

# The Ocean Exploration Issue

On the oceans' floor,  
and deeper down.  
To understand the Earth.  
Sampling rocks,  
our time machine.

WHERE  
ENTERTAINMENT  
AND SCIENCE  
MEET

## Comics & Science

### DETACHING-SLOWLY

Alessio Spataro



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*Detaching - Slowly*

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# INTRO

Forget about Space, exoplanets, and yes, even the stars.

The frontiers of knowledge are much closer, literally beneath our feet.

What do we know about the Earth's mantle and the processes happening beneath the ocean floor? Very little.

That's why a vast global research program focuses on scientific ocean drilling, which, after several re-classifications, is now known as the *International Ocean Discovery Program* (IODP).

This project involves around 5,000 researchers and has done 2,000 drillings into the ocean floors worldwide, retrieving hundreds of kilometers of sediment and rock cores to better understand the planet's history, going back as far as 170 million years.

These are challenging studies, requiring researchers to spend months in isolation on ships anchored offshore, far from land, very far from home.

And it's these people that Alessio Spataro's *Detaching - Slowly* is about: their dreams, their anxieties, their loved ones and their desire to better understand the world around us.

Roberto Natalini  
Andrea Plazzi

# The Ocean Exploration Issue

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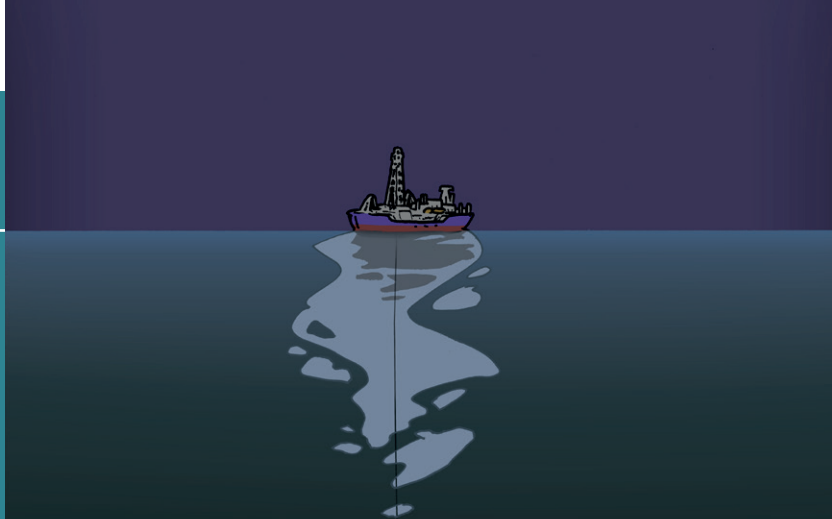
FABIO FLORINDO



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## DETACHING- SLOWLY

ALESSIO SPATARO





# OCEAN EXPLORATIONS: WHY?

**ELISABETTA ERBA**

*Commission CNR ECORD-IODP and ICDP - President*

About 72% of our planet's surface is covered by oceans, a vast expanse of water concealing the ocean floors. For geologists, it's impossible to study oceanic sediments and rocks using methods employed on land.

That's why, in 1968 the largest Earth Sciences research program dedicated to scientific ocean drilling began. Initially funded by the United States, the project went international in 1983, involving around 5,000 researchers.

More than 2,000 drillings have been conducted in the oceans world-wide, from equatorial zones to the North Pole and the Antarctic Margin, recovering approximately 500 kilometers of sediment and rock cores.

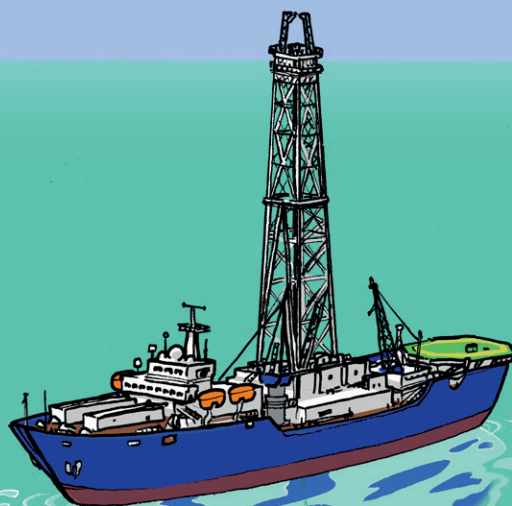
These samples are archived in three repositories, located in Texas, Germany, and Japan, which coordinate curatorial and sampling activities. The project's goal is to explore the planet's geological history, going back as far as 170 million years.

Already with the very first expeditions, the project contributed to the Plate Tectonics theory through fundamental discoveries, such as the age of ocean floors, underwater mountain chains where new oceanic crust is generated, deep trenches where this crust is consumed, magnetic anomalies, and sediments recording climate history.

Every two months, the ship becomes a "small floating city" where, in addition to advanced geological research, an incredible sociological and cultural experiment takes place, with exchanges between people from countries with vastly different educational, training and scientific backgrounds.

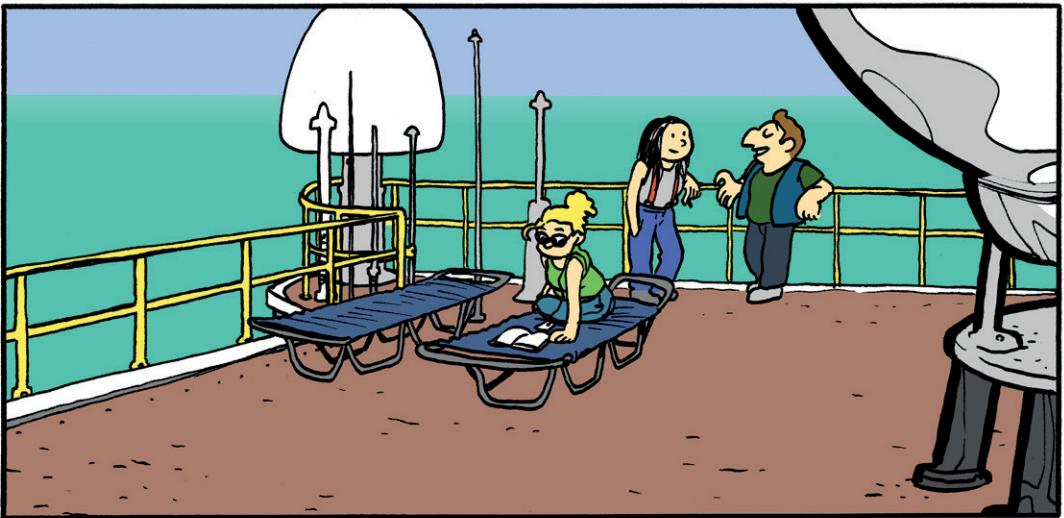
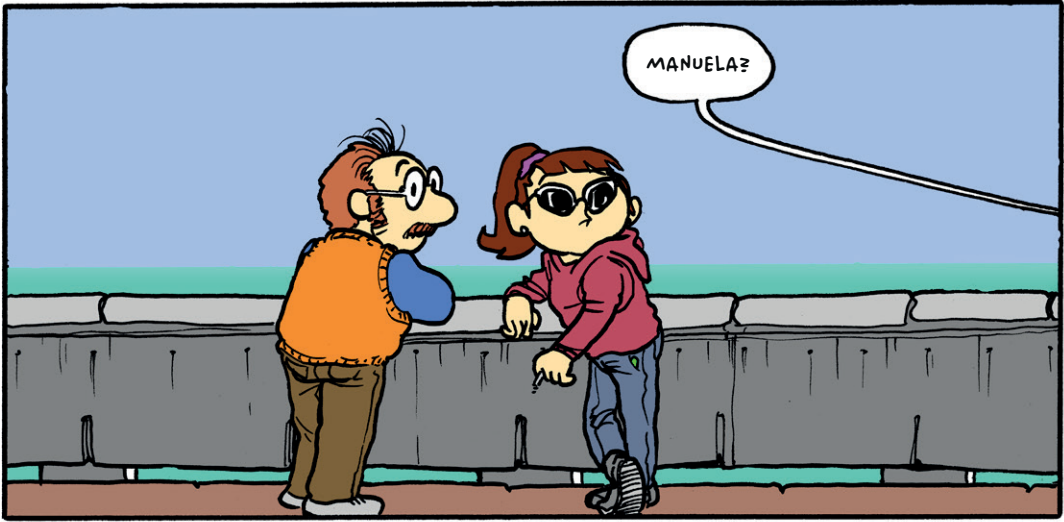
These differences make the program even more special, as it keeps evolving, incorporating socially relevant topics such as seismogenic zones, volcanic eruptions, sea level changes, energy resources, global warming, ocean acidification, marine ecosystem dynamics and the co-evolution of the planet's biological and geological aspects.

# DETACHING-SLOWLY



FEBRUARY, 2024.  
CENTRAL  
TYRRHENIAN SEA.



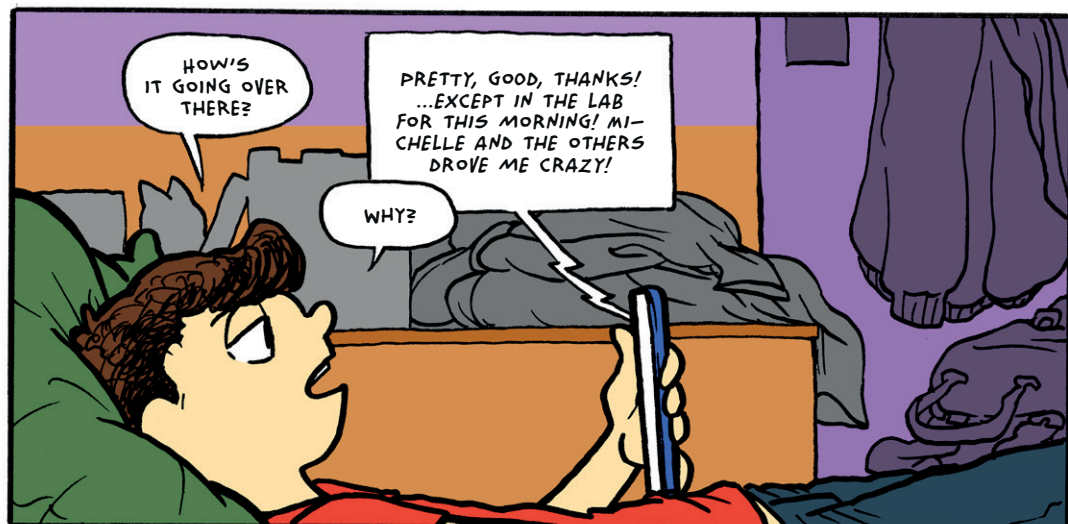
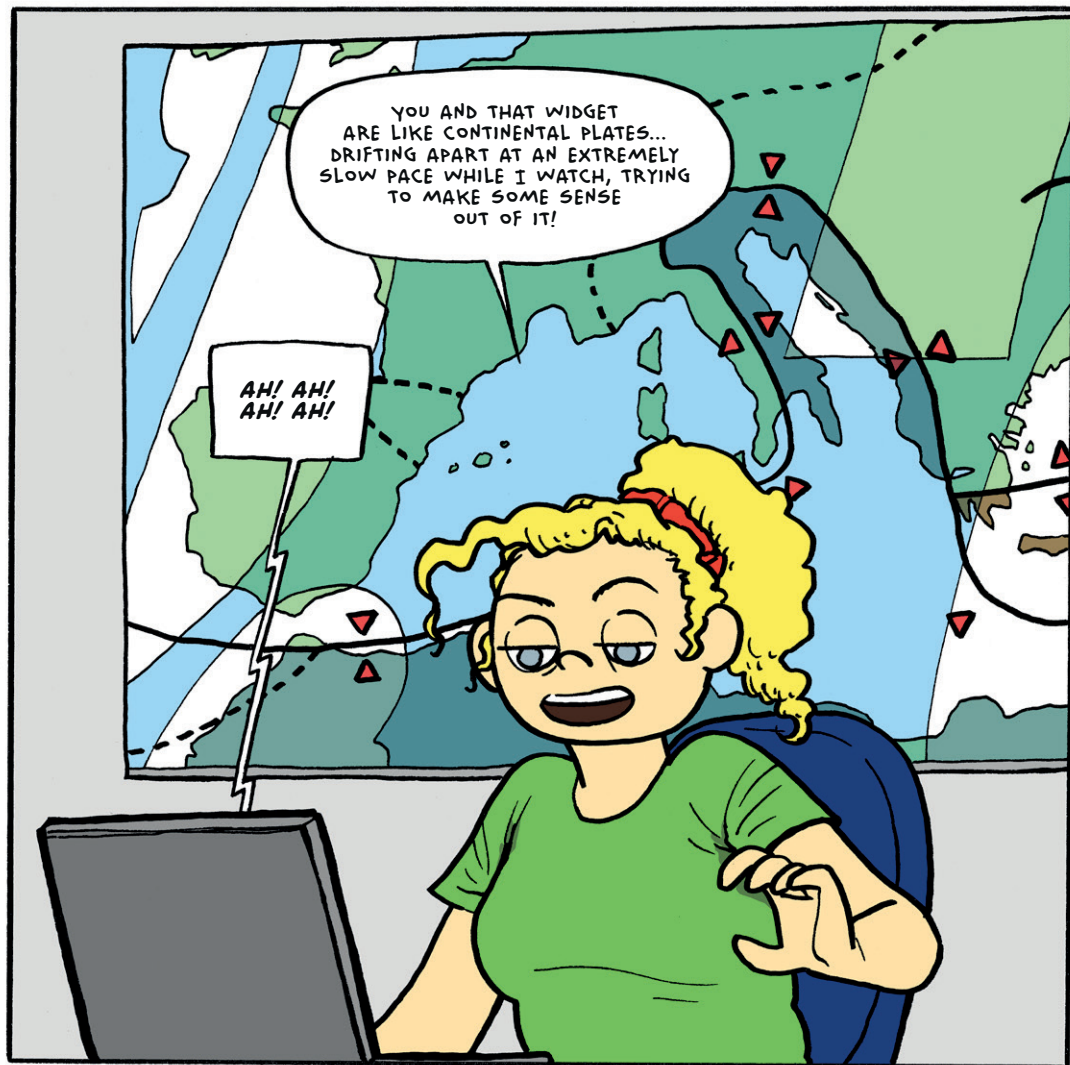


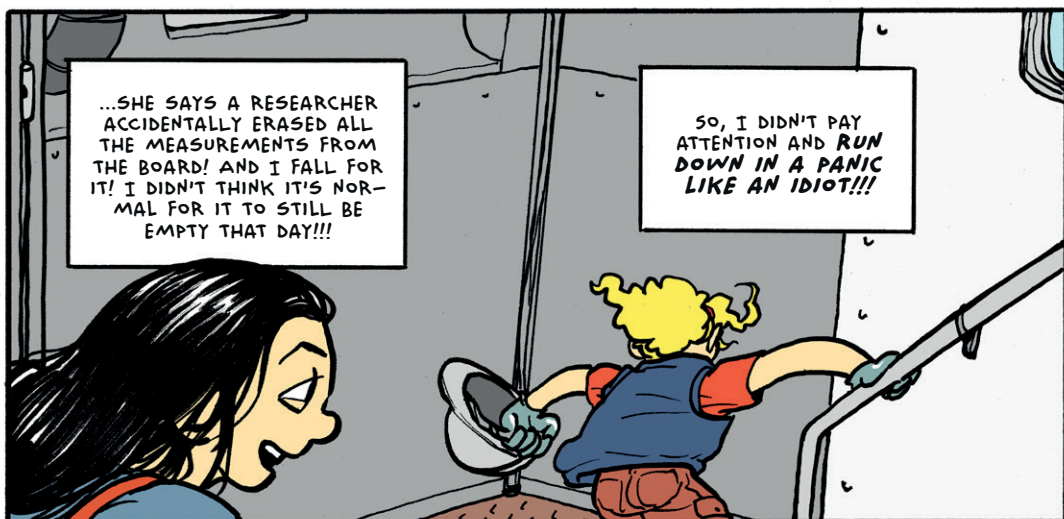
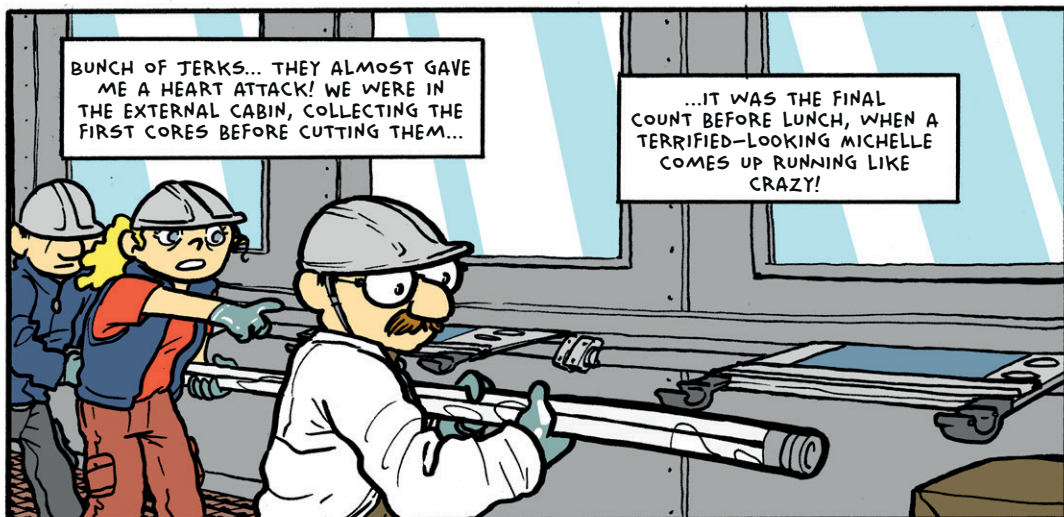




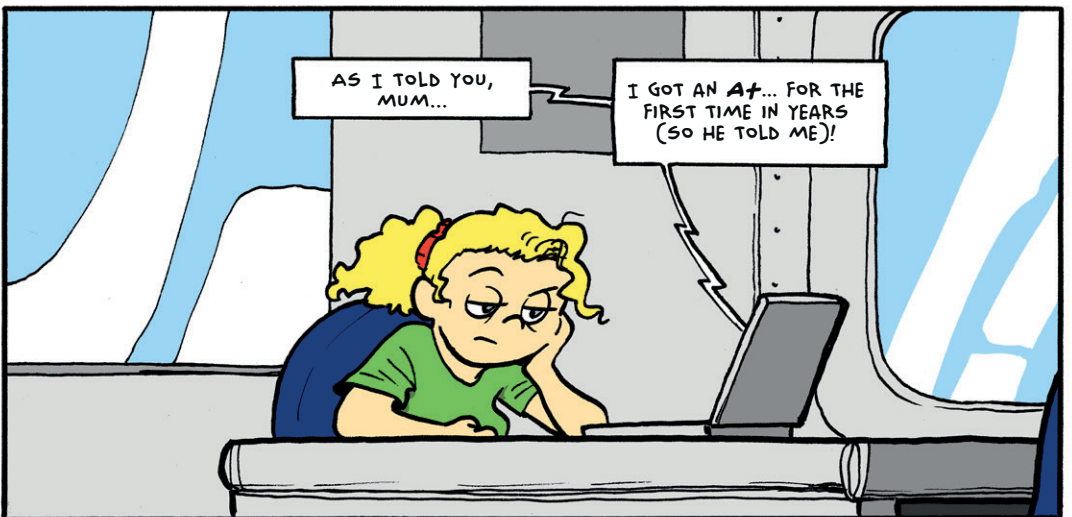
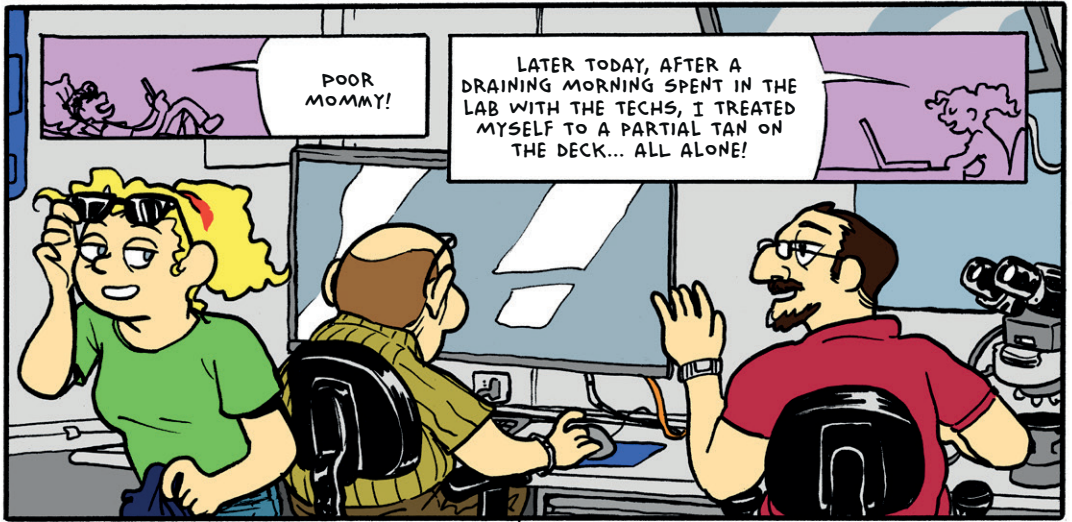




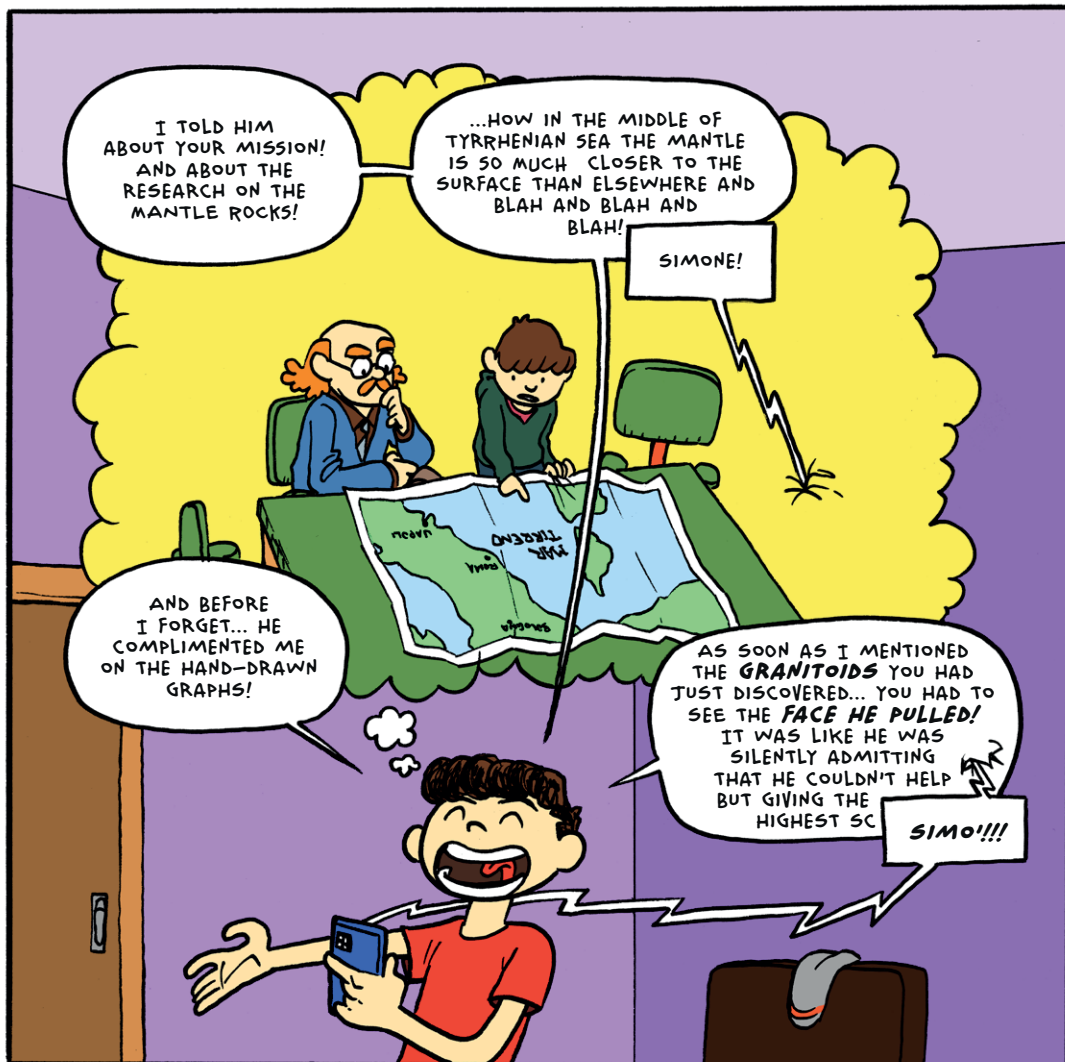


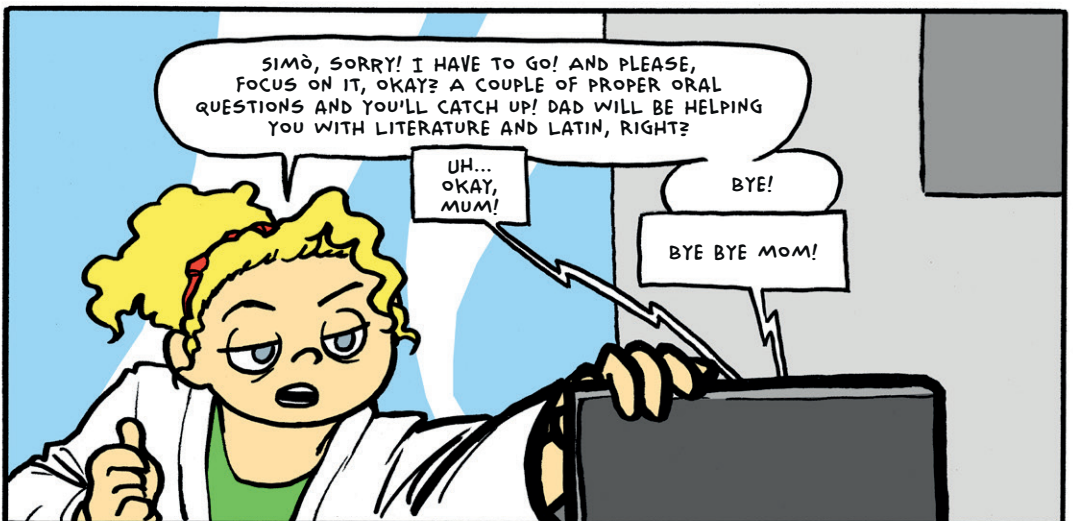




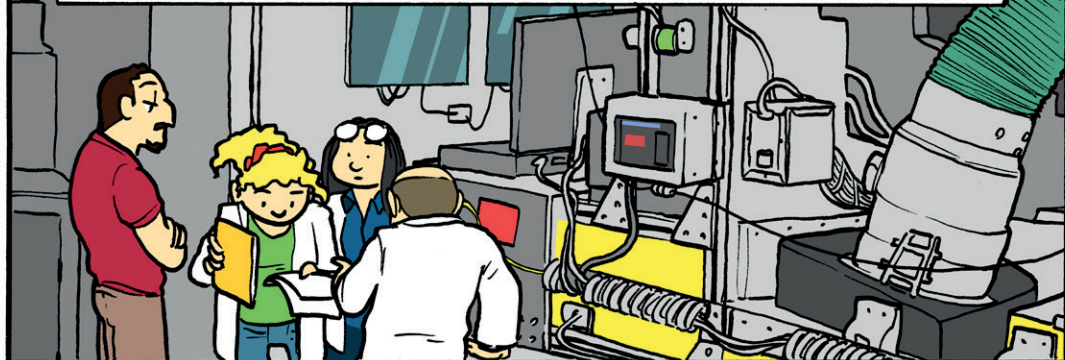








MY MOM IS A ROCK! SHE'S OVERWHELMED BY A THOUSAND COMMITMENTS... SERIOUS STUFF... BUT SHE ALWAYS MANAGES TO FIND SOME SPARE TIME FOR HERSELF. AND WITH ME, SHE'S ALWAYS TRUE TO HERSELF: CARING AND CLOSE, EVEN A HUNDRED KILOMETERS OFF THE COAST OF NAPLES!



...NEVER HEARD ANYONE WORKING WITH HER COMPLAIN! SHE'S ALWAYS VERY KIND TO EVERYONE! SHE'S ALWAYS DIRECT AND TOUGH, BUT SHE MAKES IT CLEAR RIGHT AWAY THAT SHE WOULD RATHER STAY QUIET OR MAKE A FOOL OF HERSELF THAN RISK OFFENDING ANYONE AROUND HER, REGARDLESS OF THEIR ROLE OR JOB!

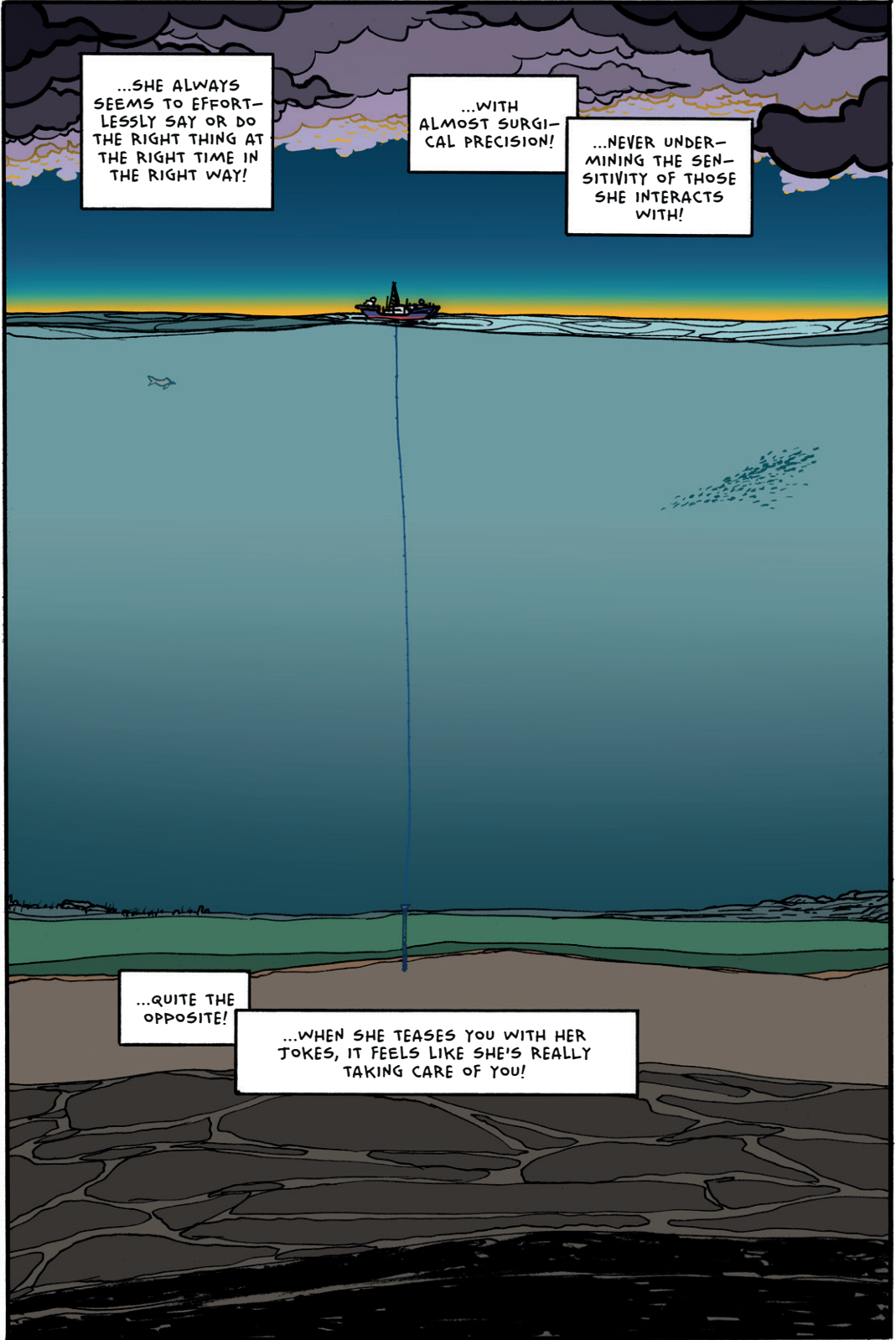


SHE WAS EVEN INTERVIEWED ON TV, AND DESPITE THE STRESS AND HER NATURAL DISCOMFORT WITH VIDEOS AND PHOTOS, SHE ANSWERED IN HER USUAL CONCISE AND APPROPRIATE WAY!

...EVEN WHILE SWEATING LIKE CRAZY UNDER THE SPOTLIGHT!







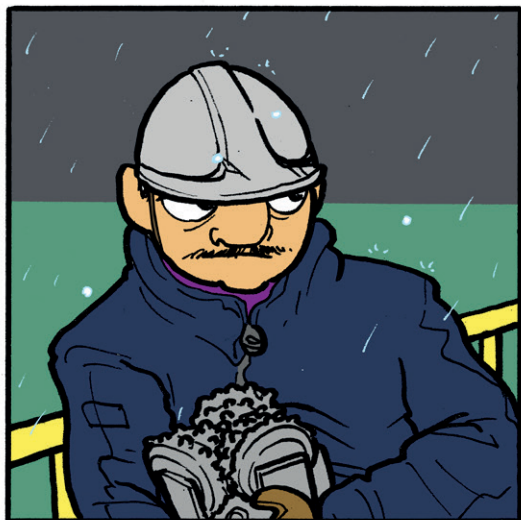
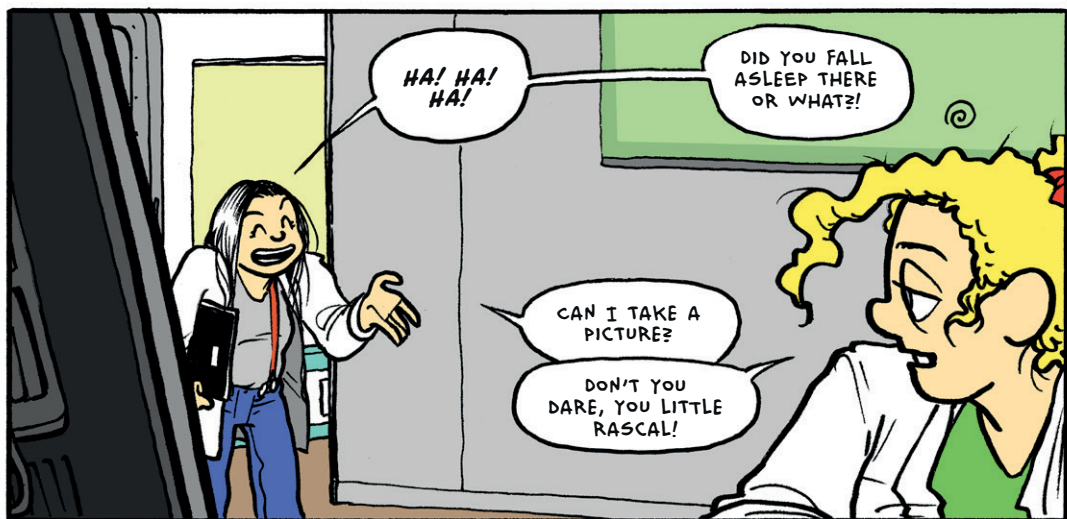
...SHE ALWAYS  
SEEMS TO EFFORT-  
LESSLY SAY OR DO  
THE RIGHT THING AT  
THE RIGHT TIME IN  
THE RIGHT WAY!

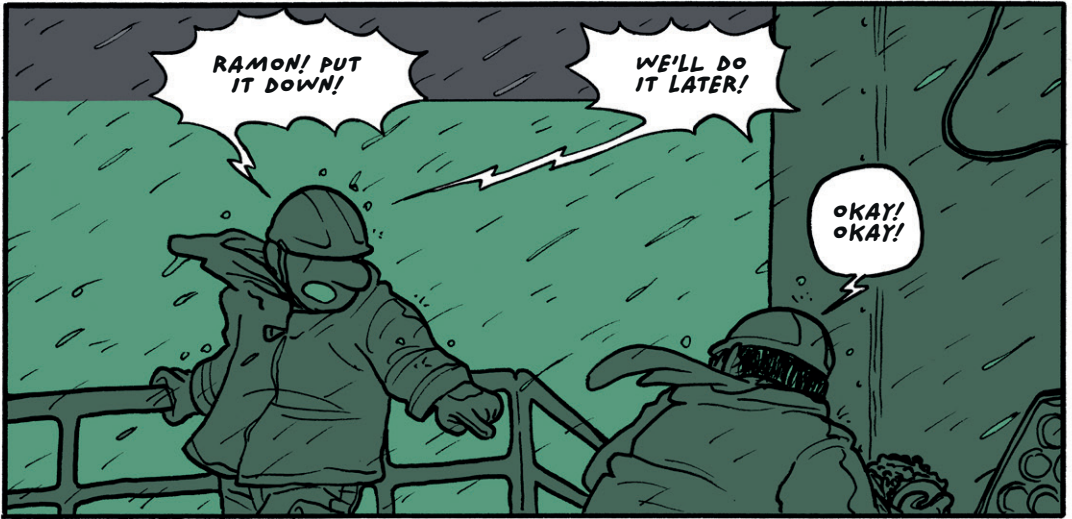
...WITH  
ALMOST SURGI-  
CAL PRECISION!

...NEVER UNDER-  
MINING THE SEN-  
SITIVITY OF THOSE  
SHE INTERACTS  
WITH!

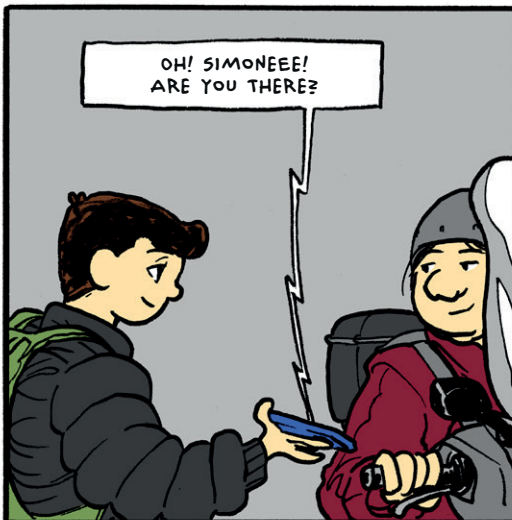
...QUITE THE  
OPPOSITE!

...WHEN SHE TEASES YOU WITH HER  
JOKES, IT FEELS LIKE SHE'S REALLY  
TAKING CARE OF YOU!



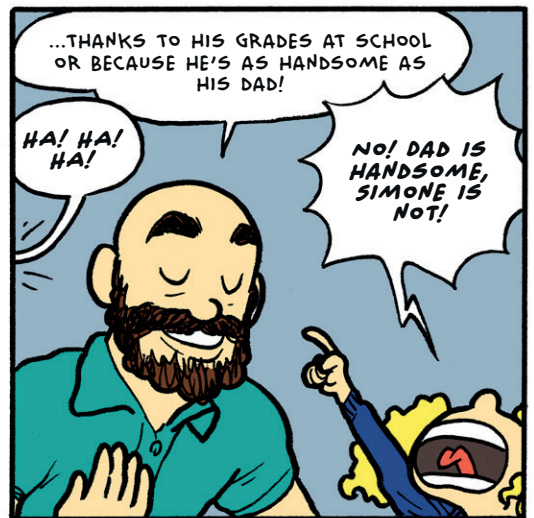
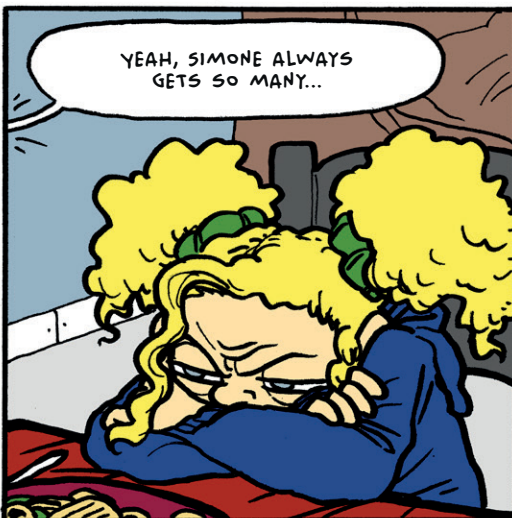
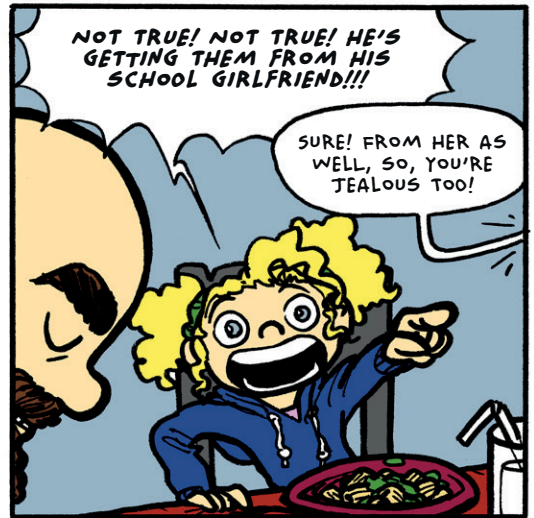




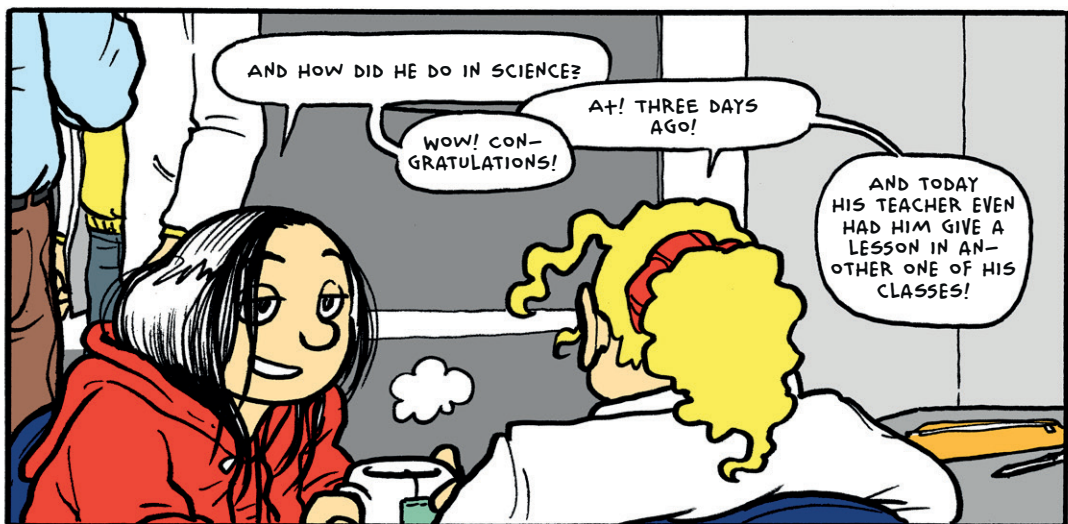




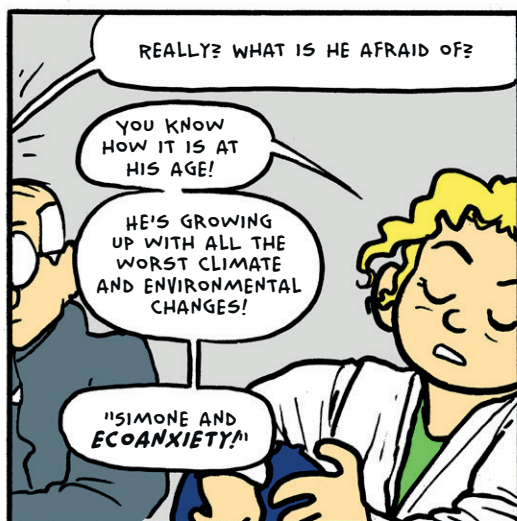


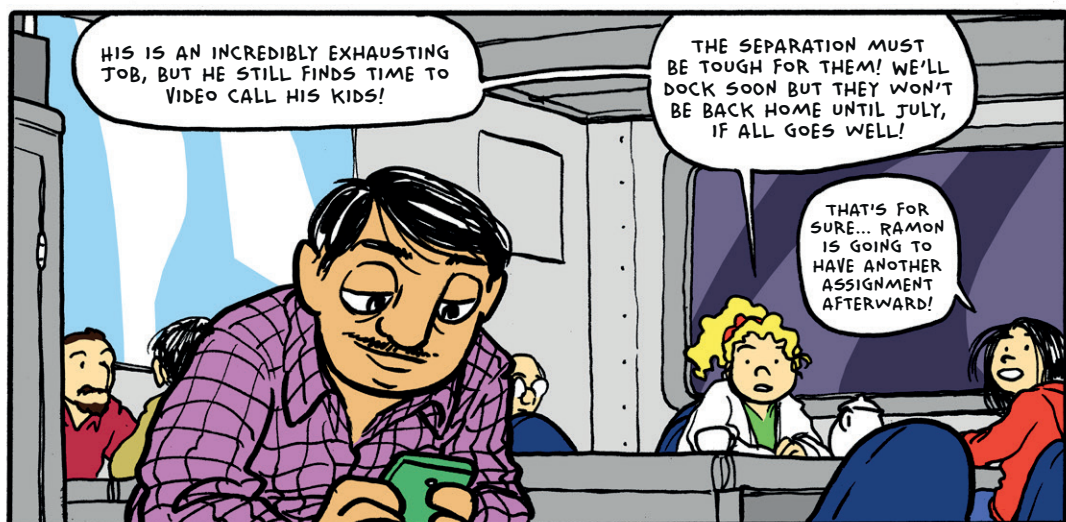












...HE TOO  
MUST BE A  
ROCK!

HE HAS TO AD-  
JUST... GET USED  
TO LOOSENING TIES  
WHEN NEEDED!

JUST LIKE  
EVERYWHERE ELSE IN  
THE WORLD!

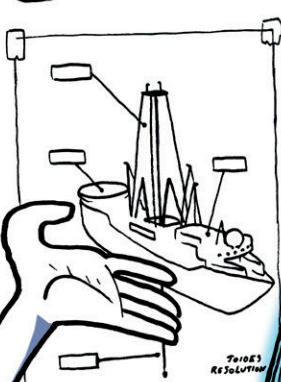


**THE END**



E D E F G H  
L M N O P Q  
V W X Y Z

ORIGINAL SERIES  
THE DUFFER BROTHERS



Product Description  
Manufacturer Information  
Product Information

**Scientific exploration and drilling of the ocean floor**  
are not just complex activities.  
They are a **template** for scientific cooperation,  
inherently calling for **multidisciplinarity**.



*“When there is teamwork,  
wonderful things can be achieved.”*

ANGELO CAMERLENGHI

To achieve great goals, a great organization is required. This is a general rule, perhaps best known through the major feats of space exploration. In fact, the exploration of space and the ocean floor share a common origin: the pursuit of knowledge about environments beyond human habitats, driven by scientific curiosity and strategic or military ambition. During the 1950s, amidst global geopolitical bipolarity, the competition extended to scientific knowledge as well. Space posed challenges with vast distances, zero gravity, radiation exposure, and extreme temperatures. The ocean depths, though not as distant (with an average depth of only 3.6 km), presented enormous pressures, complete darkness (where electromagnetic waves rapidly attenuate, hindering light and communication), and a corrosive environment for metals. Different challenges, but equally

demanding. As the race for space between the USSR and the USA began, some American scientists convinced the Congress to embark on the exploration of the ocean floor through scientific drilling. Drilling for science, not for hydrocarbons. The goal was to reach the Earth’s mantle, the rock that makes up most of our Planet. That goal was not achieved. The MOHOLE project failed; the technology wasn’t ready.

But the idea of studying Earth’s history by drilling into the ocean floor was a good one, and an international consortium of many countries joined the Americans, creating the largest and longest-running exploration program of Planet Earth. Over time, the project went under different names: *Deep Sea Drilling Project* (DSDP), *Ocean Drilling Program* (ODP), *Integrated Ocean Drilling Program* and finally, the *International Ocean Discovery Program* (IODP).

Starting in 2025, it will be known as the *International Ocean Drilling Program (IODP3)*. Thinking about it, the model of the International Space Station was first introduced by scientific ocean drilling. A vehicle (the drilling ship), and a relay of scientists and technicians alternating to carry out scientific expeditions.

Every day of the year, the drilling ship (now there are several of them) and the International Space Station advance our knowledge of the Planet and of space, respectively. As for scientific drilling, it's the ship getting back to the mainland to renew its crew, while in space, the crew gets to the station. Participating in the scientific drilling programs of the ocean floors is a technological, scientific, and human adventure.

To this day, three generations of scientists have taken part in the discovery of Planet Earth through scientific ocean drilling. These generations cross paths on the ships - Ph.D. students alongside renowned professors, technicians, engineers, and science communicators. The most diverse nationalities and cultures are united by research. Thousands of scientific publications, books, and teaching materials for hundreds of university and high school professors around the world have been produced. The Italian scientific community has made a significant contribution to these

ocean drilling programs. One of the first two women invited by the USA in the 1960s to board the scientific drilling ship *Glomar Challenger* of the Deep Sea Drilling Project was Italian. Her name was Maria Bianca Cita, a professor at the University of Milan and a pioneer of Marine Geology in Italy.

Italy has been a full member of the scientific ocean drilling programs since 1985, as a member of a European consortium. Over 100 Italian researchers and Ph.D. students have participated in drilling expeditions, nine of them as co-chief scientists. Many more have worked on sediment and rock samples taken from the archives, generating 3,880 scientific publications. The most significant contribution to research has undoubtedly come from the extraordinary Italian school of biostratigraphy. Along the way, other disciplines have also excelled, such as paleomagnetism, structural geology, geochemistry, and petrography. A particular area of expertise has been drilling in polar regions, both Antarctic and Arctic.

Italian candidates are always in demand for their skills, and requests to participate keep coming in. Participating in scientific ocean drilling expeditions changes lives, not just professionally but also personally, improving life for oneself and for others.





The **Integrated Ocean Drilling Program** is one of the most **ambitious** and **successful** research programs currently underway, with critical implications for our **understanding** of Earth and its **history**.



## *Not simply an acronym: IODP for the future*

PAOLA VANNUCCHI  
CHIARA BOSCHI

The scientific exploration conducted by the IODP reaches for uncharted territories of the ocean floor, providing unique samples and data shedding light on the geological and climatic history of Earth. Through the study of sediments and rock samples from the ocean floor, scientists can understand the processes that drive plate tectonics and biogeochemical cycles, reconstruct past climatic conditions, and explore the deep biosphere.

This knowledge is crucial for comprehending the Earth's system, understanding its geochemical and geodynamic evolution over geological time, and predicting future global and climate changes.

The scientific discoveries that have marked the history of the IODP project have continuously pushed and redefined the boundaries of scientific knowledge. Several IODP campaigns (IODP 304, 305,

357, 399) have focused on sampling a massive structure in the Atlantic Ocean composed of mantle rocks, which, at a depth of 700 meters, hosts an incredible hydrothermal field known as *Lost City*.

Here, researchers unexpectedly discovered a community of new primordial microorganisms.

The presence of microbial life in extreme environments like *Lost City* challenges radically our understanding of what the limits of life are.

The deep biosphere represents one of the last frontiers of Earth's research and hints at the habitability of other planets, "exoplanets" beyond our solar system.

These discoveries hold significant implications for biotechnology and the search for life beyond Earth.

The deep biosphere may harbor new microorganisms with unique metabolic pathways, offering potential applications in medicine, industry, and – last but not

least – environmental management. One of the most remarkable achievements of the IODP is its contribution to our understanding of mass extinction events.

The geological history preserved in the seafloor allowed IODP researchers to identify the causes and trace the consequences of catastrophic events and how life on Earth recovered afterward. Similarly, understanding how oceans responded to past global changes is crucial for developing strategies to mitigate the impacts of climate change, protect marine biodiversity, and ensure the sustainable use of ocean resources. The study of sea level fluctuations over geological eras aids in predicting future changes, which is vital for coastal planning and resilience.

Among the most fascinating events studied by scientists is the Messinian salinity crisis.

During IODP Expedition 402 in the Tyrrhenian Sea, researchers retrieved sediment cores from the Mediterranean seabed dating back to this period, when the sea nearly dried up, leaving behind vast deposits of salt.

These cores are truly spectacular, with layers of rock in vivid colors: red, yellow, green, and orange.

Studying these cores helps us better understand how climate and sea levels changed in the past, providing valuable insights for the future.

IODP plays a crucial role in advancing our knowledge of natural hazards, particularly earthquakes and tsunamis. Subduction zones – where tectonic plates converge – are the primary sites of some of the world's most devastating earthquakes and tsunamis.

By analyzing these zones, IODP helps scientists in understanding the conditions triggering such events. This information is vital for developing early warning systems and improving disaster preparedness, thereby saving lives and reducing economic losses. As we face the challenges of the 21st

century, the discoveries and innovations generated by IODP are essential for understanding the Earth system and building a more sustainable and resilient future.

Through continued international collaboration, technological advancement, and commitment to education, IODP stands as a cornerstone of scientific discovery and a source of inspiration for future generations.



A **fundamental** structure for the coordination and operation of international drilling projects. Because **the only way** to truly understand what's beneath is to **go and see**.



## *The philosophy of drilling*

FABIO FLORINDO



The International Continental Drilling Program (ICDP) is a program designed to promote and coordinate scientific drilling projects on land, in locations of significant scientific importance. The continents offer access to a "record" of Earth's history that stretches back to around 4 billion years.

However, when we explore the Earth from its surface, the information we gather about the Planet's internal structure is always indirect. Drilling is the only way to directly verify these models by comparing them with reality.

Drilling and retrieving samples from beneath the Earth's surface is a highly expensive and complex endeavor. This is where the ICDP steps in, providing the necessary support.

Today, researchers play a crucial role in protecting the environment, reducing natural risks to society, and managing the natural resources we increasingly depend on, thanks to their ability to understand the Earth system.

Scientific drilling is essential because it allows us to directly study the Earth's internal mechanisms. The ICDP raises funds to support advanced scientific research in key locations around the world, with the goal of addressing major Earth science challenges of great importance to society.

As such, ICDP projects are irreplaceable in answering crucial questions across four main themes.

Evolution of the Earth-Life System –



Studying how Earth and life on it have changed over time.

- Geological Hazards – Examining processes that can cause natural dangers, such as earthquakes and volcanoes.
- Essential Resources – Working to find and manage natural resources necessary for modern societies, such as water and minerals.
- Climate Change – Analyzing climate changes, both past and present, to better understand the problem of global warming.

Through these studies, ICDP helps protect the environment and improve people's lives.

Founded in 1996, ICDP has grown to include more than 20 countries worldwide, as well as UNESCO.

ICDP reviews project proposals and pools the annual financial contributions of all of its members to collectively fund research projects.

Being a member of ICDP offers numerous advantages. Scientists can apply for funding, lead projects initially financed by ICDP, and gain priority access to data and samples. Workshops, training, and education are provided to member

countries, giving them access to the ICDP Operational Support Group and ICDP Equipment Pool services.

ICDP members also have a seat and a vote on decision-making panels, allowing them to influence policy, funding strategies, and individual grant decisions. ICDP funding typically covers 10% to 50% of the total cost of a drilling project and helps research groups secure additional funding.

ICDP proposals are rigorously evaluated by global experts, including the Science Advisory Group (SAG) and expert project managers from member countries, based on clear criteria of scientific merit and societal relevance.

Approved ICDP projects provide a foundation for further high-quality scientific research.

Work on samples and data collected during ICDP projects leads to numerous scientific publications and supports the advancement of early-career scientists. The economic impact of ICDP investments is also not to be overlooked, as local drilling and service companies may be contracted for projects, allowing some of the investment to benefit the host country.



