and needs and foster innovative sustainable solutions for food, agriculture, smart cities, disaster management, climate change, mobility, etc. The new space economy represents a radical change of paradigm that transforms Space into the most complete sector as a support for society, a driver for innovation, training and in the development of new qualified areas of work. My hope is that the younger generation will be able to grasp the importance of this cultural change, which must also be reflected in education and high-level formation, not only technical and scientific, which must strive to foster a transversal vision of all the traditional productive segments and the great global challenges.»

A close-up, low-angle shot of an astronaut in a white space suit, looking out from a spacecraft window. The astronaut's helmet is prominent, with a circular visor reflecting the bright light of the sun. The background shows the dark expanse of space with a thin white line of the Earth's horizon and a blue sky. The overall tone is dramatic and futuristic.

# ESA is seeking new astronauts

# «YOUR WAY TO SPACE»

by the Editorial Staff

For the first time in over a decade, the European Space Agency (ESA) is seeking new astronauts. The last call for applications for the position of astronaut was in 2008. [ESA's Astronaut Selection webpage](#) provides everything you need to know to apply. ESA is looking for candidates with a large variety of profiles and from different backgrounds.

## Who can apply?

ESA is seeking candidates with a Master's degree (or higher) and a minimum of three years' of experience in:



*Natural Sciences*



*Medicine*



*Engineering*



*Mathematics*



*Computer Sciences*



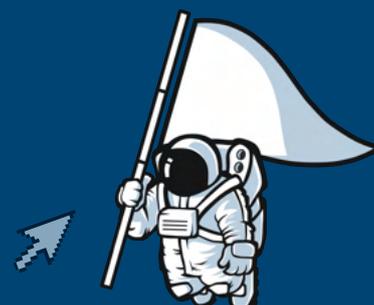
## Parastronaut feasibility project

ESA consider inclusiveness and diversity as key values for the future of human spaceflight.



## Astronauts' media kit

Everything you should know to prepare your application.



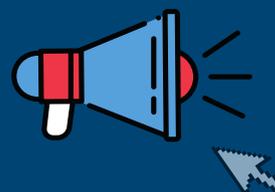
## Important dates

Applications open on 31 March 2021 and the application period will run until 28 May 2021 and the results are expected to be announced in October 2022.



## Watch media event

Get inspiration and useful tips from the official press event.



# WOMEN IN AEROSPACE (WIA)

by Cristina Valente (Leader) and Annamaria Nassisi (Co-Leader) of the WIA-Europe LG Roma

Women in Aerospace (WIA), which was founded in the USA in 1985, is dedicated to increasing the leadership capabilities and visibility of women in the aerospace community. WIA acknowledges and promotes innovative individuals who strive to advance the aerospace industry as a whole. Simonetta Di Pippo and Claudia Kessler founded the Women In Aerospace Europe in 2009 to support the creation of a diverse environment in the European space sector. This association became even more so one of the professional associations reference points in Europe for women and men who want to work and develop professionally in the space sector, to promote space programs and to support the young generation to come forward and to contribute to shaping the future. WIA-Europe (WIA-E) exists together with the other sister organisations present all over the world (e.g. WIA Canada in 2010, WIA Africa in 2011, WIA Japan and Mexico in 2017 and WIA Costa Rica in 2020). WIA-Europe is pleased to have enthusiastic and valuable corporate and partner members.

WIA-Europe, with the support of Local Groups and the dedication of many volunteers, has continued to expand and to support the creation of a diverse environment in the space sector. WIA-Europe has also become a partner in an important project collaborating with the United Nations Office for Outer Space Affairs (UNOOSA): "Space for Women". The WIA-Europe Rome local group (LG) was founded in 2013 and promotes a wealth of aerospace-related activities in Universities, companies, research institutions and government agencies, which can all be found in or around the Eternal City. The aim of the Rome LG is to bring together the large Italian Space community in order to support a more diverse and equal workforce, with a view to attracting our members and stimulating the new generation's interest in STEM. The main Rome LG initiatives are the organization of seminars, workshops, trainings, webinars, networking and mentoring with our aerospace experts and external guests.

*WIA-Europe Rome local group (LG)*



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[@womeninaerospace\\_rome](https://www.instagram.com/womeninaerospace_rome)



[WIA - E Rome Local Group](#)



[Women in Aerospace Europe WIA-E - Rome LG](#)



Women in Aerospace Europe

# WOMEN IN AEROSPACE EUROPE

STUDENTS



# COSMO-SKYMED SUPPORTS ARCHAEOLOGICAL SURVEY IN TELL EL-MASKHUTA (EGYPT)

by Giuseppina Capriotti Vittozzi, Maurizio Fea, Stefano Gusmano, Chris Stewart

**Tell el-Maskhuta is a large site along the Wadi Tumilat, characterised by a huge enclosure wall. In ancient times it was an important city named Tjekw, one of the most Eastern towns of Pharaonic Egypt, along a much used highway and it was the gateway of the Canal of the Pharaohs to connect the Mediterranean with the Red Sea.**

The work of the archaeological expedition by the National Research Council of Italy (CNR) was characterised by a wide-ranging interdisciplinary and integrated technological approach. One of the first undertakings was the use of satellite remote sensing through the interpretation of radar images, provided primarily by the Italian Space Agency and evaluated in relation to the geophysical surveys carried out on the site.

The data acquired by the Italian satellite constellation COSMO-SkyMed (CSK) were used to integrate innovative technology applied to cultural heritage. The technical, scientific and methodological activities consisted of the processing and analysis of satellite data acquired in the microwave spectral band through radar, and in the geophysical, topographical, photogrammetric and three-dimensional laser scanning surveys. The complex processing of radar satellite data allows the generation of images that illustrate certain important characteristics of the terrain. These include its roughness, and also its topography, the latter using the technique of Synthetic Aperture Radar (SAR) interferometry.

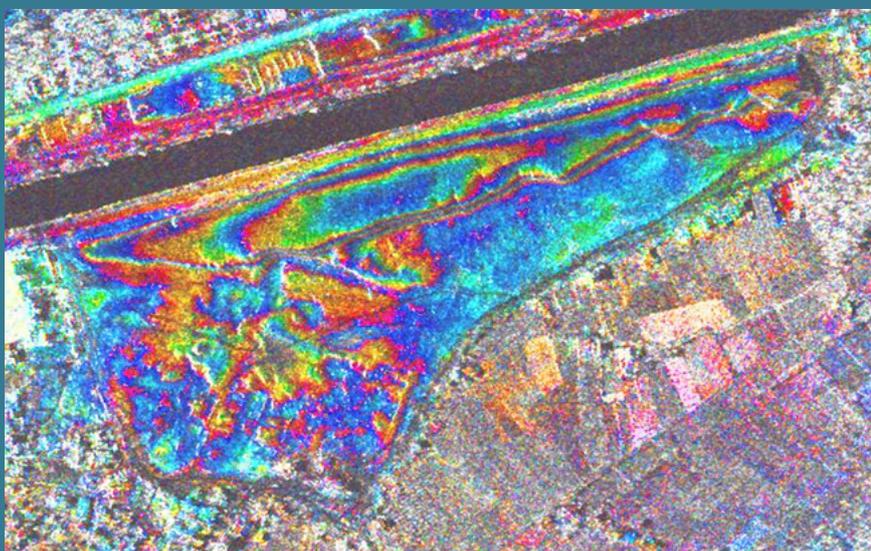


Fig. 1: Interferogram of Tell el-Maskhuta and the surrounding area produced from two CSK satellite images acquired on 1 and 5 February 2014. The coloured fringes indicate topographic height variations.

After the analysis of the CSK interferogram had confirmed what had been found through the excavation of the area around the enclosure wall, the attention of the archaeologists focused on a small blue rectangle which appeared in the interferogram in the north-west side of the perimeter wall. In the archaeologists' opinion this indicated the presence of an interesting feature.

The first results of the initial excavation in 2016 suggest the presence of a building leaning against the enclosure wall: the position of the walls in this artefact seems to coincide with that of the blue rectangular feature which, as previously mentioned, appears in the CSK interferogram.

This correspondence is a key aspect in the in-situ verification of hypotheses resulting from the analysis of CSK satellite data, and once again demonstrates the importance of dialogue between archaeology and remote sensing.

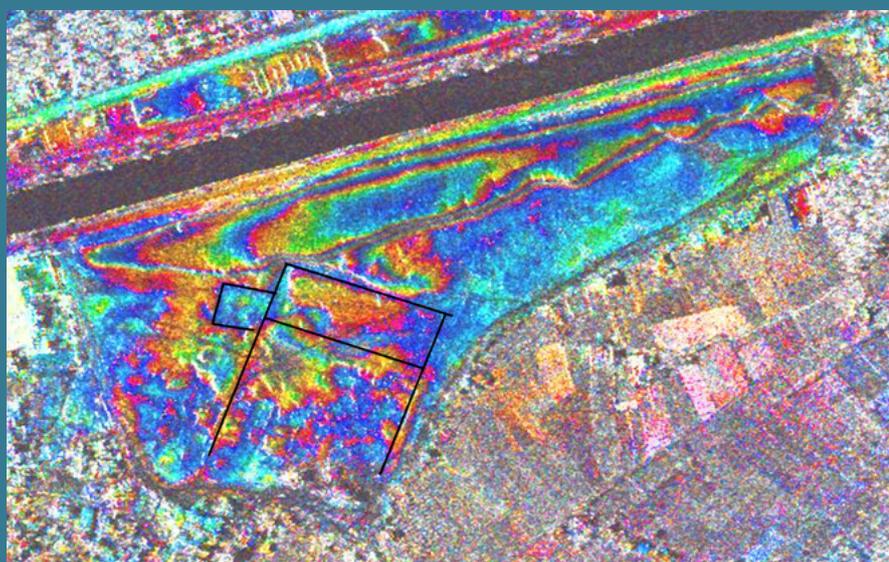


Fig. 2: Close-up of interferogram showing the outline (in black) of the walls and attached building.

# GEODATALAB, A PROJECT BORN FROM A SEED SOWN BY UNIRC

by Chiara Sammarco,  
Head of the Research and Innovation department at GeoDataLab

GeoDataLab is an innovative start-up created in 2015, which - since its foundation - has been working with and for high profile companies (such as Finmeccanica, and especially Leonardo group). It provides highly customized GIS software in the field of Earth Observation, Data Interchange Services and geobusiness intelligence.

It was founded by Giovanni Sammarco. He graduated in Territorial and Urban Planning at the University Mediterranea of Reggio Calabria (UNIRC) in 2002. His experimental thesis was the first Geographic Information System produced at UNIRC and was the topic of an informative brochure published at the "Biennale di Venezia" (section Architecture) for the UNIRC stand.

This experience allowed him to start his own business that resulted in his becoming, following a specialization in Information Systems and Satellite Remote Sensing at the IUAV University of Venice, a consultant and led to his appointment to the position of technical GIS manager at e-Geos, one of the leading companies in the field of Earth Observation in Italy. After a few years, the decision to found his own company was a natural progression and now, GeoDataLab can count on a team of about 12 internal and external co-workers, among whom there are web developers, web engineers, GIS experts, and data analysts. Among them, the undersigned. Like my brother Giovanni, I also got my degree at the University Mediterranea.

I am a Telecommunication Engineer, and as a student, I won the Forum Nokia Mobile Innovation Competition in 2008 thanks to a project in the Cooperative Localization field. After that, I discussed a Ph.D. thesis on the Internet of Things, and then I worked as an IT developer for several years.

At GeoDataLab, I work as the Team Leader and Project Manager. Starting from this year, I am in charge of the Research and Innovation department of the company.

GeoDataLab keeps growing and our projects force us to stay up to date as far as technological innovation is concerned. We are currently working, among other areas, in the avionics field, which is said to be the future of GIS.

Our wish for every student of the University Mediterranea is to aim high, keeping oneself continuously up to date with the latest technological progress. You have what it takes to achieve your goals.

## GIOVANNI SAMMARCO



He graduated in 2002 in Territorial and Urban Planning at the University *Mediterranea* of Reggio Calabria. He finished a specialization course in Information Systems and Satellite Remote Sensing.

Giovanni is the founder of GeoDataLab Srls, and the GIS consultant for Sogesid Spa, the Territorial Cohesion Agency (Agenzia per la Coesione Territoriale), and the Ministry of the Environment.

## CHIARA SAMMARCO



She graduated in 2008 in Telecommunication Engineering at the University *Mediterranea* of Reggio Calabria, where she received her Ph.D. in 2012, discussing a thesis

on the Internet of Things. She has over 7 years of experience in web programming. At the moment, she is working as the Technical Leader and Project Manager at GeoDataLab Srls, where she is also the head of the Research and Innovation department.



# TO THE EDGE OF OUR SOLAR SYSTEM: DWARF PLANETS, ASTEROIDS, COMETS

Save the date - Friday 16 April 2021  
Planetarium Pythagoras

*Call for students of  
University Mediterranea of Reggio Calabria*

by Prof. Angela Misiano, Planetarium Pythagoras Scientific Director, Reggio Calabria, Italy and Nadia Mammone, Assistant Professor in Electrical and Neural Engineering, University Mediterranea of Reggio Calabria, Italy

The Universe always reserves surprises, astronomers always hope to discover even barely detectable signals that may come from extreme regions of the observable Universe. Sometimes, however, surprises come from “around the corner”: from our Solar System. From the five “wandering stars”, Mercury, Venus, Mars, Jupiter, Saturn, discovered by the Greek astronomers, we discovered Uranus Neptune and Pluto. Such a discovery was one of the first successes of Newton’s universal gravitation law. According to the International Astronomical Union, an object acquires the status of “planet” if it orbits the Sun, if its mass allows its self-gravity to overcome the forces of the rigid body so that it assumes a form of hydrostatic equilibrium, almost round and, above all, if it manages to “dominate” its own orbit by clearing it of other celestial objects so that it does not share it with them. Pluto, because of sharing its orbit with many other small trans-Neptunian objects, was downgraded to the category of “dwarf” planet in 2006. Recent discoveries of many Pluto-like objects, including “Haumea” (Haumea 136108), inspired astronomers to define a category for such objects which to date are five, but could be many more.

Haumea, a name that derives from the fertility goddess of Hawaii, was discovered in 2004 and is located beyond the orbit of Pluto, in a region of the solar system called the “Kuiper Belt”. Compared to the other three dwarf planets known in this region Eris, Pluto and Makemake, Haumea has particular characteristics: it has a rotation period of 3.9154 hours, which explains its very elongated shape, it has an orbital period of almost 285 years, a perihelion of 35 astronomical units and an inclination which however approaches 30°. The most surprising characteristics are related to the discovery of the presence of a ring and two satellites.

*On Friday, April 16, 2021, on the occasion of Haumea's opposition, the students from University Mediterranea will meet in the Pythagoras Planetarium of the Metropolitan City of Reggio Calabria (in person or webinar) to talk about the extreme periphery of the solar system, an unpredictable and fascinating region. For the occasion, two amateur astronomical observatories will be available, which will hopefully provide live images of the planet.*

**For information and reservation**

**[universospazio@unirc.it](mailto:universospazio@unirc.it)**



# ASI “THEMATIC TABLES”

## DATA AND IMAGE ANALYSIS

by Francesco Carlo Morabito,  
Full Professor of Electrical Engineering, University Mediterranea of Reggio Calabria, Italy

The Italian Space Agency (ASI), as part of its research, development and the programs which are openly offered to the scientific community, has launched an initiative of discussion and dialogue with universities and other research centers with the aim of optimizing national commitment to space research and to the analysis of its effects in other fields. Through the creation of thematic tables, the scientific community can publicise its activities and the skills of potential interest for the space sector. Furthermore, the participating groups, selected in advance based on a project sheet, can have an impact in the definition of research topics of joint interest, actively collaborating in interdisciplinary and intersectoral areas. The topics covered on the first working day concerning “Data and Images Analysis” were organized into several sessions: 1) industrial activities; 2) University activities and research centers; 3) the observation of the Universe and planetary exploration; 4) Space Weather; 5) Earth observation. The topics were covered by twenty speakers. Among these, the University Mediterranea of Reggio Calabria, in a talk given by Prof. Morabito, presented research activities on advanced image processing also using Machine and Deep Learning techniques.

Prof Morabito’s lecture was entitled “Machine and in-depth learning for space research and applications”.

The research group belonging to the AI\_Lab and NeuroLab laboratories, in fact deals with the processing of multidimensional signals, with particular reference to the use of machine learning, neural networks, complex networks and fuzzy techniques. The head of the group worked on the processing of SAR radar data, both of the Stripmap and Spotlight type. The group also obtained a patent on the tomographic reconstruction of remotely sensed images from satellite SAR performed through the inversion technique known as Radon Transform and the use of Hough transform for detecting specific objects in images. Recently, the group has been involved in in-depth learning, developing innovative algorithms and models, which have also been implemented on hardware, in collaboration with ST Microelectronics of Catania.

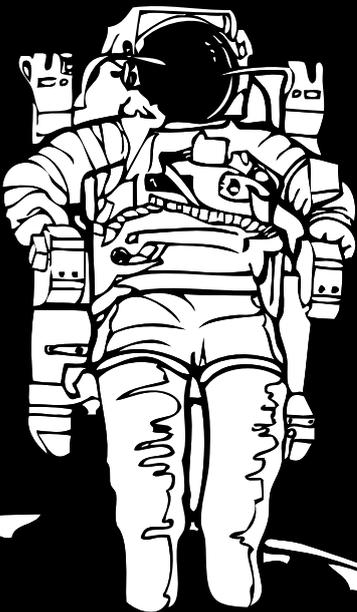
The main lines of research presented concern generative and antagonistic neural networks, the interpretability of neural models, the sparsification of models for increasing the generalization capacity, the fusion of models and real-time learning. The use of neural networks can make using brain computing methodologies for the solution of complex problems even in space navigation or for the optimization of energy resources in the constellations of satellites. The monitoring of on-board sensors for possible malfunctions is also relevant for space missions which are carried out, for example, to predict the influence of the Sun on Earth's space.

Send us your contribution on ASI Thematic Tables by writing an email to [universolospazio@unirc.it](mailto:universolospazio@unirc.it)



# SPACE EVENTS

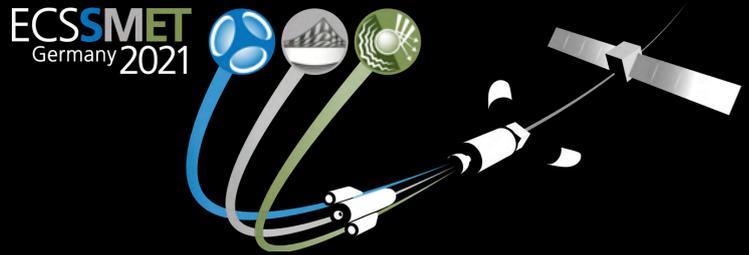
**March 2021 - May 2021**



## 16TH EUROPEAN CONFERENCE ON SPACECRAFT STRUCTURES, MATERIALS AND ENVIRONMENTAL TESTING (ECSSMET)

23-25 MARCH 2021

The aim of the European Conference on Spacecraft Structures, Materials and Environmental Testing (ECSSMET 2021) is to promote and facilitate discussion and the exchange of experience and information among members of the various mechanical engineering disciplines and the environmental testing community concerned with spacecraft development, assembly, integration and verification.



[Read more here](#)



[Read more here](#)

## BIG DATA ANALYTICS APPLICATA ALLE IMMAGINI MULTISPETTRALI E IPERSPETTRALI\*

25-26 MARCH 2021

Free training course organized by the E. Amaldi Foundation as Ambassador of the ESA Business Applications Italy Program. The course is aimed at experts, entrepreneurs, researchers and any other person interested in discovering how Earth Observation satellite data works.

*\*Course in Italian*

## EDINBURGH WOMEN IN SPACE CONFERENCE

26-28 MARCH 2021

For a brighter future for women in the space sector. Nobody gets anywhere alone, which is why we aim to give you a network of inspirational leaders in the space sector, as well as like-minded students who share the same passion as you. This conference will offer you a network of individuals who can help you with your journey.



[Read more here](#)

## 2ND INTERNATIONAL CONFERENCE ON HIGH-SPEED VEHICLE SCIENCE & TECHNOLOGY (HISST 2021)

19-22 APRIL 2021

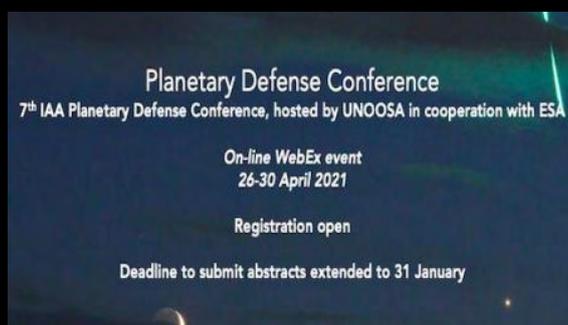
The “2nd International Conference on High-Speed Vehicle Science and Technology” (HiSST) community promotes open discussion between research institutions, academia and industry from around the globe on research and the development of enabling technologies from supersonic to high-speed vehicles. Presentations at the Conference, paper reports and interactive discussions cover different aspects of high-speed aerial and space vehicles development including fundamental research and technical solutions in aerodynamics, flight dynamics, operations, materials and structures.



[Read more here](#)

## 7TH INTERNATIONAL ACADEMY OF ASTRONAUTICS PLANETARY DEFENSE CONFERENCE 2021

26-30 APRIL 2021



[Read more here](#)

The International Academy of Astronautics will hold the 7th IAA Planetary Defense Conference in 2021 in Vienna, Austria. The Conference will be hosted by the UN Office for Outer Space Affairs (UNOOSA).

The conference will include a hypothetical NEO/Earth impact event scenario that will be part of the conference. Conference attendees may also use the hypothetical scenario as their topic for papers and presentations. Although this scenario is realistic in many ways, it is completely fictional and does not describe an actual potential asteroid impact.

## SPACE TOURISM CONFERENCE

28-29 APRIL 2021

The Space Tourism Conference (STC) is an annual event that will be organised with the support of the Space Tourism Society (STS), which has been the world's leading promoter of space tourism for over 20 years. The conference date of April 28 was deliberately chosen as it marks the anniversary of Dennis Tito's lift-off into the history books in 2001 as the world's first private space tourist. Tito's flight jump-started the space tourism industry, generating massive consumer awareness of the possibilities of private space travel and the commercialization of space through earth-based experiences.



*Profiting from the Space Experience Economy*

[Read more here](#)

## DASIA (DATA SYSTEMS IN AEROSPACE)

18-20 MAY 2021

DASIA gathers space data systems specialists for presentations, workshops/panels and discussion lasting 3 days. It provides opportunities for exhibitors and networking. DASIA embraces the technical and managerial aspects of development, operation and maintenance of data-handling related components and systems. It deals with the hardware and software for space and aircraft systems or systems for other sectors which share similar requirements for high reliability and complexity. Cross-domain topics and participation have a high priority at DASIA together with other areas including e. g. transport, communications, navigation, energy, remote sensing, robotics and automation.



[Read more here](#)



[Read more here](#)

## THE 5TH SGAC EUROPEAN SPACE GENERATION WORKSHOP (E-SGW 2021)

28-29 MAY 2021

The 5th SGAC European Space Generation Workshop (E-SGW 2021). The 5th European Space Generation Workshop (E-SGW) is a two-day international event that aims at bringing together students and young professionals in order to think and collectively create Europe's future in space. The event is intended for students and young professionals (aged 18-35 years).

## ASCEND 2021

CALL FOR CONTENT  
DEADLINE 30 MARCH 2021

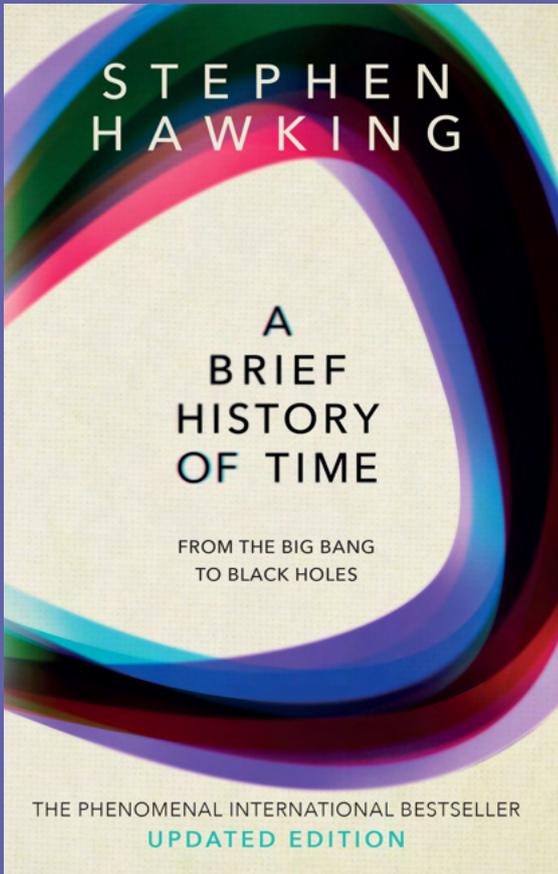
Share your vision for humanity's off-world future with ASCEND's growing community of space professionals, students, and enthusiasts during our second annual apex event, 15-17 November 2021.

The Call for Content invites you to publish and present your research and/or organize a collaborative session.

# ASCEND

15-17 November 2021  
Powered by AIAA

[Call for content](#)



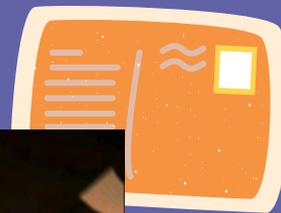
## SPACE FOR BOOKS

Space and Time: Was there a beginning of time? Is the universe infinite or does it have boundaries? To this day, *A Brief History of Time* remains a bible in the scientific canon and its clear language continues to introduce millions to the universe and its wonders. The book begins by reviewing the great theories of the cosmos from Newton to Einstein, before delving into the secrets which still lie at the heart of space and time, from the Big Bang to black holes, via spiral galaxies and string theory.

**"The increase of disorder or entropy is what distinguishes the past from the future, giving a direction to time."**

Stephen Hawking, *A Brief History of Time*

## SPACE POSTCARD



This image was captured while NASA's Perseverance rover drove on Mars for the first time on March 4, 2021. One of Perseverance's Hazard Avoidance Cameras (Hazcams) captured this image as the rover completed a short traverse and turn from its landing site in Jezero Crater.

A key objective for Perseverance's mission on Mars is astrobiology, including the search for signs of ancient microbial life. The rover will characterize the planet's geology and past climate, pave the way for human exploration of the Red Planet, and be the first mission to collect and cache Martian rock and regolith (broken rock and dust).

*Perseverance Hazcam First Drive, March 4, 2021*

CREDITS: NASA/JPL-Caltech

# Call for ideas



Write an email to [universospazio@unirc.it](mailto:universospazio@unirc.it)  
or reach out to us on our social media!



UNI@VERSO LO SPAZIO

*University Mediterranea of Reggio Calabria*



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