SPACE NEWSLETTER

JUNE 2021

UNI@VERSO LO SPAZIO

University Mediterranea of Reggio Calabria

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University Mediterranea of Reggio Calabria

Greetings to all,

The light and enthusiasm of the approaching season fills us with expectations for the coming months and encourages us to continue to devote our energies to the objectives of the Space Newsletter. We are committed to maintaining contact and dialogue with other Mediterranean countries and examining their contributions to the space sector.

In this edition, you will find a lot of information (discovered through space sciences and technology) that allows us to rediscover the treasures of the Mediterranean. We have included some results obtained through natural sciences, observation of the Earth, space exploration and many more.

We have the opportunity to hear from the President of the Italian Space Agency telling us how essential space is in our lives and how Italy is continuing research and confronting the challeges presented by space exploration.

We have also reflected on the importance of other people's stories. The telling of and listening to these stories can reveal opportunities for both individuals and the community in general. For this reason, young people play an even more central role in the objectives we have set. Their stories, opinions and life experiences enable us to think even more.

We are therefore, in this edition, calling on all students of the University *Mediterranea* to tell us about their experiences of projects and activities carried out by the Space Community - an ever increasing presence within the university.

Confident of and grateful for your participation in this and your passion for space, we look forward to sharing with you the incredible journey that awaits us all.

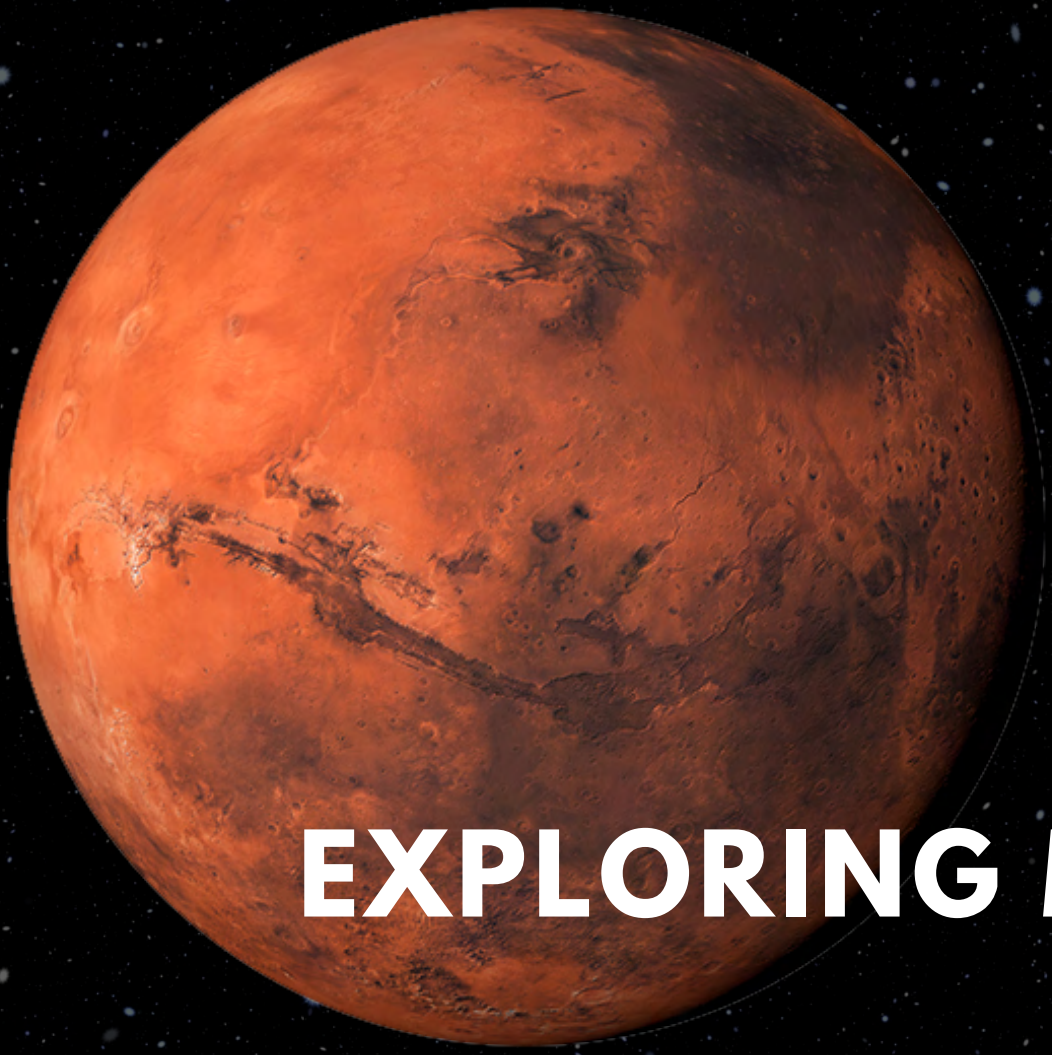
Sending you our warmest regards,

Space Newsletter Editorial Staff

IN THIS ISSUE

"I think the space is one of the few sectors that has a possible broad-spectrum involvement. So, it's up to you to decide which direction to take. New disciplines will be born and you will have something to enjoy."

Giorgio Saccoccia,
President of the Italian Space Agency



EXPLORING MARS

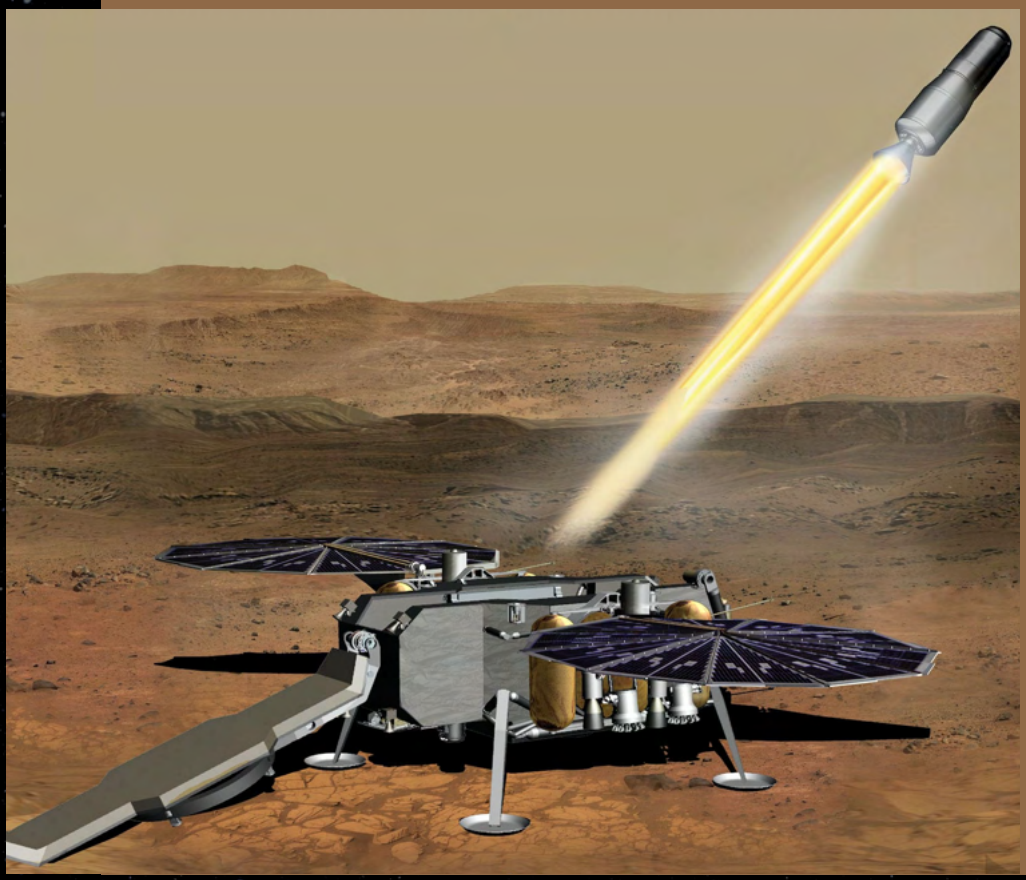
by Enrico Flamini, International Research School of Planetary Sciences - D'Annunzio University

In the last four decades, we have passed from the age of the discoveries, or "the first time" age, to the age of exploration, and now we are moving towards the exploration of the various bodies of our solar system. The Moon, Mars and asteroids have all been on the agenda. The exploration of Mars, especially (initially by NASA), has been the focus of research and development by the major space agencies over the last twenty years. Since the landings of the two Vikings, in 1976, it has been quite evident that, despite the extreme environmental conditions on the surface of Mars, this planet was and still is the only one where the foundation of a permanent and autonomous human settlement would be possible.

Autonomy is the main difference between a large permanent settlement and a short-term outpost. Furthermore, autonomy implies the availability of resources, mainly energy, water and valuable minerals. What we have learned in the last forty years on Mars, in other words from the landing of the two Vikings, is that the planet was once capable of hosting biological lifeforms and that it might still be an incubator for microbial life. We have also understood that Mars is, from the point of view of a geologist, a living planet where daily and annual temperature variations cause winds, the evaporation of carbon dioxide and the deposition of ice, where landslides can occur. Liquid water may occasionally reshape some surface features such as gullies.

Every two years, global dust storms may hide the sun for weeks, but these are not the sandstorms shown in the sci-fi movies. We have measured the depth of the polar caps, and we know the amount of water stored there, a quantity large enough to cover the entire planet surface with an approximate ten-meter-deep ocean. Recently an Italian instrument, MARSIS, has demonstrated that liquid water lakes are hidden in the depth of the subsurface of Mars. We have also learned that solar operated rovers may survive for years and that a compact nuclear thermal generator may produce electric power for a much longer period. Therefore, we know that energy and water exist on Mars. Water is not necessarily easily accessible, but it is widely available and not only at the poles. Actually, some information has indicated that large glaciers are present at mid-latitudes and a new mission is planned with the primary goal of locating and measuring them.

These glaciers are similar to those on Earth, where the ice lies under a layer of rocky debris, so it is not directly visible with optical observations. These frozen water reservoirs are currently the main target for accessing the water essential for a human outpost. Ice means drinking water when melted and filtered, but it also means oxygen and hydrogen: the main ingredient for breathable air and fuel for rockets. The transformation of local resources into usable elements is the goal of ISRU or In Situ Resources Utilization, and it is driving the development of robotic exploration where robotic instrumentation is used to excavate the available in-situ rocks regolith, ices and atmosphere in order to process them to produce useful elements. The first ISRU experimental package is already operating onboard the last NASA rover, Perseverance. It is called MOXIE- Mars OXigen In situ Experiment, and it is designed to process the atmospheric CO_2 on Mars, producing oxygen.

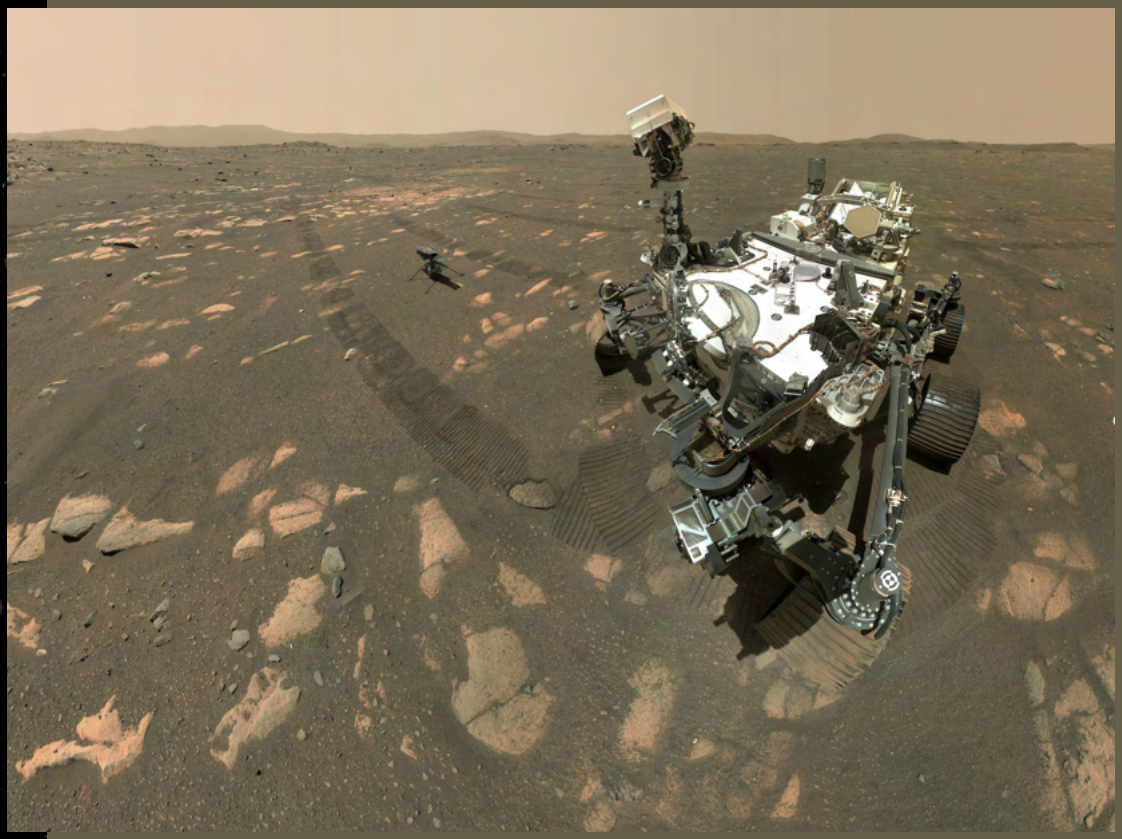


The Mars Ascent Vehicle will return samples on Earth.
Image Credits: NASA

It is approximately the size of a car battery. It will demonstrate the full feasibility of this process with the intention of placing on Mars a much larger version capable of producing the quantity of fuel needed for the return journey to Earth. This quantity is estimated at between 40 and 50 tons. Combining carbon dioxide and molecular oxygen is also possible to produce methane, another fuel currently used in the latest generation of launchers, such as the Space-x Starship.

These instruments are essential to plan a human-crewed mission capable of returning the crew to Earth. It is imperative to show that the rocket can return to Earth before sending a human crew to Mars. For many years one of the priorities for the scientific community has been to analyze soil from Mars and atmospheric samples in a terrestrial laboratory where all the necessary instruments can be extensively utilized.

The return to Earth of these samples by means of a robotic mission allows this process to be carried out. The Mars Sample Return programme is already in place thanks to the partnership between the American and European space agencies.



Perseverance and Ingenuity moving on Mars.
Image Credits: NASA

There are different elements to be launched separately: a rover to select, collect and store the samples in a suitable container, a lander equipped with the launch pad and the ascent vehicle to put the container in orbit around Mars where an orbiter will be waiting to bring the samples to Earth. It is indeed a complex programme, but it does represent a real turning point in the ultimate plan to bring about a human mission to Mars. On the private side, the return from Mars is a critical milestone too. Space-X's vision follows a different technical approach: a large, very powerful rocket capable of landing and restarting (having refuelled on Mars) and returning to Earth. It is currently at an advanced phase of planning and is called Spaceship.

Both approaches need a lot of work and research to be completed and technological and scientific challenges to be overcome. In conclusion, Mars is there, and we now know that we could survive there, and within a couple of decades, its landscapes will be seen by human eyes.

Perseverance's First Road Trip.
Image Credits: NASA

MILAN CANDIDATE CITY TO HOST THE INTERNATIONAL ASTRONAUTICAL CONGRESS 2024

by Gabriella Arrigo,
International Affairs Director at the Italian Space Agency (ASI)

The International Astronautical Congress (IAC) last time in Italy was in **2012 in Naples**, which was attended by 3300 delegates from the six continents. In **1997 Turin** hosted the Congress opened by the President of the Italian Republic. In **1981 and 1956, Rome** opened the doors to the Congress. Thus, the first IAC in Italy took place in the middle of the Cold War, heroic years in which scientists from the two blocs met and exchanged information.

The IAC is organized annually by the International Astronautical Federation (IAF), which brings together all international space community: **about 6000** representatives of agencies, industry, academia, young people, parliamentarians, astronauts, media and the general public. The Congress sessions cover all the disciplines of space, from engineering to economics, from politics to art, from science to society.

Last April 30, the entire Italian space community presented the candidacy of Milan to host the IAC 2024. **AIDAA** (Italian Association of Aeronautics and Astronautics), **ASI and Leonardo** are the three promoters, with the support of the whole national aerospace industry and academy (including the University Mediterranea of Reggio Calabria), the central and local political authorities.

The motto of the Congress is **Responsible Space for Sustainability**. The Earth's orbital space environment constitutes, in fact, a finite resource that is being used by an increasing number of States. Furthermore, the proliferation of space debris and the increased risks of collision with the operation of space objects may affect the long-term sustainability of space activities. Addressing these developments and risks requires international cooperation to avoid harm to the space environment and the safety of space operations. Voluntary responsible behaviour is premised on the understanding that outer space should remain an operationally stable and safe environment for peaceful purposes.

The logo is ready, and the scientific program, the social events, and the technical tours. **Why Milan?** Because it is a city of excellence in the field of sciences and research; the MiCo, the largest Conference Centre in Europe, is conveniently located in the heart of the city; Milan offers a wide choice of accommodation facilities with 43.000 hotels rooms; with its three airports, the city is one of the best-connected international cities. Furthermore, Milan is considered the economic hub of Italy and the region is also highly active in space missions and leader in Italy for some specific space systems and technologies.

WELCOME TO ITALY AND MILAN!

Renato Panesi, D-Orbit's founder and CCO and Luca Rossettini, D-Orbit's founder and CEO

D-ORBIT: THE COMPANY (RE)INVENTING ORBITAL TRANSPORTATION

D-Orbit is a global space logistics and transportation company committed to helping companies do business in space profitably and sustainably.

«While the company was officially founded in 2011, the idea came up in 2010, while Renato and I were both attending a Fulbright scholarship in Technology Entrepreneurship in Silicon Valley. After an internship at NASA Ames Research Center, we wondered how we could enable the entire humankind to successfully exploit the space ecosystem and improve space business and overall human space activities durably. To answer this question, we came back to Italy and created D-Orbit with the vision of creating the first space logistics infrastructure to enable the next trillion-dollar space economy and human expansion in a sustainable space», says Luca Rossettini, D-Orbit's founder and CEO.

Today D-Orbit provides orbital transportation services to satellite operators for the last-mile delivery of satellites to their operational slot, inter and intra-orbital transportation, space logistics, and space waste management. «Our core technology is ION Satellite Carrier, a modular and scalable space transportation vehicle able to transport a batch of satellites to space, release each one of them in independent orbital slots, and perform orbit-change manoeuvres between each deployment, and host third party payloads for in-orbit validation and demonstration (IOD/IOV) missions», says Renato Panesi, D-Orbit's founder and CCO.

«The evolution of ION will enable us to carry out shortly in-orbit servicing missions perform small repairs, visual inspections, life extension, and disposal of satellites that are already in orbit.»

D-ORBIT
NEW SPACE SOLUTIONS

Artistic representation of ION Satellite Carrier in orbit. The picture in the background has been taken by ION during the ongoing PULSE mission.

D-Orbit's vision is to offer in-space servicing and transportation for a profitable business and human expansion in a sustainable space. «We take logistics for granted here on Earth. However, there will be no businesses without logistics services: even if you produce pens, you need someone picking up the pens at your factory and transport them to the distributor and so on to the local shop where you can buy them for a reasonable price. We want to create such effective infrastructure in space by providing a payload into a parking orbit, transporting it to a particular orbital slot for operations, service and repair older spacecraft, and clearing the orbit by removing defunct vehicles. And this is just the starting point», says Luca Rossettini. «Having a successful space ecosystem will allow us to transform Earth and the way we live on Earth and to broaden humankind's opportunities to operate in space and explore the solar system. It's reasonable to think that in 500 years we'll be travelling in space, have settlements on other planets, and be able to move from one planet to another just as we take a plane today and go to another country. Today we are at the starting blocks of a path to the future. Space logistics is the enabling service that will allow us to build that path.»

RADAR TECHNOLOY AND SUSTAINABILITY: AN INNOVATIVE LOOK TO SOCIETY

by Alfonso Farina, Leonardo SpA Consultant
and Luca Timmoneri, VP, NS LoB - CTO/Capability, Leonardo SpA

Alfonso Farina, former Senior VP CTO of Selex ES (now Leonardo) and Professor of Radar Techniques at the University of Naples, Federico II, and Luca Timmoneri, Chief Technical Officer, Naval Business Dpt, Leonardo, have recently developed a study on social utility and environmental sustainability of radar technologies. The contribution collects their ideas, recently presented in a POLARIS Innovation Journal webinar. Professor Farina also proposed some of these topics in a seminar organized by the Engineering Departments of our University.

RADAR is the acronym for "Radio Detection and Ranging". Many associate Radars with rotating antennas, control rooms or Plan Position Indicators (PPI) with long-decaying light-emitting phosphors, which are so often depicted in action movies. Behind the apparent simplicity of radar's equipment lies one of the most complex and sophisticated engineering system, characterized by a mix of technologies ranging from electronics to mechanics, from communications to software, to processes for sustainable approaches in production. Modern radar systems are equipped with Phased-Array antennas, a technology based on a suitable collection of radiating elements, each equipped with a transmitter/receiver module (TRM) functionally connected to form a single antenna with optimized performance.

The Institute of Electrical and Electronic Engineers (IEEE) recently recognized Christian Hülsmeyer as the father of radar by dedicating him a prestigious award (IEEE Milestone) for the Invention and First Demonstration of Radar (1904). Today, radar technology is pervasive and contributes significantly to our safety and security. Defence radar systems in the various domains of land, air, and space continue to provide information in all conditions of weather, day and night.

Satellite radars offer global coverage for remote sensing of Earth, providing massive data for scientific research and continuous monitoring. They have been used in planetary investigations to observe and inspect other planets (in particular, Mars).

Air traffic management's control and safety depend entirely on radar, while weather radars provide essential information for forecasting and anticipating adverse events. Radar is essential for space research:

- Weather Sensors for Aviation (detection of micro-burst and gust, wind profilers) and Hydrology,
- Space-borne altimetry,
- Space-borne remote sensing (crop, hydrology, geodesy, archaeology, astronomy, defence),
- Synthetic Aperture Radar (SAR) imaging,
- Planetary exploration,
- Acquisition and tracking of satellites in the re-entry phase, monitoring of space debris.

Radars play a relevant role in facing the present worldwide pandemic crisis through digital, green, sustainable, and space economy. Some of the applications can be summarized in the following:

- active array antenna technology is exploited for the broadband Internet all over the world;
- weather radars will be able to support agriculture and wildlife management;
- the analysis of the conditions and monitoring of glaciers can be entrusted to radar sensors (particularly in Synthetic Aperture (SAR) and Interferometric SAR modes) directly onboard aircraft;
- sensors have been developed that do not contribute to electromagnetic pollution but exploit the commercial emissions (i.e., radio and TV) already present in the "ether";
- radars traditionally dedicated to aerial surveillance can be decisive for protecting our planet in the event of a fall of space debris;
- miniaturization of sensors commonly installed onboard cars to increase the safety of urban traffic; the possibility to install radars on drones for multiple applications;
- the control of future sub-orbital flights for space tourism purposes cannot ignore radar sensors.

EU promotes the considerable effort that radar technology is finalizing through ambitious development plans through European Defense Funds. Finally, it is important to underline how many generations of Italian engineers and technicians have grown professionally thanks to the opportunity to work in this advanced technological field. Italian radar has a long history, suffice it to mention the speech of 1922, given by Guglielmo Marconi at I.R.E. (Institute of Radio Engineers), now IEEE: "*a ship could radiate divergent beam ... if coming across a metallic object, such as another steamer or ship, would be reflected to a receiver on the sending ship, and thereby immediately reveal the presence and bearing of the other ship in fog or thick weather*". Indeed, as of today, many products of the Italian radar industry are spread worldwide.

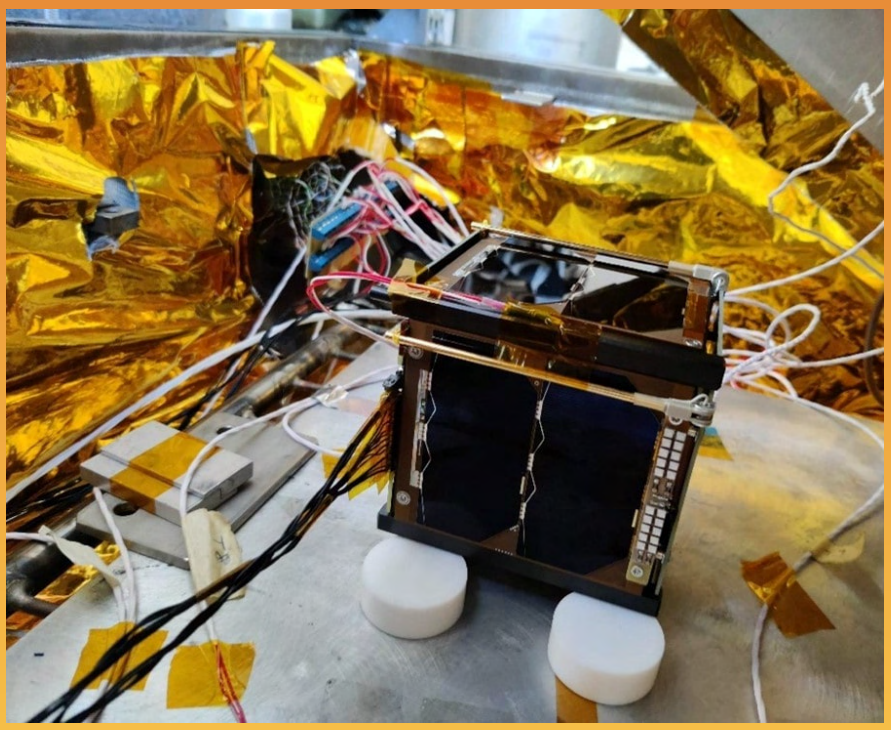
THE ITALIAN-KENYAN SATELLITE SIMBA STUDYING WILDLIFE IN KENYA

by Fabio Santoni,
Associate Professor of Aerospace Systems, Sapienza University of Rome

The Cubesat WildTrackCube-SIMBA was launched on March 22 from the Baikonur Cosmodrome (Kazakhstan). This satellite is the third in a series made by students and researchers at the Sapienza University of Rome, under the supervision of Prof. Fabio Santoni and Prof. Fabrizio Piergentili, collaborating with colleagues and students at Machakos University and University of Nairobi, Kenya.
SIMBA, the Swahili word for lion, stands for System for Improved Monitoring of the Behavior of Animals.
The primary motivation for the mission is contributing to wildlife monitoring, addressing the numerous human-wildlife conflict incidents reported every year in Kenya. These have a relevant socioeconomic impact, mainly in rural areas, where crops and livestock represent the main livelihood. Animal movement monitoring can also contribute to contrasting poaching and wildlife trafficking.

The three universities conceived the satellite as a technical demonstration of low-cost means for tracking animals using a Cubesat-based system. Animals will be fitted with a collar collecting data on their geographical position and state of health and. If the technical demonstration proofs successful, tracking units may be deployed on a large scale, and animals tracked systematically, to the benefit of scientists and operators in the Kenya National Parks.

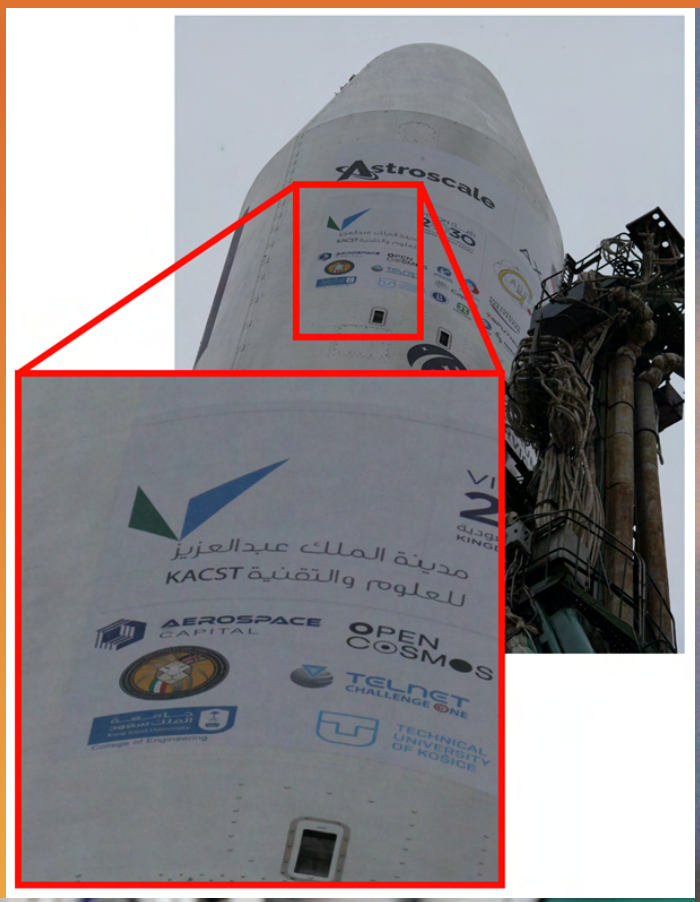
Mission LOGO

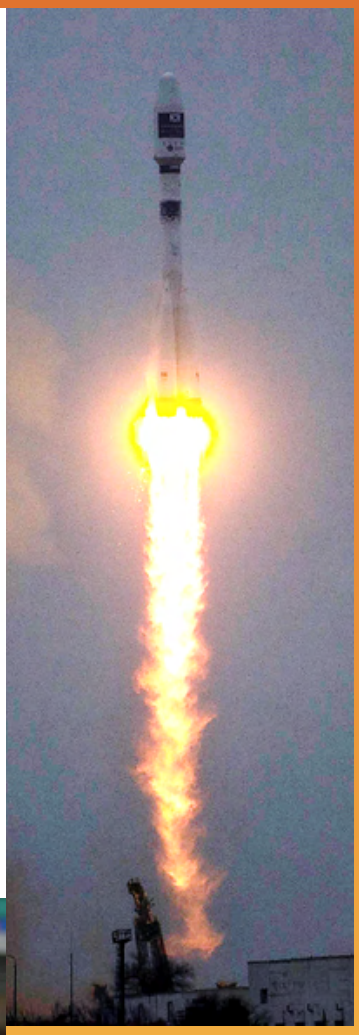


WildtrackCube-SIMBA undergoing thermal-vacuum testing at the Sapienza University facilities.

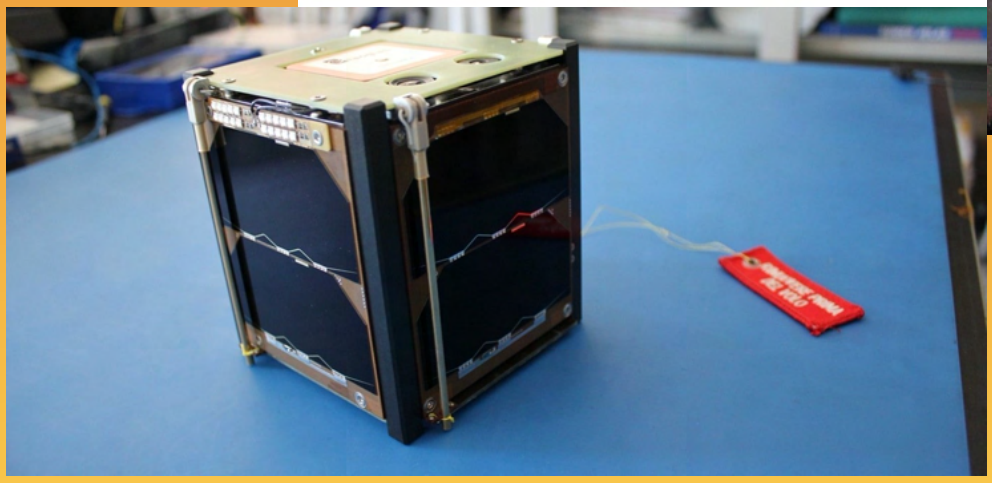
The Italian Space Agency (Agenzia Spaziale Italiana - ASI) and the Kenyan Space Agency under the Italian-Kenyan University Nano-Satellites (IKUNS) programme supported the project, which also benefits from the Joint Postgraduate Course in "Capacity Building in Astronautics", established in cooperation between Sapienza University and Machakos University. During the course, students from Italy and Kenya are involved in hands-on activities under the supervision of professors and experts from both countries.
In 2019, the mission won the international competition "Win a free launch of 1U Cubesat on the first commercial mission of GK Launch Services", sponsored by the International Astronautical Federation and the launch company GK Launch Services.

'Win a free launch of 1U Cubesat on the first commercial mission of GK Launch Services' Award ceremony - Washington DC, October 2019.





Soyouz-Fregat Launch on March 22, 2021.



WildtrackCube-SIMBA before integration on the launch system.

"For Italy, space means operating in all application sectors."

GIORGIO SACCOCCIA

Born in Belluno, on January 11, 1963, Giorgio Saccoccia is the President of the Italian Space Agency (ASI) since May 2019. He graduated from the University of Pisa (Italy) with a degree in Aerospace Engineering and from Webster University at Leiden (The Netherlands) with a Master in Business Administration. Before joining ASI, he worked for almost thirty years at the European Space Agency (ESA) in several technical and management positions. In particular, he has been Head of the Electric Propulsion Section, Head of the Propulsion and Aerothermodynamics Division and Acting Head of the Mechanical Engineering Department of ESA. During his experience in ESA, he was in charge in different tasks as project manager and technology coordinator in particular in the field of space exploration. Giorgio Saccoccia is an Associate Fellow of the American Association for Aeronautics and Astronautics (AIAA), Full Member of the International Academy of Astronautics (IAA) and Emeritus Member of French Aeronautics and Astronautics Association.

How and when did you decide to pursue your career in the space sector? What are your present main objectives and what are those of the Italian Space Agency?

«Quando ho deciso di intraprendere la mia carriera nel settore spaziale? Sono una di quelle persone che ha avuto la fortuna di avere fin da bambino una passione. Sono stato sempre appassionato dallo spazio. Da quando avevo pochissimi anni, avevo la testa tra le stelle. Avevo sei anni, quando l'uomo è sceso sulla luna, ricordo quella notte molto bene: eravamo io e mia mamma e io ero quello fissato che voleva assistere. Poi ho avuto la fortuna di conseguire degli studi che mi hanno permesso di entrare in questo settore. In realtà, dopo la laurea, non ho subito iniziato a lavorare nel settore spaziale perché le prime opportunità sono state nel settore aeronautico, però molto presto, dopo poco più di un anno, ho deciso di rinunciare a un contratto di lavoro a tempo indeterminato e ho colto un'opportunità invece un po' più incerta, ma che mi ha riportato nel settore spaziale.

Ci tengo a ricordarlo questo perché a volte, soprattutto quando si è ragazzi, bisogna fare delle scelte che sono meno dettate dall'idea di sicurezza, perché tanto c'è tutta una vita davanti per correggere e per mettere al sicuro certi progetti. Questo di fatto poi mi ha aperto di nuovo la chance di lavorare in un settore che era quello che faceva parte dei miei sogni da bambino.

Sono rimasto in questo settore per tutta la mia carriera: per un breve periodo sono stato in Italia e poi sono andato all'estero di nuovo, con una prospettiva molto breve perché il mio primo contratto all'Agenzia Spaziale Europea era di soli due anni, però appunto poi si sono aperte altre opportunità e ci sono stato ben quasi 30 anni prima di venire qui in Italia come Presidente dell'Agenzia Spaziale Italiana.»

"I have always been passionate about space. Ever since I was a small child, my head was in the stars."

«When did I decide to pursue my career in the space sector? I am one of those people who was lucky. Since childhood, I have always been intensely interested in space. I have always been passionate about space. Ever since I was a small child, my head was in the stars. I was six years old when man landed on the moon. I remember that night as if it were yesterday, my mother and I were together, and I was the one obsessed with wanting to wait up for that historic moment. Furthermore, I was lucky enough to follow some degree programmes which allowed me to enter this sector. After graduation, I did not immediately start working in the space sector because the first opportunities cropped up in the aeronautics sector. However, after just over a year, I decided to give up a permanent job in order to embark upon a slightly more uncertain career choice, which brought me back to the space sector. I would like to remind you of this because sometimes, especially when you are a teenager, you have to make choices that are less dictated by the idea of job security; after all, you have your whole life in front of you to rethink and obtain certain projects. This career choice presented me once again with the chance to work in a sector that was part of my dreams as a child. I have remained in this sector for my entire career. For a short time, I was in Italy and, after that, I went abroad again thinking it would be for a brief period because my first contract with the European Space Agency was only for two years. However, other opportunities presented themselves, and I had been there for almost 30 years before coming back to Italy as President of the Italian Space Agency.»

«Quindi il messaggio è che non si può prevedere tutto dall'inizio, assolutamente. Per quanto riguarda invece gli obiettivi dell'Agenzia Spaziale Italiana, lo spazio per l'Italia vuol dire operare in tutti i settori applicativi, quindi, è chiaro che ci sono delle priorità del momento, però di fatto noi dobbiamo mantenere e far crescere questo posizionamento pressoché completo dell'Italia, dell'industria italiana e della nostra capacità in tutti i settori dello spazio.
È su questo che ci muoviamo con l'Agenzia: per identificare da subito quali sono le opportunità sulle quali concentrarsi, finanziando attività che sono più urgenti al momento ma soprattutto facilitando le condizioni di partnership dell'Italia anche con altri paesi per poter partecipare ai progetti di visione più globale.»

«Hence, the message is that you cannot predict everything from the beginning. Regarding the objectives of the Italian Space Agency, for Italy, space means operating in all application sectors. Therefore, it is clear that there are priorities at the moment, but we must maintain and consolidate Italy's position, Italian industry, and our capacity in all space sectors. This is what we are working on with the Agency: to immediately identify the opportunities we must focus on by financing the activities, which are now the most urgent, but above all by facilitating Italy's partnership conditions with other countries in order to participate in projects with a more global vision.»

Considering the changes we have faced in the last year, how will space and space technologies transform and improve our lives?

«Lo spazio e le tecnologie spaziali hanno un impatto immediato sulle criticità con le quali ci siamo confrontati nell'ultimo anno a causa della pandemia. Per esempio, il fatto di dover intervenire con strumenti medicali a distanza per interagire direttamente con i pazienti, quindi la cosiddetta telemedicina, trova la sua applicazione più stimolante e innovativa proprio nelle attività spaziali. Il fatto di poter monitorare la salute degli astronauti o addirittura intervenire per poter curarli a distanza è una cosa obbligata nel settore spaziale. E tutto quello che impariamo in quel campo, come lo sviluppo di sensoristiche mediche in remoto, lo possiamo poi trasportare nella vita di tutti i giorni e diventa efficace in situazioni come quelle della pandemia.»

Space Technologies to contrast Covid-19: ASI invests 10 million euros. Source: ASI

«Un altro esempio è la realizzazione di farmaci direttamente in condizioni di gravità sulla Stazione Spaziale Internazionale, sfruttando la microgravità che facilita certe condizioni per lo sviluppo di farmaci più efficaci. Questo è stato già dimostrato e verrà utilizzato ancora di più in futuro. Pensiamo alla combinazione dei satelliti per l'osservazione della Terra, per la navigazione e le telecomunicazioni per ridurre il digital divide e quindi per raggiungere con qualunque forma di connessione luoghi più remoti o gente che è isolata, per esempio, a causa della pandemia o più in generale durante emergenze o situazioni di crisi. Tutto questo ovviamente è supportato dallo spazio. Quindi, di fatto, durante questo periodo del Covid-19 ci siamo resi conto di quanto le tecnologie spaziali possano essere preziose e in supporto alla vita di tutti i giorni.»

"Space and space technologies have an immediate impact on the critical issues we have faced in the last year due to the pandemic."

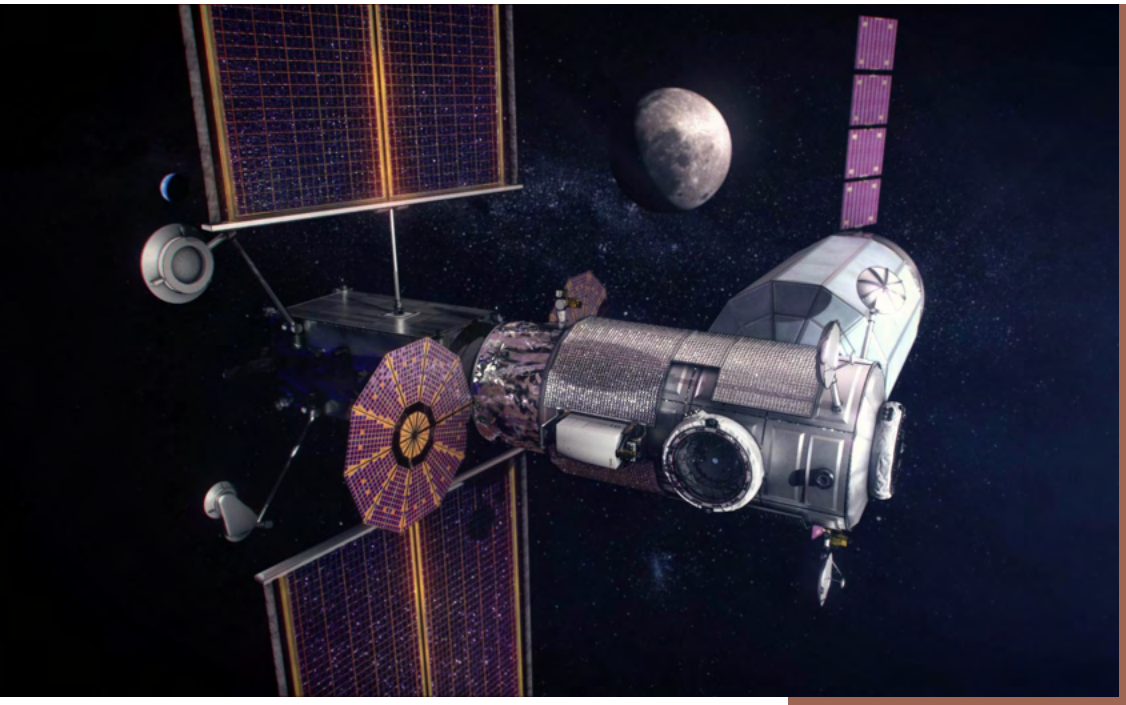
«Space and space technologies have an immediate impact on the critical issues we have faced in the last year due to the pandemic. For example, intervening with remote medical instruments to interact directly with patients, the so-called telemedicine finds its most stimulating and innovative application, above all, in space activities. Being able to monitor the health of astronauts or even treat them remotely is a must in the space sector. Everything we learn in that field, such as developing medical sensors remotely, can be transferred into everyday life and become effective in situations like those of the pandemic. Another example is the creation of drugs directly in the gravity conditions which exist on the International Space Station by taking advantage of the microgravity that facilitates certain conditions for the development of more effective drugs. This has already been proven and will be used even more in the future. We can also add to the list the combination of satellites for Earth observation, navigation, and telecommunications used to reduce the digital divide and therefore to reach remote places or people who are isolated, for example, due to the pandemic or, generally speaking, during emergencies or crises. All of this is supported by space. Therefore, during this period of Covid-19, we realized how valuable space technologies can be in support of everyday life.»

What are the current challenges of space exploration, and how is Italy facing them?

«Le sfide dell'esplorazione spaziale sono molte: partendo dall'orbita terrestre ed allontanandoci verso quella lunare. L'evoluzione in orbita terrestre della Stazione Spaziale Internazionale verso qualcosa che sarà sempre più un'opportunità per attività commerciali o comunque per business privati. Queste sfide passano attraverso la conversione in attività commerciali, della capacità che è stata sviluppata dalle industrie, grazie all'impegno delle istituzioni, dell'Agenzia e dei governi. L'Italia ha una bella esperienza i e l'industria italiana sta già realizzando prodotti puramente commerciali, che segneranno il passaggio della Stazione Spaziale Internazionale da iniziativa istituzionale a iniziativa mista pubblica-privata. Il passaggio successivo sarà una stazione totalmente privata con la logistica di supporto a questa stazione che sicuramente potrà avere un forte contributo dall'Italia. L'altro grande obiettivo ovviamente è il ritorno alla Luna... questa volta per rimanere! Anche questa è per l'Italia una sfida che ha già colto partecipando al programma ARTEMIS per il ritorno lunare, tramite l'Agenzia Spaziale Europea, con l'intento di farlo anche a livello bilaterale con gli Stati Uniti e lavorando ad identificare una serie di contributi possibili, basati su rifugi, moduli pressurizzati, sistemi di telecomunicazioni, tutte cose che abbiamo imparato a fare con la Stazione Spaziale Internazionale.»

«Space exploration involves many challenges, starting from the Earth's orbit and moving towards the moon's orbit. The evolution in the Earth's orbit of the International Space Station towards something that will increasingly be an opportunity for commercial or private businesses. These challenges have been transformed into commercial activities due to the capacity that has been developed by industries, thanks to the commitment of institutions, the Agency, and governments. Italy has good experience, and the Italian industry is already making purely commercial products, which will mark the transition of the International Space Station from an institutional initiative to a mixed public-private initiative. The next step will be a private station with the logistics to support this station, to which Italy will certainly make a significant contribution. The other main goal is the return to the moon... this time to stay! This also presents a challenge for Italy, which has already taken it up by participating in the ARTEMIS program, the aim of which is to return to the moon through the European Space Agency, with the intention of doing so together with the United States. This program aims at working to identify the different contributions we can make - shelters, pressurized modules, telecommunications systems, all of which we have learned to do with the International Space Station.»

Image Credits: NASA



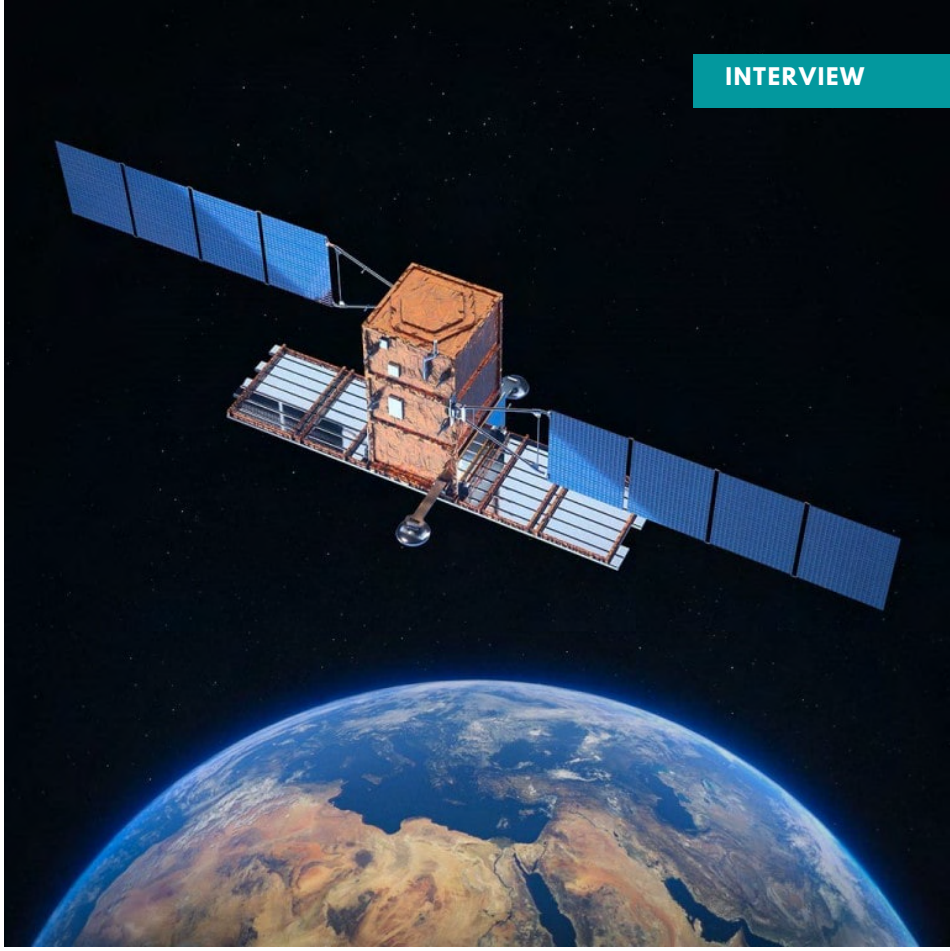
"All the great work done by our scientists and researchers for the development of experiments and instruments, which are used in all these missions, will serve to contribute to a great scientific return."

Concept art of the Lunar Gateway circa 2024, published in March 2020. Image Credits: NASA

«Quindi speriamo di portare presto un pezzetto di Italia, quindi qualcosa sviluppato dall'Italia, anche sulla superficie lunare. Sicuramente lo faremo in orbita attorno alla Luna con la nuova stazione Lunar Gateway.
E poi ovviamente il passo successivo un giorno sarà quello di arrivare su Marte con gli esseri umani, però per fare questo c'è tutto un processo intermedio di missioni robotiche, nelle quali, di nuovo l'Italia ha una lunga tradizione e intendiamo svilupparla ulteriormente con la partecipazione al contributo europeo al progetto Mars sample return.
Il ruolo italiano di leadership su ExoMars dell'Agenzia Spaziale Europea, e poi tutto il grande lavoro fatto dai nostri scienziati e ricercatori per lo sviluppo di esperimenti e di strumenti che volano su tutte queste missioni e che serviranno a contribuire a un grande ritorno scientifico. Ce ne sono già stati tanti clamorosi come la scoperta di acqua salata sotto la superficie marziana ma ce ne saranno ancora tanti, quindi di fatto siamo impegnati in tutti i grandi obiettivi di esplorazione del momento.»

«Therefore, we hope to soon take a piece of Italy (in the form of something developed in Italy), onto the lunar surface. We will definitely do it in orbit around the moon with the new Lunar Gateway station. Obviously, the next step involves the arrival of man on Mars one day but in order to do this, a whole intermediate process of robotic missions must be carried out and, in this field, Italy once again has a long tradition. We intend to develop it further by participating in the European contribution to the "Mars sample return" project.
The Italian leadership role in ExoMars of the European Space Agency and all the great work done by our scientists and researchers for the development of experiments and instruments, which are used in all these missions, will serve to contribute to a great scientific return. Many sensational contributions have already been made, such as the discovery of saltwater under the Martian surface, but there will still be many others. Hence, we are committed to all the great exploration objectives of the moment.»

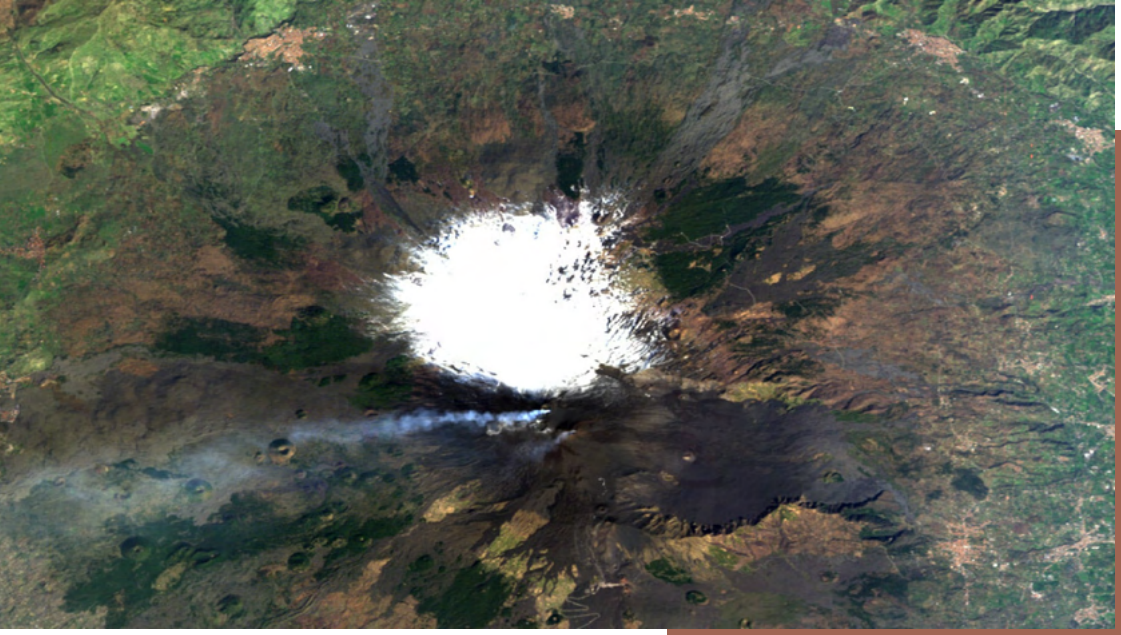
How is Italy contributing to the activities of the space sector in the Mediterranean area? And what are the main areas of research and technologies in which to invest?



COSMO-SkyMed Second Generation (CSG). Image Credits: ASI

«Il Mediterraneo è un tesoro prezioso per paesi come il nostro, che ne è immerso profondamente dentro. Quindi va preservato, va curato, perché così come il Mediterraneo è stata la madre, la culla, che ha generato la nostra civiltà adesso noi ne dobbiamo avere cura in questa fase così delicata. Per fare questo il primo strumento che lo spazio offre è quello del monitoraggio offerto dai satelliti per l'osservazione della terra che consentono di guardare specificamente al mare, alle coste, e a tutto ciò che si affaccia sul Mediterraneo al fine di poter monitorare situazioni di degrado, di inquinamento. Mediterraneo vuol dire anche ovviamente preservarne la sicurezza e quindi monitorare i traffici leciti o illeciti nelle sue acque. Tutto questo viene fatto da satelliti e da strumenti diversi montati sui vari satelliti. Specificatamente l'Italia ha a disposizione alcuni strumenti preziosi come la costellazione Cosmo-SkyMed che guarda utilizzando un radar ad apertura sintetica che permette di fare osservazioni e monitoraggio continuo 24 ore su 24, 7 giorni su 7, anche attraverso le nubi e ogni condizione meteorologica. Soprattutto la seconda generazione di Cosmo-SkyMed, che stiamo lanciando in questo momento, permette di fare anche di più rispetto alla prima anche attraverso l'interferometria che consente di guardare anche a situazioni tridimensionali sulla superficie.»

«The Mediterranean is a precious treasure for countries like ours, which are deeply immersed in it. Hence, it must be preserved, it must be cared for, because just as the Mediterranean was the mother, the cradle, which generated our civilization, now we must take care of it in this delicate phase. To do this, the first tool provided by space is that of monitoring which is carried out by earth observation satellites, allowing you to look specifically at the sea, the coasts, and everything bordering the Mediterranean in order to monitor situations of degradation and pollution. The Mediterranean also obviously means preserving its safety and, therefore, monitoring the lawful or illegal trafficking in its waters. All this is done by satellites and by different instruments mounted on the various satellites. Italy, in particular, has some irreplaceable tools at its disposal, such as the Cosmo-SkyMed constellation, which is capable of close observation using a synthetic aperture radar which allows continuous observation and monitoring 24/7, even when the weather is cloudy or, as a matter of fact, in any weather conditions. Above all, the second generation of Cosmo-SkyMed, which we are launching at the moment, allows you to do even more than the aforementioned instrument using interferometry for the observation of three-dimensional situations on the surface.»



Etna captured by PRISMA. Image Credits: Data/Information generated by Leonardo under an ASI License to use. Original PRISMA product - ©ASI - (2021).

«Quindi monitorare con maggiore attenzione le criticità. Poi consideriamo un satellite iperspettrale, come Prisma, che guarda invece soprattutto ai materiali contenuti in ciò che si sta osservando. Per esempio, per monitorare l'inquinamento da plastiche del nostro mare che sembra essere incredibilmente elevato, più di altri mari importanti. Prisma sicuramente e le successive evoluzioni di questo tipo di sensori iperspettrali consentiranno di poter guardare con attenzione ai contenuti di plastica come di altri materiali inquinanti nel mare e così via. Queste sono le attività dal punto di vista tecnologico ma più specificamente, questo lo sapete già benissimo, attraverso delle iniziative di tipo formativo e l'organizzazione anche di eventi internazionali importanti come l'International Space Forum - The Mediterranean Chapter che si è svolto nel 2019 a Reggio Calabria. L'Agenzia Spaziale Italiana cerca di fornire degli strumenti anche per preparare al futuro attraverso, ad esempio, il nuovo corso di alta formazione "La gestione delle informazioni e dei dati satellitari per i bisogni e lo sviluppo sostenibile del Mediterraneo" che partirà ad autunno di quest'anno organizzato dall'ASI insieme all'Università degli Studi *Mediterranea* di Reggio Calabria. Scopo del corso è la formazione dei giovani, nel prendersi cura del Mediterraneo e delle coste, attraverso gli strumenti offerti dalle attività spaziali. Quindi questo è forse ancora di più un prezioso contributo perché non è un contributo diretto ma crea le basi per una cura a lungo termine.»

«Therefore, it monitors critical situations more carefully. Furthermore, we must consider a hyperspectral satellite, such as Prisma, which looks mainly at the materials contained in what is being observed, e.g., to monitor the plastic pollution of our sea that appears to be incredibly widespread, more than in other important seas. Prisma and the future evolutions of this type of hyperspectral sensors will allow us to look carefully at the contents of plastic as well as other polluting materials in the sea and much more. These are the activities from a technological point of view but, as you already well know, there are other activities involving training initiatives and the organization of important international events, such as the International Space Forum- The Mediterranean Chapter, which took place in 2019 in Reggio Calabria. The Italian Space Agency also seeks to provide tools to prepare for the future through, for example, the new advanced training course "The management of satellite information and data for the needs and sustainable development of the Mediterranean" which will start in the autumn of this year and is organized by ASI together with the University Mediterranea of Reggio Calabria. The purpose of the course is the training of young people to take care of the Mediterranean and the coasts, using the tools offered by space activities. Hence, this is perhaps an even more valuable contribution because it is not a direct contribution, but it creates the basis for long-term care.»

University Mediterranea Rector, Santo Marcello Zimbone and ASI President, Giorgio Saccoccia. International Space Forum - The Mediterranean Chapter, Reggio Calabria (2019).

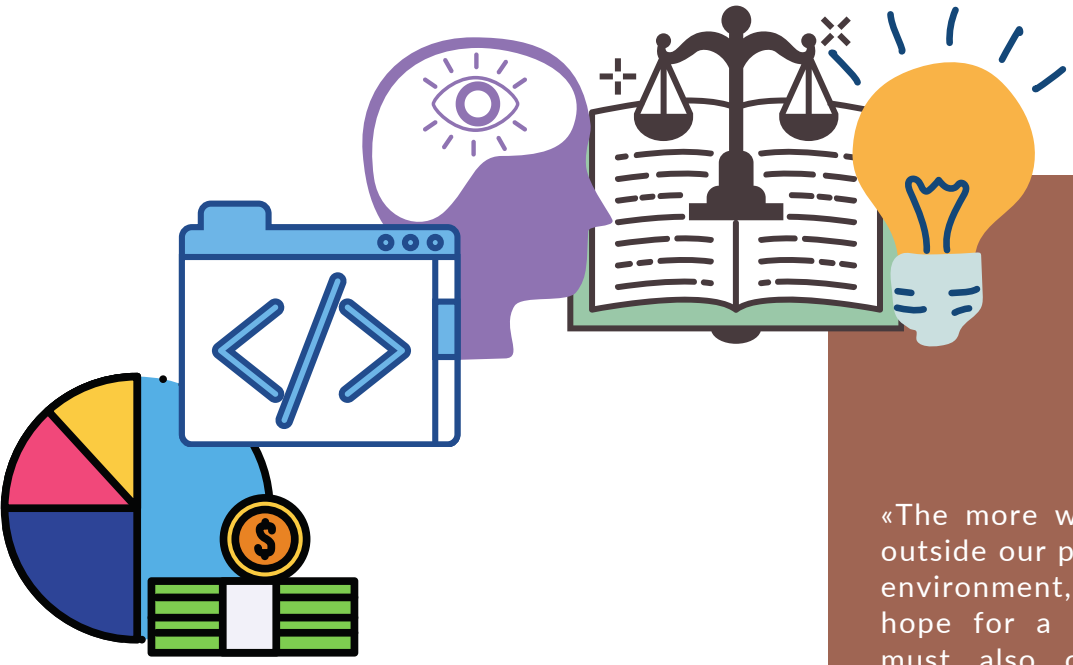
What are the skills required to work in the space sector, and what advice would you give to young people who dream of making their contribution to this sector?

«Lo spazio ha di bello che è per definizione interdisciplinare. È chiaro che le attività spaziali siano abilitate da conoscenze tecniche che devono essere sviluppate al meglio ed essere disponibili. Come conoscenze tecniche parliamo ovviamente di Ingegneria, ma sono di parte essendo un Ingegnere, però c'è bisogno di competenze STEM ad ampio raggio. Servono infatti sempre di più competenze meno classiche.

Quando si parla di applicazioni e di attività spaziali che richiedono per esempio intelligenza artificiale, servono persone che hanno conoscenze di matematica, statistica, logica. Ovviamente c'è tutta la parte scientifica e fisica che deve essere sviluppata. Però il bello è che non servono solo le competenze tecniche, perché la complessità delle attività spaziali e le opportunità legate alla Space Economy hanno bisogno anche di importanti competenze economiche per cogliere al meglio le opportunità offerte dallo spazio per la crescita economica o più semplicemente per il business di impresa.

Oppure, visto che siamo ancora agli inizi di quelli che sono i regolamenti e le legislazioni legate al settore spaziale, sicuramente le discipline legate al diritto dello spazio cresceranno nei corsi universitari. Inoltre, le attività spaziali richiedono assegnazioni di importanti contratti, dunque c'è tutta la disciplina legale-contrattuale che esiste già da tempo, infatti in Agenzia abbiamo tantissime persone che hanno queste competenze che continueranno ad essere necessarie.»

«The beauty of space is that it is, by definition, interdisciplinary. It is clear that space activities have been made possible by technical knowledge, which must be as well developed as is possible and available. When we speak of technical knowledge, we are speaking about Engineering - I am biased, being an Engineer, but there is a need for wide-ranging STEM skills. Indeed, less traditional skills are even required more. When we talk about applications and space activities that require, e.g., artificial intelligence, we need people who know mathematics, statistics, logic. Obviously, the scientific and physical parts must be developed. However, the beauty is that not only technical skills are needed because the complexity of space activities and the opportunities related to the Space Economy also require important economic skills in order to seize the opportunities offered by space for economic growth or, more simply, for the enterprise business. Furthermore, given that we are still at the beginning of what are the regulations and the legislation related to the space sector, surely there will be an increase in the number of disciplines related to the law of space in university courses. In addition, space activities require the assignment of important contracts, and hence, in the Agency, many people who have skills in the legal-contractual discipline will continue to be necessary.»



«Tanti aspetti anche sociologici e psicologici dovranno essere coltivati, quanto più pensiamo di proiettare l'umanità al di fuori del nostro pianeta e di inserirlo in un nuovo ambiente, in un nuovo sistema, un giorno speriamo un nuovo ecosistema. Questo porterà degli impatti significativi. Una nuova umanità spaziale deve essere creata e deve essere supportata anche da un punto di vista interiore, questo è ancora tutto da studiare. È già in luce, studiato da chi interagisce con i nostri astronauti ma ci sarà ancora molto da fare. Come nella medicina, di cui abbiamo già parlato. Veramente, credo sia uno dei pochi settori che ha un possibile coinvolgimento ad altissimo spettro. Quindi, sta a voi decidere che direzione prendere. Il bello è che spesso e sicuramente sarà interessante anche avere qualcuno che possa guardare le cose in maniera correlata, mista. Quindi dei sistemisti interdisciplinari, se vogliamo. Dunque starà a voi. Nasceranno delle discipline che ancora non ci sono e avrete di che divertirvi. Se un messaggio ve lo posso dare, di fatto ve l'ho passato già all'inizio raccontando un po' la mia storia, non pensate di poter prevedere tutto all'inizio, questo non è possibile. Se trovo una fragilità nella generazione delle mie figlie, dei figli dei miei amici e colleghi, è quella di pensare che da subito dovete avere una visione completa su quello che vi aspetta, e se questa non c'è, o non avete questa impressione, magari rinunciate. Ecco, non lo fate!»

«The more we think of projecting humanity outside our planet and inserting it into a new environment, into a new system - one day we hope for a new ecosystem- the more we must also cultivate the sociological and psychological aspects. This will have significant impacts. A new space humanity must be created and must also be supported from an internal point of view. This is still to be examined in-depth but it is already being studied by those who interact with our astronauts. However, there will still be a lot to do. The same is true for medicine which we have already spoken about. Actually, I think it is one of the few sectors that has a possible broad-spectrum involvement. So, it's up to you to decide which direction to take. The beauty is that it will also be interesting to have someone who can look at things in a related and mixed way, so interdisciplinary systems analysts, if you like, will appear. Hence, it will be up to you. New disciplines will be born and you will have something to enjoy. If I can give you a message, I have passed it on to you at the beginning by telling my story: don't think that you can foresee everything at the beginning, this is not possible. A weakness, I find in the generation of my daughters, in the children of my friends and colleagues, is to think that you can immediately have a complete vision of what awaits you, and if this does not exist, or you do not get this impression, maybe you give up. Don't do so!»

THE “SPACE EYES” PHOTOGRAPH THE SPECTACLE OF ETNA

by Vittorio Gentile,
COSMO-SkyMed & Radar new applications, e-GEOS

Etna, the highest active volcano in Europe, has recently offered an evocative spectacle of its snow-capped peaks with eruptions that have illuminated the Sicilian skies. The "eyes" of the COSMO-SkyMed and PRISMA satellites have captured the natural wonder of the Sicilian volcano. The images provided by various satellites - with the different processing techniques used to analyse the images - have highlighted different phenomena related to the volcano's eruptive activity. A Multi-Temporal (MT) image is a false-colour RGB image generated by using the amplitude (or intensity) of three single SAR acquisitions collected with the same observation geometry (i.e., interferometric images) on the same area of interest in three different moments in time. MT images are commonly used for land monitoring - e.g. to detect changes in the area of interest during the monitoring period - but also for identifying targets subject to temporal variations in the shape or position of the target itself.
Indeed, starting from the concept of "time signature" (i.e., a feature of the target sampled by the sensor during the monitoring period),

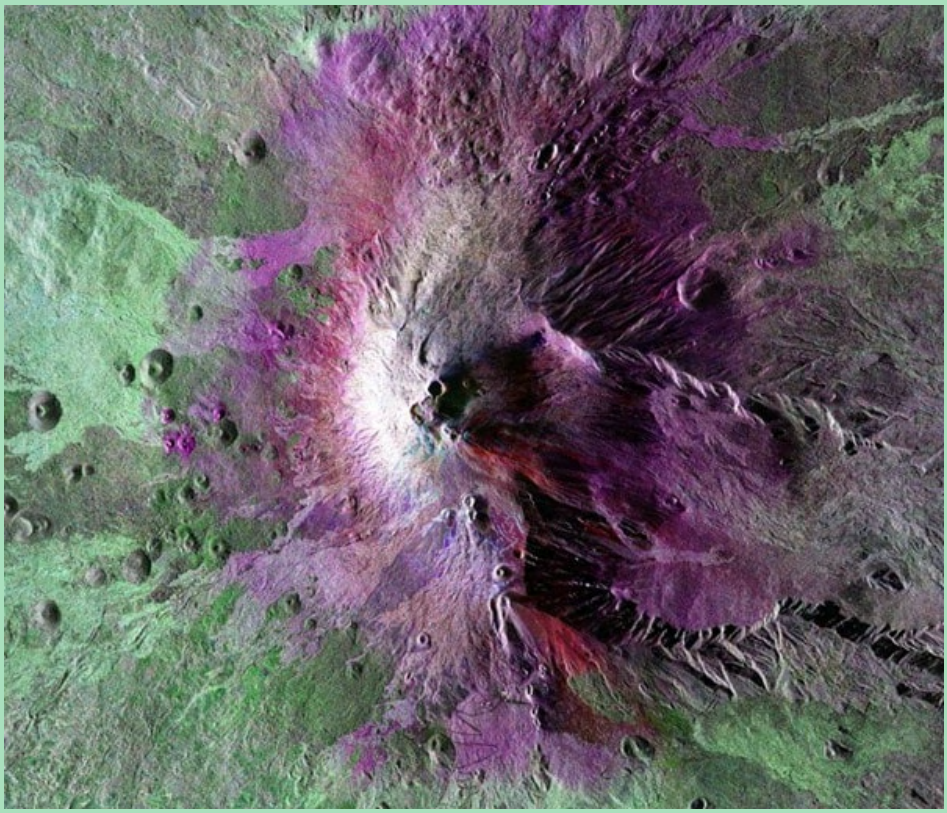
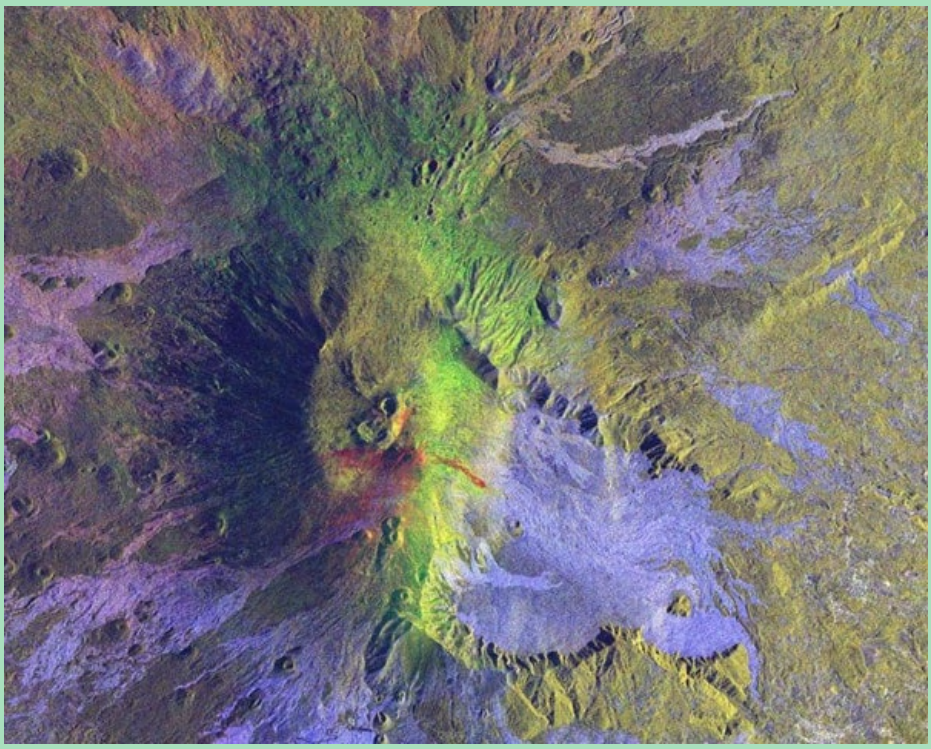


Image processed by e-GEOS. Multi-Temporal (MT) image of the COSMO-SKyMed constellation of 4 radar satellites in X-band. COSMO-SKyMed image © ASI, Processed and distributed by e-GEOS (2021).

through an MT image, it is possible to: highlight the changes that occurred in the area of interest during the time interval of the different acquisitions; improve image classification; support the detection and characterisation of different targets.
The COSMO-SkyMed MT image on Etna has been obtained using three images collected from 02/02/2021 to 19/02/2021. The MT image shows some lava flows during the observation time interval and other characteristics related to the volcanic activity (most likely associated with ash deposits on the ground). Furthermore, it is worth noting that the exploited image processing technique suggests some Etna craters subject to temporal variation or change, whereas some others are stable over time.



A Multi-Temporal and Coherence (MTC) image is a false-colour RGB image produced by processing a pair of SAR interferometric images - i.e., collected with the same acquisition mode, angle of incidence, polarisation, orbit, and direction of illumination on the same area of interest - acquired in the short and medium-term. The time interval of SAR acquisitions is a variable parameter, substantially dependent on the required type of the application.

Multi-temporal and Coherence (MTC) of the COSMO-SKyMed constellation of 4 radar satellites in X-band. COSMO-SKyMed image © ASI, Processed and distributed by e-GEOS (2021).

The RGB image shown has been constructed using the following colour code:

- red channel: SAR backscattering map relating to the first acquisition;
- green channel: SAR backscattering map relating to the second acquisition;
- blue channel: value-added product generated by exploiting the phase difference between the two SAR images, or the interferometric coherence map.

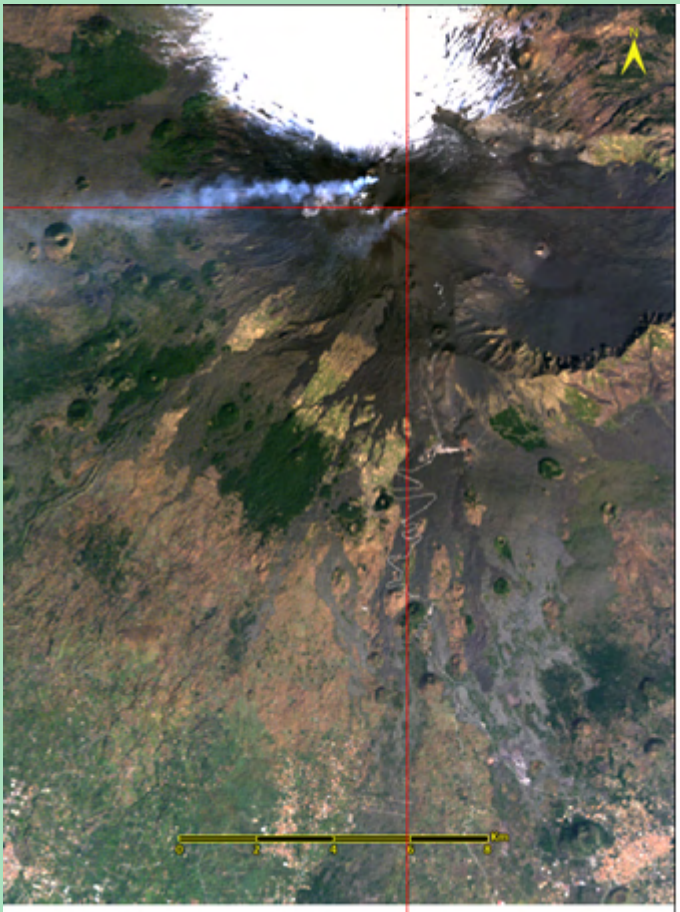
Interferometric coherence is generated by exploiting the phase correlation of two signals received by the SAR satellite antenna during two consecutive acquisitions. Consequently, the more the illuminated target will be stable over time, the more the two signals will be similar and comparable (i.e., coherent). Otherwise, if the target changes position, shape or size, the two signals will not be consistent.

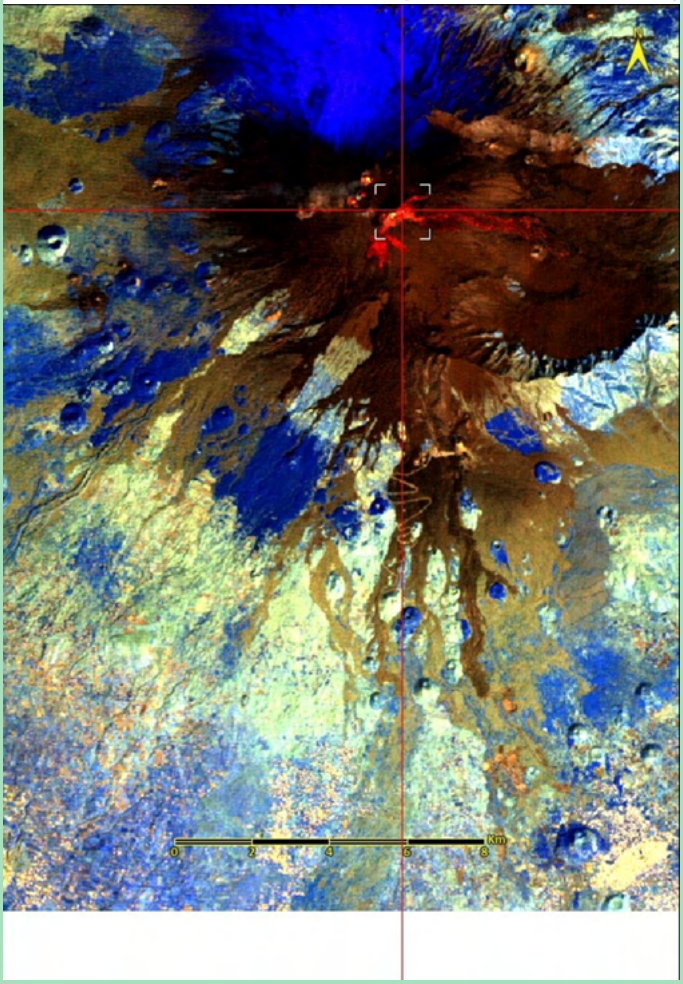
The TCM map is a powerful tool useful for various applications such as the characterisation of land use/land coverage, thematic mapping, monitoring of strategic sites.

In addition, the TCM image is particularly suitable for detecting temporal changes that occurred in the area of interest during the monitoring period.

One of the essential characteristics of the TCM image is its ability - thanks to the contribution of the interferometric coherence - to detect changes on a small scale (of the order of centimetres). Indeed, the MTC can be considered a more accurate product than the MT (the latter can detect variations having an order of magnitude equal to the image pixel size).

The MTC image on Etna was obtained from a COSMO-SkyMed interferometric pair acquired between 08/02/2021 - 16/02/2021 at 17:33 LT. The MTC clearly shows the lava flow due to the volcanic activity that occurred on 16/02/2021. Thus, the MTC can finally highlight the lava flows that occurred in the past (i.e., the bluish and relatively straight shapes in the image).





Finally, PRISMA: the first image shows the volcano throughout its magnificence.
It was captured on 24/02/2021 at 10:56 by the PRISMA satellite of the Italian Space Agency and processed using the visible channel (VNIR) of the hyperspectral instrument created by Leonardo, the most powerful in the world.
Hyperspectral technology allows us to see more than the human eye and recognise the shapes of objects and what chemical elements they contain. Each material has its spectral signature, an actual digital fingerprint that the PRISMA instrument can analyse by travelling at 27,000 km per hour at about 620 km of altitude, thus tracing the area's characteristics under observation. In volcanic eruptions, PRISMA can recognise the fronts of successive flows, helping to predict the evolution of future ones.

In particular, through the processing of data relating to the plume, useful information can be obtained to understand the composition of the gases, one of the premonitory parameters of volcanic activity fundamental for risk analysis. Processing the hyperspectral signatures of areas with high thermal emission (hot-spots), on the other hand, helps to estimate the trend of the emitted energy flow and, therefore, to predict its trend and risk. Finally, studying the composition of lava and ash can help understand the volcano's internal conditions and have information on the evolution of the danger.

The second image shows a spectral analysis of the lava present on Etna on the morning of 24/02/2021, which suggests a possible evolution towards new eruptive phenomena. A few hours after the image was captured, Etna produced a spectacular eruption, with lava fountains reaching 500 meters above the crater and columns of ash and lapilli that stood out in the sky for kilometres.

"To the new generations I would highly recommend the power of culture, of knowledge, and the wisdom in using them, the ability to cooperate and to seek cross-fertilization."

ALFONSO FARINA

Alfonso Farina (FREng, FIET, LFIEEE, Fellow of EURASIP, EurASc) received the Doctoral – Laurea - Degree in Electronic Engineering from the University of Rome, Rome, Italy, in 1973. From 1974 to 2014, he covered several technical and management positions in the Aerospace sector.

From 1979 to 1985, he was also a Professor of Radar Techniques with the University of Naples, Italy. He is currently a Visiting Professor with the Department of Electronic and Electrical Engineering at University College London and with the Centre of Electronic Warfare, Information and Cyber at Cranfield University, a Distinguished Lecturer of the IEEE Aerospace and Electronic Systems Society and a Distinguished Industry Lecturer for the IEEE Signal Processing Society (Jan 2018-Dec 2019). He is a Consultant for Leonardo S.p.A. "Land & Naval Defence Electronics Division" (Rome). He has authored or co-authored more than 800 peer-reviewed technical papers and books and monographs (published worldwide), some of them also translated in to Russian and Chinese. He received the IEEE Dennis J. Picard Medal for Radar Technologies and Applications for "Continuous, Innovative, Theoretical, and Practical Contributions to Radar Systems and Adaptive Signal Processing Techniques" (2010). IEEE Signal Processing Society Industrial Leader Award (2018). Christian Hülsmeyer Award from the German Institute of Navigation (DGON) (2019). IEEE AESS Pioneer Award (2020). Honorary chair of IEEE RadarConf 2020, Florence.

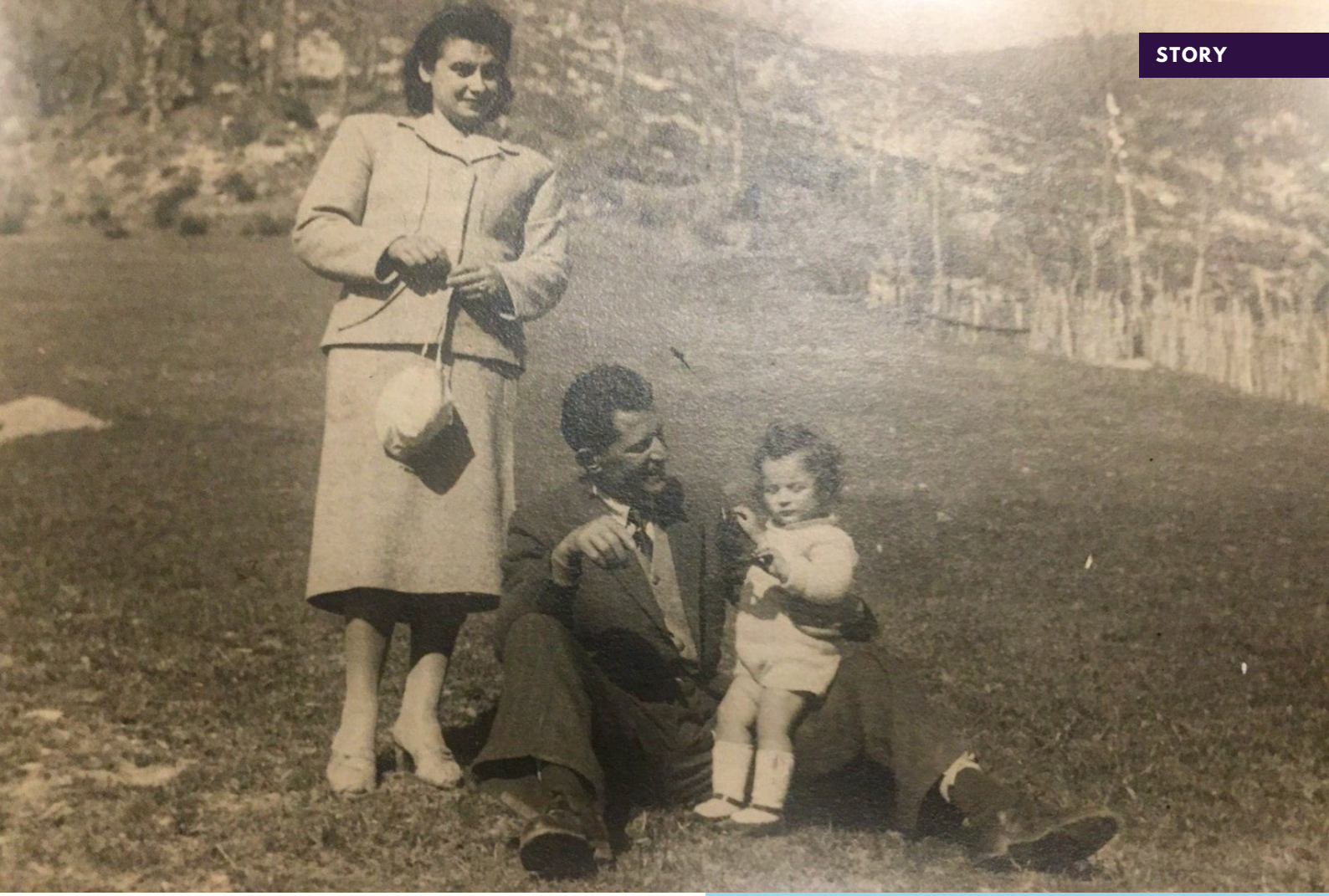


Figure 1: My Mom, My Dad and me.

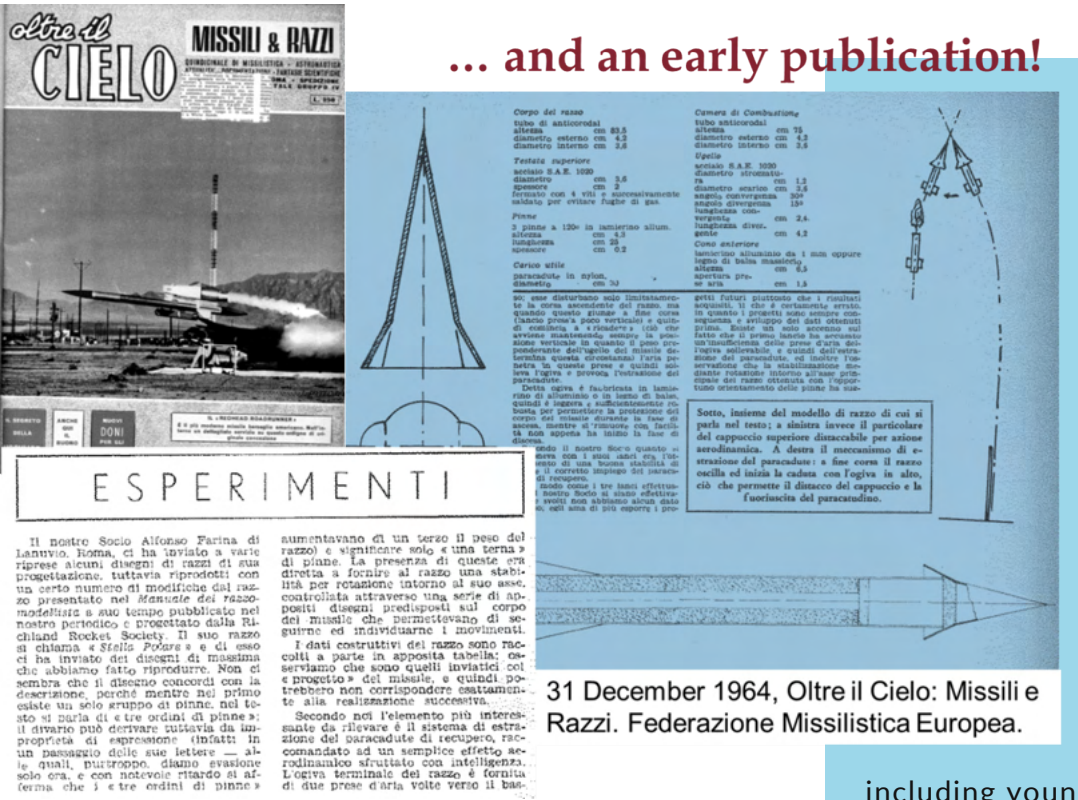
«Ho avuto la fortuna di nascere in un piccolo paese della provincia di Rieti. La presenza di alcune centinaia di esseri viventi, inclusi animali e lupi, poteva essere avvertita da lontano quando era inverno. La cittadina è alquanto famosa per il castello ormai in rovina (che è stato teatro della tragica storia di Beatrice Cenci), un laghetto artificiale sottostante e la brezza estiva. Il paese si sviluppa intorno ad una piazza attraversata da una strada, l'unica, all'epoca. In estate, giunse un furgone con un proiettore cinematografico. Il proiettore sul furgone si trovava a un'estremità della piazza: mi sembra di sentire ancora il magico rumore periodico di quel proiettore. Lo schermo si trovava dall'altra parte della piazza, sopra una fontana alla quale si abbeveravano perfino gli animali. Tutti gli abitanti del villaggio, compresi noi piccoli, portavano da casa le loro sedie o seggiolini per assistere alla proiezione. Non c'erano molte luci ma si vedevano molte lucciole e le stelle nel cielo. Sembra la storia del Nuovo Cinema Paradiso, ma era proprio così. Se un'auto si ritrovava ad attraversare la piazza per seguire la strada, non c'era fretta: la gente si fermava a vedere il film. Credo che la gioia che abbiamo provato sia stata raramente provata dai ragazzi di oggi.»

«I was lucky enough to be born in a small town in the Rieti area. In the winter, a few hundred living creatures including animals and wolves could be heard at a distance. The town is somewhat famous for the now ruined castle (which witnessed the tragic story of Beatrice Cenci), the artificial lake which lies below and the fresh summer air. The town is centred around a square which a road runs through, a unique feature at the time. In the summer, a van with a film projector came. The projector on the van was at one end of the square, I can still hear the magical noise of the projector. The screen was set up on the other side of the square, more specifically, on the fountain where the animals also drank from. All the villagers, including us children, used to bring their chairs or small seats from home to watch the film. There weren't many lights but you could see lots of fireflies and , up above, the stars in the sky. All this sounds like the story of Nuovo Cinema Paradiso, but it was just like that. If a rare car had to drive through the square, there was no rush: people stopped watching the film. I believe that the joy we felt has rarely been experienced by children today.»

«Con questo background d'infanzia, ho sempre cercato arene in cui d'estate si proiettavano film all'aperto. Mio fratello è sempre stato un divoratore di film e lo è ancora, mi "trascina" al cinema qualche fine settimana. Benedico Nicolini per l'invenzione ormai scomparsa dell'estate romana (1977), dove si svolgevano le proiezioni ai Fori Imperiali. Vi era una partecipazione massiccia e variegata, comprese le giovani madri che allattavano i loro bambini! Tornavo direttamente dall'ufficio con la mia borsa da lavoro e andavo a vedere le proiezioni. Tuttavia, sto andando troppo veloce. La mia famiglia si è presto trasferita da Rieti nei pressi di Roma per dare a noi (me e mio fratello) l'opportunità di essere preparati per studiare all'università. Mi diplomai presso il nuovissimo istituto tecnico per l'elettronica E. Fermi dove avevo professori che provenivano direttamente dall'insegnamento universitario. Nel frattempo, la "conquista dello spazio" mi ha attirò verso alla missilistica.»

Figure 2: An early bird passion for Engineering and research saw me as a teenager with the rocket model I launched at 17 from Shooting Range of Furbara Air Force Base (Rome).

... and an early publication!



31 December 1964, Oltre il Cielo: Missili e Razzi. Federazione Missilistica Europea.

Figure 3: "My first publication" at pp. 564-566, Missili & Razzi. Oltre il Cielo, which preceded the conception, design and realisation of the launch of Figure 2.

"In the meantime, "Space conquest" converted me to rocketry."

«Due to this cherished childhood memory, I have always been looking for arenas where summer films are shown outdoors. My brother has always been a film buff and he still is, he occasionally "drags" me to the cinema at the weekend. I bless Nicolini for the invention of the Roman summer (1977), an initiative which has long since disappeared, where the projections took place at the Imperial Forums. Massive numbers of people from different walks of life participated in the event, including young mothers nursing their babies! I came directly from the office and went to see the films. However, I am going too fast. My family soon moved from Rieti to nearby Rome to give us (myself and my brother) the opportunity to get ready to study at the university. I graduated from the newly founded Technical Institute for electronics E. Fermi where I had professors who were also university teachers.»

Figure 4: With my beautiful future wife Franca at my thesis defense. In the meantime, I was also becoming a second lieutenant of Italian Air Force.

«Pochi anni dopo, era il 1973..., mi sono laureato in Ingegneria Elettronica presso l'Università degli Studi di Roma "La Sapienza", con Antonio Ruberti, Professore di Controlli Automatici - uno scienziato di primo piano a livello internazionale. Il lavoro di tesi riguardava il "Kalman Filtering" (KF). Parte della mia carriera professionale è stata galvanizzata dal KF, un importante gioiello della matematica per un vasto spettro di applicazioni. Anni fa ho avuto l'onore di diventare amico del professor Kalman e di incontrare periodicamente lui e la sua famiglia.
Nel 1974 sono stato assunto in Selenia, SpA. Fin dall'inizio, mi sono occupato di argomenti avanzati, dovendo lavorare duramente su riviste scientifiche IEEE e IEE, Transactions on Aerospace and Electronic Systems Society (AESS), Atti di Conferenze sui Radar e molti altri. Ho viaggiato in molti paesi per ricerca e sviluppo internazionale e cooperazione allo sviluppo di practical systems (CE, NATO, ecc.): Regno Unito (primo viaggio nel 1975), Bruxelles (pochi anni), Copenaghen (alcuni mesi), Norvegia (molte volte), Germania, in tutta Europa. Molte volte negli Stati Uniti (primo viaggio nel 1979), Brasile, India, Cina, Singapore, Dubai, Nord Africa, ecc. Ho lavorato per alcuni anni su siti sperimentali. Sono stato anche responsabile di alcuni siti aziendali in Italia.»

«A few years later, in 1973, I got my degree in Electronic Engineering from "La Sapienza" (the University in Rome) under the guidance of Antonio Ruberti, who was Professor of Automatic Controls - a leading scientist at an international level. My dissertation thesis was about the Kalman Filter (KF). Part of my professional career has been inspired by KF, which is an important mathematical jewel for a huge spectrum of applications. Years ago, I had the honour of becoming a friend of Professor Kalman and getting to see him and his family from time to time.
In 1974 I was hired by Selenia, SpA. From the very beginning, I was dealing with advanced issues which included having to work hard on IEEE and IEE scientific magazines, AESS Transactions, Proceedings of Radar Conferences and several other ventures.
I have travelled widely for international R&D and practical systems development partnerships (EC, NATO, etc.). My first trip to the UK was in 1975. I have spent a few years in Brussels, a few months in Copenhagen, I have been to Norway on many occasions. I have been to Germany and, in short, all over Europe. I have been in the U.S. (first trip 1979), Brazil, India, China, Singapore, Dubai, North Africa, etc., many times. I have worked on experimental sites for a few years. I have also been responsible for some corporate sites in Italy.»

Figure 5: Selenia, SpA site, in the so-called “Tiburtina Valley”.

«Sono stato coinvolto in molte iniziative scientifiche, di ricerca e sviluppo e applicative. Tra gli innumerevoli risultati, cito Target tracking, Radar adaptivity, Synthetic Aperture Radar (SAR), Passive Coherent Location (PCL) Radar, Critical Infrastructure Design, Simulation, valutazione delle performance, collaborazioni internazionali e accademiche. Alcuni dettagli possono essere trovati in AESS Historical Interview: "A Conversation With Friend: Alfonso Farina", Intervistatore: Fulvio Gini, IEEE AES SYSTEMS MAGAZINE, giugno 2016, pp. 41-49. IEEE Aerospace and Electronic Systems Society. È stata brevemente menzionata l'esperienza LABSAR, di cruciale importanza per contribuire a portare la tecnologia del radar ad apertura sintetica (SAR) nel Paese. Permettetemi di ricordare qui un libretto che lo racconta.»

«I have been involved in many scientific, R&D and practical ventures. Among the many results, I mention Target tracking, Radar adaptivity, Synthetic Aperture Radar (SAR), Passive Coherent Location (PCL) radar, Critical infrastructure design, simulation, evaluation of performance, International& University partnerships. Some details can be found in the AESS historical interview: "A Conversation With Friend: Alfonso Farina", Interviewer: Fulvio Gini, IEEE AES SYSTEMS MAGAZINE, June 2016, pp. 41-49. IEEE Aerospace and Electronic Systems Society.
The LABSAR pivotal experience to help bring the technology of Synthetic Aperture Radar (SAR) into the country was briefly mentioned. Let me remind you here that there is a booklet which gives a detailed account of the story.»

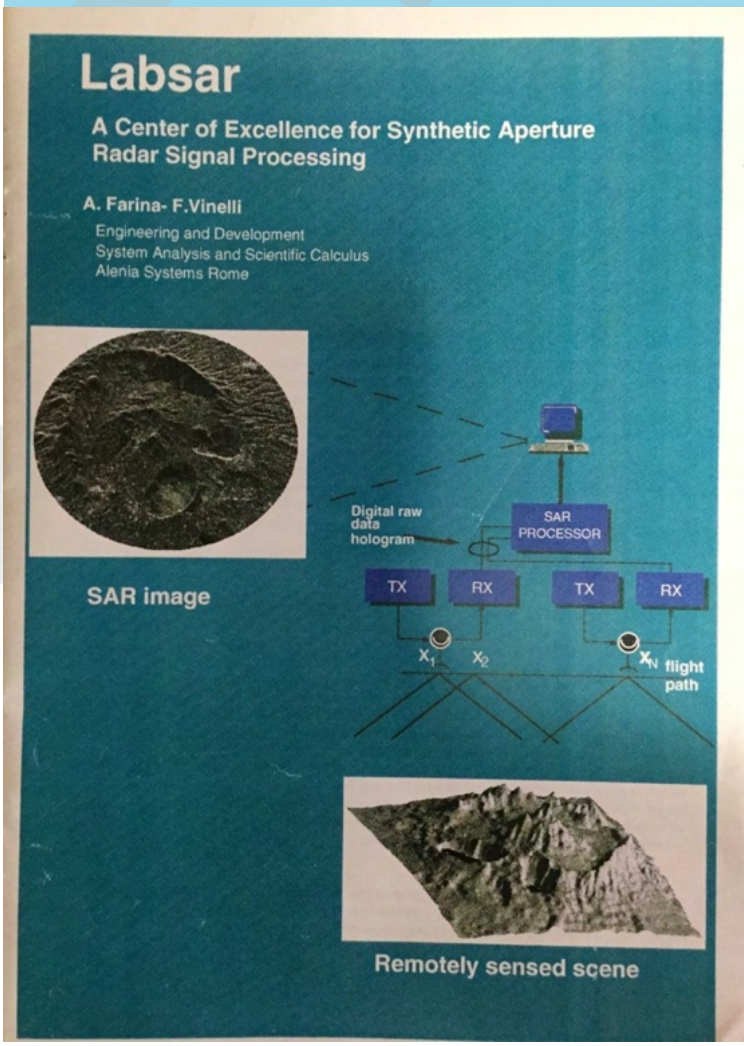
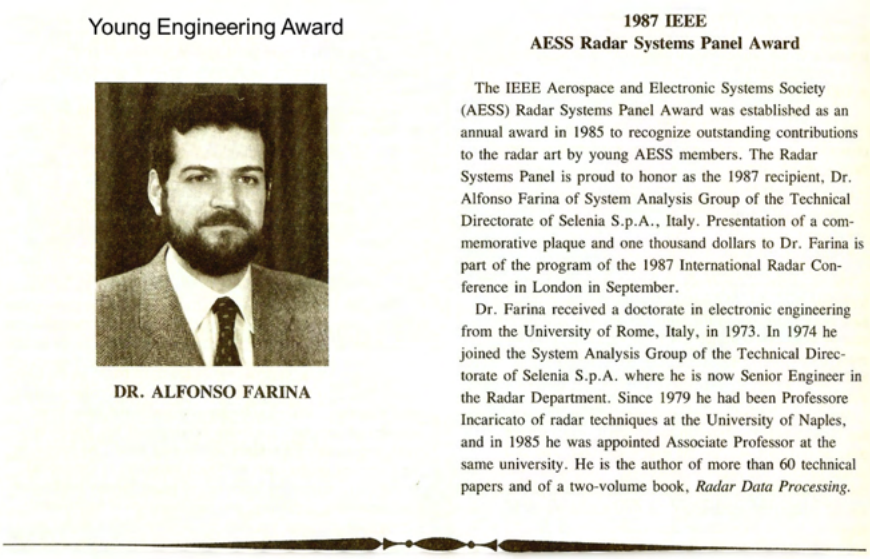


Figure 6: The 3D image of the two lakes in Castelli Romani area is thanks to the SAR interferometry from space. Results like these were not frequent in that times.



Young Engineering Award

DR. ALFONSO FARINA

1987 IEEE
AESS Radar Systems Panel Award

The IEEE Aerospace and Electronic Systems Society (AESS) Radar Systems Panel Award was established as an annual award in 1985 to recognize outstanding contributions to the radar art by young AESS members. The Radar Systems Panel is proud to honor as the 1987 recipient, Dr. Alfonso Farina of System Analysis Group of the Technical Directorate of Selenia S.p.A., Italy. Presentation of a commemorative plaque and one thousand dollars to Dr. Farina is part of the program of the 1987 International Radar Conference in London in September.

Dr. Farina received a doctorate in electronic engineering from the University of Rome, Italy, in 1973. In 1974 he joined the System Analysis Group of the Technical Directorate of Selenia S.p.A. where he is now Senior Engineer in the Radar Department. Since 1979 he had been Professore Incaricato of radar techniques at the University of Naples, and in 1985 he was appointed Associate Professor at the same university. He is the author of more than 60 technical papers and of a two-volume book, *Radar Data Processing*.

Figure 7: Young Engineering Award.

«Per il mio lavoro sono stato insignito di numerosi premi nazionali e internazionali. Ne cito alcuni. Premio Giovane Ingegnere dell'anno. In realtà, il primo italiano a riceverlo. Successivamente, pochi altri brillanti ricercatori italiani nell'ambito dei radar hanno ricevuto lo stesso riconoscimento (Figura 7). Nel 2004 ho ricevuto, in qualità di team leader, il 1° premio della 1° edizione del Premio Innovazione Tecnologia del Gruppo Finmeccanica, su oltre 330 progetti presentati da 16 Società del Gruppo Finmeccanica (Figura 8).»

Figure 8: Finmeccanica Group Innovation Technology Award.

«Il progetto vincitore riguardava l'applicazione pratica e di successo dell'adattabilità a un avanzato phased-array radar in funzione. Nella foto, Farina riceve il premio dal Ministero della Ricerca Scientifica italiano dall'onorevole Possa e dal Presidente e Direttore Generale di Finmeccanica Dott. Guarguaglini. Genova, Magazzini del Cotone. Ce ne sarebbero alcuni altri da citare (link). Due che non posso non menzionare sono rappresentati nelle Figure 10 e 11 che seguono.»

Ceremony of the 2010 IEEE Dennis J. Picard Medal for Radar Technologies and Applications for outstanding accomplishments in advancing the fields of radar technologies and their applications. Montreal, June 2010.

International Fellow of the Royal Academy of Engineering 2005

Figure 9: 2005 Fellow RAE & 2010 IEEE Picard Medal.

«For my work, I have won numerous national and international awards. I would like to mention some of these. Young Engineer of the year award. The first Italian to receive it. Subsequently, few more bright Italian radar researchers received the same honour. In 2004, I was the recipient, as the team leader, of the 1st prize of the 1st edition of the Finmeccanica Group Innovation Technology award, out of more than 330 submitted projects by 16 Companies of Finmeccanica Group. The winning project was on the practical and successful application of adaptivity to an advanced phased-array 8 radar in operation. In the Figure 8, Farina receives the award from the Italian Ministry of Scientific Research honourable Possa and the President and General Manager of Finmeccanica Dr. Guarguaglini. Genova, Magazzini del Cotone. There are a few more worth quoting. Two that I cannot avoid mentioning are in the ensuing Figures 10 and 11.»

The SEE Paris conference
Colloque International sur le Radar
1978

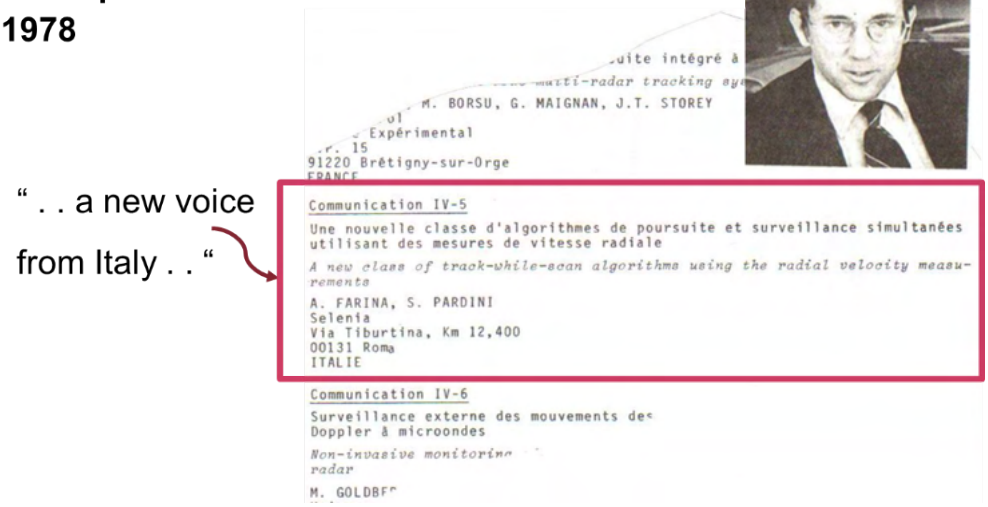


Figure 10: From the presentation of Robert HILL at the IEEE Radar Conference 2008 in Rome. I was referred to as "a new voice from Italy". I am still touched by this.

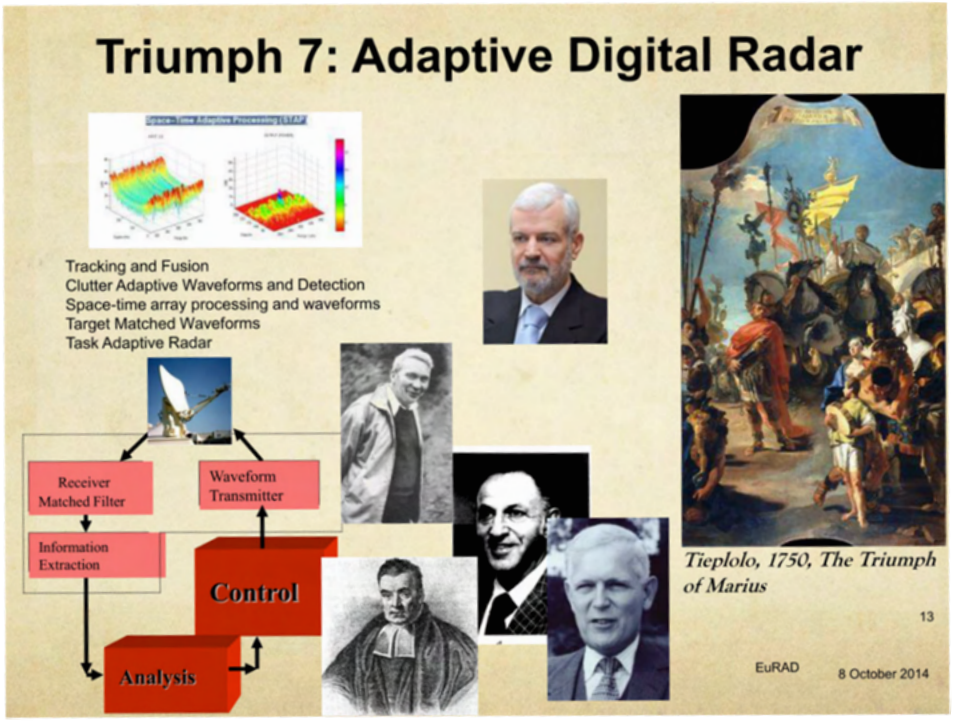


Figure 11: Professor Rob Evans (Australia) at the Plenary of EURAD'2014, Roma, was so kind to put me close to my heroes, Andrej Nikolaevič Kolmogorov, Thomas Bayes, Rudolf Emil Kálmán, Indeed too much for me.

«Fin dai primi anni in Selenia sono stato relatore di numerose tesi universitarie e ho promosso collaborazioni con i miei colleghi universitari in Italia e anche all'estero (Dr. E. Hanle (FFM-FGAN, oggi Fraunhofer Institute); DSTO (Australia), B. Ristic, B. La Scala e J. Fabrizio; B. Billingsley (MIT-LL); Dr. Jim Sangston di GTRI, solo per citarne alcuni). È una storia che il tempo ha decretato essere di successo e che sicuramente può essere migliorata Venendo ai nostri giorni, i miei colleghi/amici universitari ed io abbiamo organizzato la IEEE Radar Conference, Firenze, settembre 2020, come degno seguito della fortunata IEEE Radar Conference tenutasi a Roma nel 2008.»

«Since my early years at Selenia I have been the supervisor of numerous university theses and I have promoted partnerships with my university colleagues in Italy and also abroad (Dr. E. Hanle (FFM-FGAN, known today as the Fraunhofer Institute); DSTO (Australia), B. Ristic, B. La Scala, and J. Fabrizio; B. Billingsley (MIT-LL); Dr. Jim Sangston of GTRI, just to mention a few). It is a success story which has developed over time and which can certainly be improved upon. Getting back to the present my university colleagues/friends and I have organised the IEEE Radar Conference, Florence, September 2020, which is a suitable continuation of the very successful IEEE Radar Conference held in Roma in 2008.»

Figure 12: The organizing committee (Prof. P. Lombardo, Prof. M. Greco, Prof. F. Gini, Prof. A. De Maio and myself) at the opening ceremony in full compliance with health recommendations.

«In conclusione, lasciatemi parlare dei miei progetti attuali e futuri, ed eventualmente dare consigli alle nuove generazioni interessate al settore.
È il sesto anno che ho perso la mia amata moglie. La solitudine in casa è difficile da mitigare soprattutto in questo periodo di pandemia. Tuttavia, mi sento fortunato. Amo la vita. Continuerò a godermi la mia piccola famiglia e l'amicizia di tante care persone. Il mio futuro immediato è ancora con i miei colleghi dell'Industria e dell'Università. Mi piace anche seguire il motto IEEE: *"Advancing Technology for Humanity"*. Il mondo in cui viviamo è bello ma non perfetto e spesso abbastanza ingiusto. È l'unico che abbiamo. Gli Ingegneri Radar, tutti gli esseri umani e noi in generale, dovremmo fare del nostro meglio per trasformare il motto IEEE in realtà.
Recentemente, il Dottor L. Timmoneri e io abbiamo tenuto un lunchtime seminar: "Tecnologia radar e sostenibilità: come la tecnologia RADAR potrebbe essere d'aiuto per il pianeta Terra?" Il riassunto di questo seminario compare in questa stessa Newsletter. Pertanto, non mi soffermerò più su di esso. Tuttavia, sono pronto a ripetere il seminario, se suscita interesse. I punti che abbiamo toccato sono stati: impatto sull'economia digitale, impatto sull'economia sostenibile, impatto sulla green economy, impatto sull'economia spaziale, impatto sul mercato commerciale, continuare a contribuire alla sicurezza e fluidità dell'ATC, continuare a contribuire alla sicurezza nazionale e della NATO.»

«In conclusion, let me speak about my current and future projects, and possibly give advice to the new generations interested in the sector. It is six years since I lost my beloved wife. It is difficult to ease the loneliness I feel at home, especially in this pandemic period. However, I feel fortunate. I love life. I will continue to enjoy my small family and the company of many dear and close friends. My immediate future will continue to be spent with my colleagues in Industry and at University. I also like to follow the IEEE Motto: "Advancing Technology for Humanity". The world in which we live is beautiful but not perfect and often quite unfair. It is the only one we have. Radar engineers, and all of us, in general, should do our best to turn the IEEE motto into reality.
Recently, Dr. L. Timmoneri and I have delivered a lunchtime seminar: "Radar Technology and Sustainability: How RADAR technology might help, for Planet Earth?" The resumè of this seminar appears in this same newsletter. Therefore, there is no need to divulge any of its contents. Nonetheless, I am willing to give a rundown of the contents of the seminar, if they are of any interest. The points on which we touched were: the impact on the digital economy, the impact on the sustainable economy, the impact on the green economy, the impact on the space economy, the impact on the commercial market, which continue to contribute to safety, the fluidity of ATC and to National & NATO Security.»

"I also like to follow the IEEE Motto: "Advancing Technology for Humanity". The world in which we live is beautiful but not perfect and often quite unfair. It is the only one we have."

«Argomenti correlati cui sono interessato sono i sistemi complessi (che ho già “toccato” nella mia precedente esperienza professionale nell'ingegneria delle infrastrutture critiche), ovvero dove molti agenti interagiscono fra loro. La sfida sembra la seguente: l'umanità ha svelato le grandi equazioni da Pitagora, Newton, Galileo, Maxwell, Einstein, a Schrödinger. I “sistemi” complessi, come creature viventi, sviluppano leggi appropriate per dare origine a funzioni di alto livello come la visione, la coscienza e così via. Le grandi leggi ora non sono in grado di spiegare queste capacità emergenti di alto livello. Pertanto, queste leggi dei sistemi complessi hanno la stessa dignità delle grandi equazioni conosciute. Ad esempio, "F = m·a" funziona bene per pochi corpi. Non sembra utile per prevedere il comportamento di 10^23 corpi, per dare un numero. I sistemi complessi sviluppano leggi di alto livello come ad esempio la transizione di fase. Queste leggi emergenti non si manifestano quando il numero di corpi è piccolo. Il visionario S. Hawking ha detto: "Penso che questo secolo sarà il secolo della complessità", Stephen Hawking (Complexity Digest 2001/10, 5 marzo 2001).
Inoltre, una passione che è emersa in me negli anni è la storia della scienza e dell'ingegneria. Nelle mie presentazioni è diventato comune mescolare matematica, tecnologia, ingegneria e storia delle Persone che hanno permesso di raggiungere questi risultati, così utili per il progresso dell'umanità. Alle nuove generazioni raccomando il potere della cultura, della conoscenza e la saggezza nell'usarle, la capacità di cooperare e di ricercare la lo scambio culturale. La verità è onnipresente. Prova a metterti alla prova cercando un pezzo di essa.»

«The related topics in which I am interested are the complex systems (which I have already “touched on” in my previous professional experience in the engineering of critical infrastructures), i.e., where many agents interact. The challenge facing us seems to be the following: humanity has unveiled the great equations from Pythagoras, Newton, Galileo, Maxwell, Einstein, to Schrodinger. Complex “systems” like living creatures develop their own laws giving rise to high-level functions like vision, consciousness and so on. The great laws are now unable to explain these emerging high-level capabilities. Therefore, these laws of complex systems possess the same dignity as the well-known great equations. As an example, “F=m·a” works well for few bodies. It doesn’t seem useful to predict the behaviour of say 10^23 bodies. Complex systems develop high-level laws as, for example, in the case of the phase transition. These emerging laws do not manifest themselves with a small number of bodies. The visionary S. Hawking said, “I think this century will be the century of complexity”, Stephen Hawking (Complexity Digest 2001/10, 5 March 2001.) In addition, I have, over the years, become increasingly more passionate about the History of Science and Engineering. In my presentations, it has become common to blend Mathematics, Technology, Engineering and the history of the People who have made it possible to achieve the results which are so useful for the progress of humanity. To the new generations I would highly recommend the power of culture, of knowledge, and the wisdom in using them, the ability to cooperate and to seek cross-fertilization. The truth is omnipresent. Try to challenge yourself by looking for a piece of it.»

Figure 13: Professor Carlo Morabito (right) and Myself. After my talk, Aula Magna Ingegneria, Thursday 19 December 2019. “Cognitive Radar. Il ruolo delle nuove tecnologie radar nell’industria 4.0”, University *Mediterranea* of Reggio Calabria.

ALESSANDRA VERNILE

From geopolitics to space!

Alessandra participating to the International Astronautical Congress (IAC) in Washington D.C. back in October 2019.

My name is Alessandra Vernile, and I am a space young professional and enthusiast! I started my career in space back in 2015, scared that my non-traditional space background would have been an obstacle to my dream.

As a graduated in international relations, I always thought that space is not just technology, science and engineering. There is a non-technical component that is highly relevant.

National space assets represent a strategic element for any country, as demonstrated by the long-standing space tradition in Italy. Soon after my master's degree, I decided to attend two advanced masters' courses that revealed to be quite complementary in their diversity: one master in Geopolitics, Economics and Intelligence, and another one in Space Institutions and Policies. The latter was an eye-opener experience: it focused on the legal, political and economic disciplines related to the exploration and exploitation of outer space... during the course, I found out that I was right! Space is not just science and technology!

From there on, my career in space begun: since 2015, I have been lucky enough to live my life abroad, working in stimulating environments. My first experience in space has been a 6-months traineeship at the European Space Agency HQ (ESA). There I learnt how ESA interacts and monitors Members' States space policy. After this, I moved to Vienna. For one year and a half, I worked as Resident Fellow - recipient of the ASI-SIOI research fellowship - at the European Space Policy Institute (ESPI).

This is the classic picture to be taken during the Salon international de l'aéronautique et de l'espace de Paris-Le Bourget, June 2019.

It was my first real working experience, where I saw my work and efforts recognized internationally. During the year in Vienna, I deep dived into the hottest topic of the space sector: New Space and Space for Sustainable Development. Besides, I had the chance of being an observer to the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS)- based in Vienna- attending high-level meetings, discovering that space diplomacy is a key element to achieve fruitful cooperation in space. Currently, I am based in Paris working at Eurisy. Eurisy is a non-profit association gathering space agencies, international organisations, research institutions, and private businesses involved or interested in space-related activities across Europe. By connecting the needs of end-user communities and service providers with opportunities coming from satellite-based services, Eurisy capitalizes on synergies for collaboration beyond the traditional boundaries of the space community. It equally promotes users' needs and the space industry offers. In this role, I am learning how space technology can practically help the development of our society and economies, as demonstrated by the plethora of applications existing in agriculture, maritime, health, to mention a few.

Remember to be curious and brave enough to discover what opportunities the space sector has to offer. The young generation has today the chance of shaping the future of space exploration and development. To all the newcomers in the domain, I always invited them in becoming members of the multiple existing international volunteer platforms in the sector.

Are you a space young professional and enthusiast? Do you think your story can help students find their way to space?
Send an email to ***universolospazio@unirc.it*** *with your motivations!*

A representation of the great SGAC family at the Naturhistorisches Museum (Museum of Natural History Vienna) in June 2018.

Personally, in 2016, I found out about the Space Generation Advisory Council (SGAC). Being a volunteer for SGAC is an exceptional opportunity to grow professionally, thanks to the incredible opportunities offered, but it also helps in letting your international network grow. Even if it means sacrificing free time, SGAC is one of the most exciting experience I have ever had. As an SGAC member, you can contribute to shaping the space sector, bringing your expertise to a stimulating community of other peers from around the globe.

Even if it seems hard, the space sector is the most inspiring place to be today. It pushes you to go beyond your limit because even the impossible becomes possible. Therefore, I would like to invite every student interested in starting a career in the space sector to not be afraid of sharing ideas, to promote your work in international fora, and to always think that space offers different opportunities. Stop thinking that space is just exploration and rocket science. Space is something more: Space is diplomacy, policy, economics, technology, innovation, science, engineering, communication, and much more.

AND, MOST IMPORTANTLY: SPACE IS FOR EVERYONE!

IEEE AEROSPACE AND ELECTRONIC SYSTEMS SOCIETY EMI STUDENT BRANCH CHAPTER

by Qarqachat Assia,
Team leader of the aeronautical club IEEE Aerospace and Electronic Systems Society

Ambitious, Morocco has embarked on a journey towards the aeronautical industry, triggering a remarkable leap in this sector, being the leading exporter of aeronautical equipment in the African continent.
To adapt to this progress, the Mohammadia School of Engineers students took the initiative in 2012 and founded the first aeronautical and aerospace society in Morocco that has become the forum of students passionate about these two fields, allowing them to share their varied knowledge to carry out creative projects such as IEEE-AESS-DRONE and IEEE-AESS-PLANE.
In addition to these workshops, IEEE Aerospace and Electronic Systems Society EMI is engaged every year in the organization of conferences under different themes related to aeronautics, aerospace and astronomy, visits to various aeronautical institutions, and annual versions of the “Moroccan Aeronautical Meeting”: an opportunity to meet leaders and experts in the aeronautical and aerospace industries in Morocco as well as abroad, this meeting is a favourable environment for the creation of opportunities and direct contact between students and the professional world.

The committee of IEEE AESS EMI 2020/2021.

Through these activities, IEEE AESS EMI committee aims to exhibit the different policies that the world takes in the face of the aeronautical industry and the evolution and challenges of this field.
This year, the aeronautical and aerospace society of Mohammadia School of Engineers made the exception, being the initiator of creating the first student branch chapter of its kind in Morocco, joining an international organization successfully and becoming more connected with the Aerospace sector.

AESS EMI IEEE Student Branch

IEEE Aerospace and Electronic System Society EMI

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DIDO 3 – LAUNCHING LIFE SCIENCE TO ORBIT

by Guy Samburski,
Chemical and Pharmaceutical applications, SpacePharma

A unique Academic Research project was successfully concluded at the beginning of this year when four experiments had investigated the effect of microgravity on biochemical processes. The experiments were executed onboard DIDO-3, a free-orbit satellite.

DIDO 3 is a joint space mission of the Italian and Israeli space agencies and the Swiss-Israeli company SpacePharma and leading universities in the two states. The satellite is carrying a miniaturised, automated, remote-controlled lab, made and operated by SpacePharma.

The lab contains micro-litre scale laboratory equipment and analytical instruments. It can perform several experiments, analyse the results, and send the results to the researchers on Earth. The experiments were executed in an interactive way, where the researchers decide on the experiment parameters, receive results and modify the experiment based on the data.

The four experiments explored various biochemical processes essential for understanding Infectious disease and ageing processes: Enzymatic reactions with bacteria, DNA folding, Albumin binding properties and the development of antibiotic resistance in bacteria.

The experiments were conducted over four months, with the most extended experiment taking more than 40 days. During this time, the researchers were in daily contact with SpacePharma satellite operators, providing instructions and analysing the results. In addition, about 300 spectroscopy readings and 30 microscope images were downloaded.

The COVID 19 Pandemic that has burst just before the planned launch had its impact on the mission. The launch was delayed several times, and therefore several reagents suffered from ageing. Yet, significant results were obtained. It was found that bacterial conjunction, an important mechanism in the acquisition of antibiotic resistance, was significantly reduced, possibly due to alteration in the expression of three specific genes. The results could serve for new ideas in drug development and provide insights regarding future long space travels.

GIOVANNI INTERDONATO

Driven by that passion for research born at University Mediterranea

I'm Giovanni Interdonato, 34 years old, and I come from Villa San Giovanni (RC).
I have received both bachelor's and master's degree in Telecommunication Engineering and Computer and Telecommunication Systems Engineering, respectively, from the University *Mediterranea* of Reggio Calabria. In the last year of the master's program, I had the opportunity to work for six months as visiting researcher with the Centre Tecnològic de Telecomunicacions de Catalunya (CTTC) in Barcelona (Spain), funded by the EU within the ERASMUS PLACEMENT (now renamed ERASMUS+) programme. Work experience that led to a joint (UniRC/CTTC) Master thesis concerning the design, implementation, and performance analysis of novel LTE random access protocols for supporting Quality of Services of massive machine-type communications and ensuring coexistence between Machine-to-machine and Human-to-Human communications. Driven by my passion for research, I decided to pursue a PhD in Communication Systems.
In 2015, I joined Ericsson Research and the University of Linköping (Sweden) to work as an early-stage researcher and industrial doctoral student funded by the Marie Skłodowska-Curie Actions Innovative Training Network (MSCA-ITN) under the framework Horizon 2020.

Photo by courtesy of Anna Nilsen. Source here

My research interest included innovative architectures, wireless technologies, and tools for high capacity and sustainable 5G ultra-dense cellular networks. More specifically, my work was about the analysis, design, and optimization of smart and distributed device-centric cellular architectures with a particular focus on 5G and beyond-5G large-scale multiple-antenna technologies (e.g., co-located and cell-free massive MIMO).

I have received the Ph.D. degree in Electrical engineering with a specialization in Communication Systems from the University of Linköping in 2020 with a Ph.D. dissertation titled: “Cell-Free Massive MIMO: Scalability, Signal Processing and Power Control”. During my period as a doctoral student, I co-authored many scientific publications. I had the opportunity to travel all around the world, presenting my works in international conferences and scientific events, and I served as a teaching assistant in two courses of the master’s program in Engineering and Computer Sciences of Linköping University, specifically, Wireless Communications and Multiple Antenna Communications.

While my industrial research at Ericsson led me to co-invent around twenty filed patent applications, one invention, the Radio Stripes, has been very successful and received most attention. The Radio Stripes constitute an innovative solution for deploying beyond-5G networks with a flexible and ubiquitous architecture. They aim at enabling the invisible, low-cost deployment of a large number of distributed access points in the vicinity of the users.

This is achieved by serial integration of several transmitting and receiving components into a cable or stripe, based on printed electronics, providing fronthaul communication and power supply. Ericsson showcased the futuristic concept of the Radio Stripes at the Mobile World Congress 2019 in Barcelona. Since then, I also got the media spotlight (newspaper articles, interviews, citations, etc.).

For instance, the former Prime Minister of Italy, Prof. Giuseppe Conte, when visiting Ericsson’s premises in Genova in 2019, received a frame depicting the Ericsson Radio Stripes concept as a gift to emphasize the Italian origin of this promising beyond-5G technology. I have recently joined the University of Cassino and Southern Latium, Cassino (FR), Italy, as an Assistant Professor with the Department of Electrical and Information Engineering (DIEI). I teach a course on digital signal processing within the master’s program in telecommunication engineering. I conduct academic research on 6G physical layer technologies, including cell-free massive MIMO, millimeter-wave communications, and intelligent reflecting surfaces.

Follow-up on the Reggio Calabria Page for the Mediterranean countries

by the Editorial Staff

At the end of the 4th International Space Forum 2019 – The Mediterranean Chapter – which has succeeded the first International Space Forum in Trento (Italy) and the following regional Chapters in Africa (Nairobi 2017) and Latin America and the Caribbean (Buenos Aires 2018), the Reggio Calabria Page was adopted. It was a final joint declaration in which Ministers, Diplomats, Heads of Space Agencies and young professionals identified some main objectives to be pursued. Among these:

- the promotion of a greater awareness of the usefulness for the Mediterranean region of space programs and satellite systems such as GALILEO and COPERNICUS;
- the use of satellites to safeguard and protect infrastructures and activities, and to discourage threats and illegal activities through or around the sea;
- the exploitation of the existing national and international space centres and infrastructures to contribute to the United Nations 2030 agenda at a regional level;
- the creation of Space Curricula focused on the Mediterranean needs.

Related to the above recommendations, the Italian Space Agency and the University *Mediterranea* of Reggio Calabria, in collaboration with the e-GEOS Company, jointly built a training course entitled *"Geo-Information and Space Data Management for the Needs and Sustainable Development of the Mediterranean Region"*. The course was planned to be activated last year, but the pandemic situation blocked all activities. The University *Mediterranea* of Reggio Calabria and ASI will relaunch it this year and involve all interested Mediterranean countries.
At the beginning of July, the participants of the International Space Forum 2019 will meet virtually to continue the dialogue related to the implementation of the Reggio Calabria Page.

Read here the Reggio Calabria Page

DO YOUR ACTIVITIES CONCERN THE SPACE SECTOR?

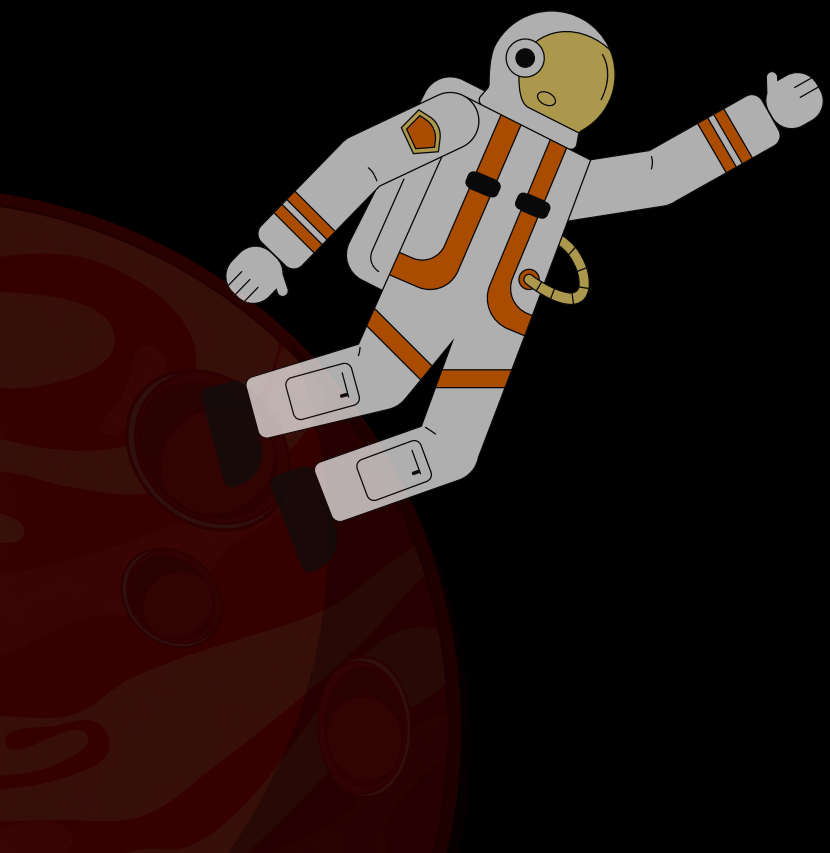
WE WANT TO TELL YOUR STORY!

Are you a student, are you doing your PhD, are you a researcher or a former student of the ***University Mediterranea of Reggio Calabria***?

Write an e-mail to universolospazio@unirc.it with the subject *"Bringing Space to UNIRC"* for more information!

SPACE EVENTS

June 2021 - September 2021



CRYOSAT 10TH ANNIVERSARY SCIENCE CONFERENCE

14-17 JUNE 2021

The European Space Agency is pleased to invite you to the CryoSat 10th Anniversary Conference on 14–17 June 2021, which will take place virtually. The conference focuses on the latest scientific contributions. It is also a celebration of contributions that CryoSat has made to our understanding of the cryosphere and its role in the Earth, the climate, and, in turn, the impacts on society.

Read more here

Read more here

GLOBAL SPACE EXPLORATION CONFERENCE - GLEX 2021

14-18 JUNE 2021

The International Astronautical Federation (IAF) and ROSCOSMOS are organizing the Global Space Exploration Conference (GLEX) 2021 in St. Petersburg, Russian Federation. The leaders in the field will discuss recent results, current challenges, innovative solutions and offer several opportunities to learn about how space exploration investments provide benefits and discuss how those benefits can be increased through thoughtful planning and cooperation.

THE 11TH INTERNATIONAL ESA CONFERENCE ON GUIDANCE, NAVIGATION & CONTROL SYSTEMS - GNC 2021

22-25 JUNE 2021

The Conference and the Exhibition provide a significant opportunity to promote GNC products & activities, meet potential customers, exchange ideas, and encourage future cooperation by involving the Aerospace Industry, Academia, Equipment Manufacturers, and Space Agencies. The Product and Poster Exhibition will have an extended dedicated session on the 22nd of June 2021 to provide a platform for manufacturers of the next-generation products used in the GNC subsystems and for potential users.

Read more here

ISU SPACE STUDIES PROGRAM (SSP 2021)

28 JUNE - 27AUGUST 2021

The Space Studies Program (SSP), an intense two-month professional development course for postgraduate students and professionals of all disciplines, is a unique educational experience. The curriculum covers the principal space-related fields, both non-technical and technical. It ranges from policy and law, business and management, and humanities to life sciences, engineering, physical sciences, and space applications.

Read more here

Read more here

THE 1ST INTERNATIONAL SYMPOSIUM ON VERY LOW EARTH ORBIT (VLEO) MISSIONS AND TECHNOLOGIES

28-29 JUNE 2021

This symposium aims to bring together the industrial, academic, and policy-making community involved in, or with aspirations for, VLEO missions to share operational experience, relevant technology development, and current and future applications in the market. It will provide speaking and networking opportunities to discuss synergies, opportunities for collaboration, and the development of both technology and business roadmaps for VLEO Missions and Technologies.

THE 34TH GENERAL ASSEMBLY AND SCIENTIFIC SYMPOSIUM (GASS) OF THE INTERNATIONAL UNION OF RADIO SCIENCE (URSI)

28 AUGUST – 4 SEPTEMBER 2021

The XXXIV General Assembly and Scientific Symposium (GASS) of the International Union of Radio Science (Union Radio Scientifique Internationale-URSI) will be held at Sapienza University Campus. The GASS of URSI is held at intervals of three years to review current research trends, present discoveries, and make plans for future research and special projects in all areas of radio science.

Read more here

INDUSTRY SPACE DAYS 2021

8-9 SEPTEMBER 2021

The European Space Agency (ESA) invites members of the space community to attend its next Industry Space Days on-site at its European Space Research and Technology Centre (ESTEC) in the Netherlands on 8th–9th September 2021. The ISD is organized by the ESA SME Office to foster cooperation between different actors in the entire space sector. Unfortunately, due to the coronavirus outbreak, the event has moved from ESA/ESTEC to a virtual environment.

Read more here

Read more here

SPACE AM - ADVANCED MATERIALS AND TECHNOLOGY FOR THE SPACE SECTOR

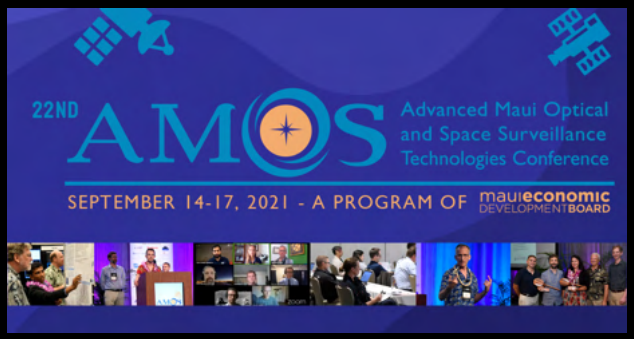
14-15 SEPTEMBER 2021

SpaceAM, the premier conference and exhibition highlighting the use of advanced materials in space technology, takes place at Leicester Racecourse, UK, on 14th-15th September 2021.
Since we live in a world dependent on space technology, SpaceAM will explore the chance to discover and join the growing global community working together to develop and launch innovation in orbit and beyond.

THE 22ND AMOS ADVANCED MAUI OPTICAL AND SPACE SURVEILLANCE TECHNOLOGIES CONFERENCE

14-17 SEPTEMBER 2021

The Advanced Maui Optical and Space Surveillance Technologies (AMOS) Conference is the premier technical conference in the nation devoted to space situational awareness/space domain awareness. The cross-section of private sector, government, and academic participation helps foster important dialogue and international collaboration. The continued growth in attendance and participating countries at AMOS reflects a growing interest in space sustainability and space commerce initiatives.



Read more here

THE 10TH ADVANCED TRAINING COURSE ON LAND REMOTE SENSING

20-24 SEPTEMBER 2021

The European Space Agency (ESA) is organizing an Advanced Training Course on Land Remote Sensing, focusing on Earth Observation and Artificial Intelligence for Forestry. This course is dedicated to training the next generation of Earth Observation (EO) scientists and experts working in the forestry domain to exploit data from EO missions (e.g., the Copernicus Sentinels) and use Artificial Intelligence (AI) for science and applications development. The course is part of ESA's EO Science for Society – Scientific Exploitation element of EOEP-5 (the fifth cycle of ESA's Earth Observation Envelope Programme).

Read more here

Read more here

THE 26TH KA AND BROADBAND COMMUNICATIONS CONFERENCE AND THE 38TH INTERNATIONAL COMMUNICATIONS SATELLITE SYSTEMS CONFERENCE (ICSSC)

27-30 SEPTEMBER 2021

The 26th Ka and Broadband Communications Conference and the 38th International Communications Satellite Systems Conference (ICSSC) are the two most influential technical conferences on satellite systems. The main themes will be "Satellite Constellations and 5G" and "Artemis and Beyond: Communications and Navigation for Space Exploration". Other technical sessions and panels will focus on a broad spectrum of space communications, navigation, and Earth observation.

SPACE FOR BOOKS

Amalia and Elvina are two women linked by the curiosity of discovering the secrets of the Universe. The mather, Amalia, decides to dedicate her life to the study of the Universe and her example will guide the daughter, Elvina, to undertake her path in Science. Two voices that tell different lives intertwined by similar desires. This all-female book is an invitation to follow your intuition and shine like the brightest stars.

"Da piccola immaginavo di tracciare delle linee tra una stella e l'altra; sognavo di lanciare lo sguardo al di là dei cieli conosciuti, di andare a caccia di comete..."

"Caro diario, da grande voglio essere un ingegnere, come papà, e stare nella stanza dei bottoni, da dove si comanda il mondo."

Oltre le stelle più lontane. Elvina Finzi, Amalia Ercoli Finzi

SPACE POSTCARD

Sunrise

Image Credits: NASA

On Saturday, June 11, 2011, International Space Station astronaut Ron Garan used a high definition camera to film one of the sixteen sunrises astronauts see each day.

This image shows the rising sun as the station flew along a path between Rio de Janeiro, Brazil and Buenos Aires, Argentina.

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