

A CHANGING INTERPLAY BETWEEN ART, SCIENCE, TECHNOLOGY, AND SOCIETY

Daniel Rey

Centro de Investigación Mariña
Universidade de Vigo and Campus do Mar

VISUAL ART



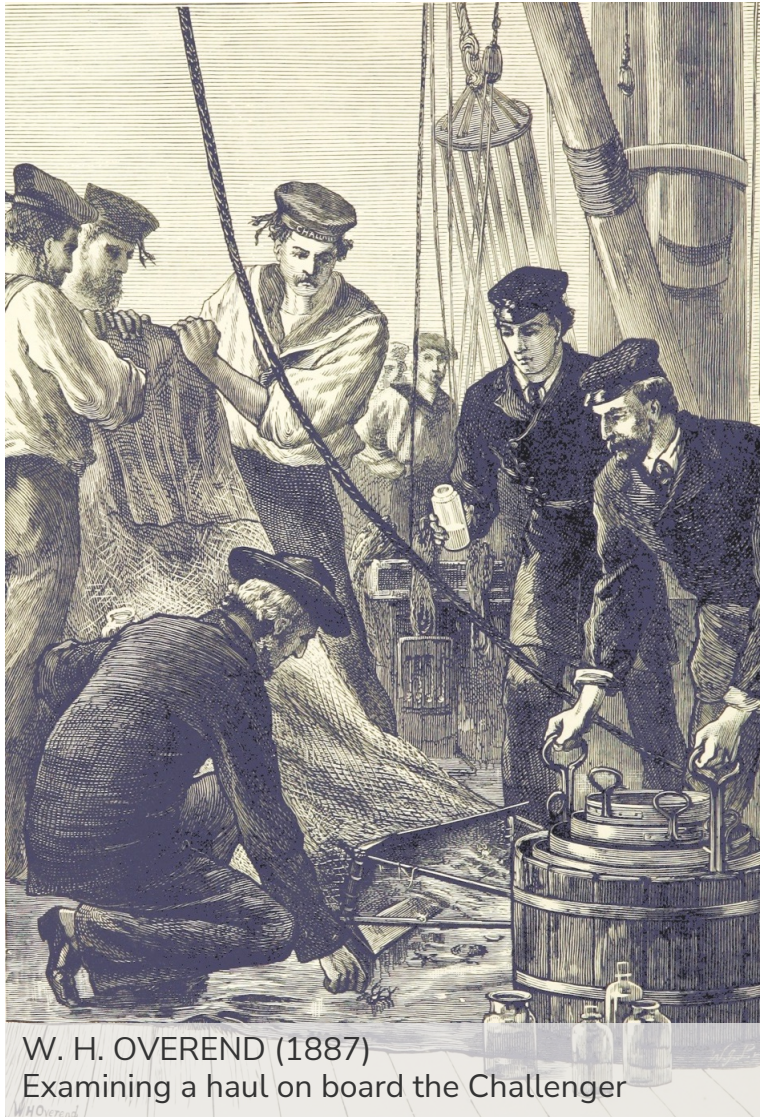
PHOTOGRAPHY & FILMING



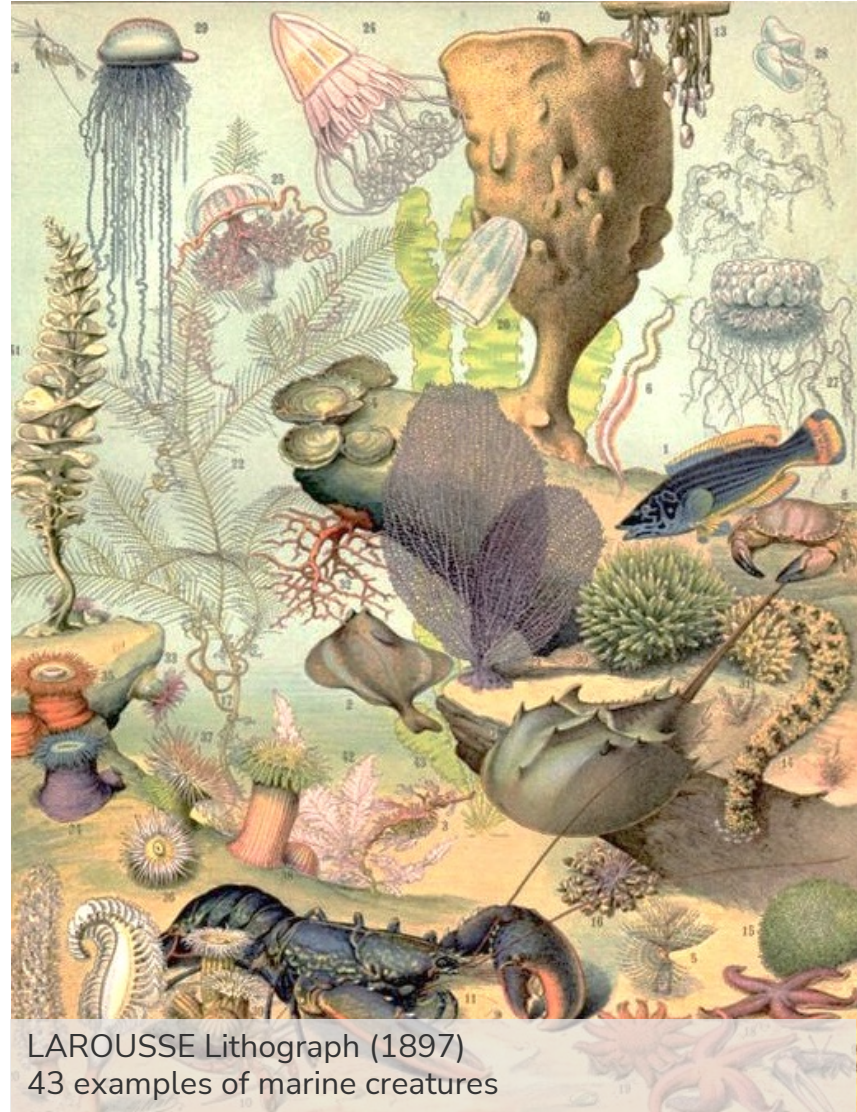
ANUAR PATJANE (2015)
Humpback whales off the coast of Mexico



ILLUSTRATION

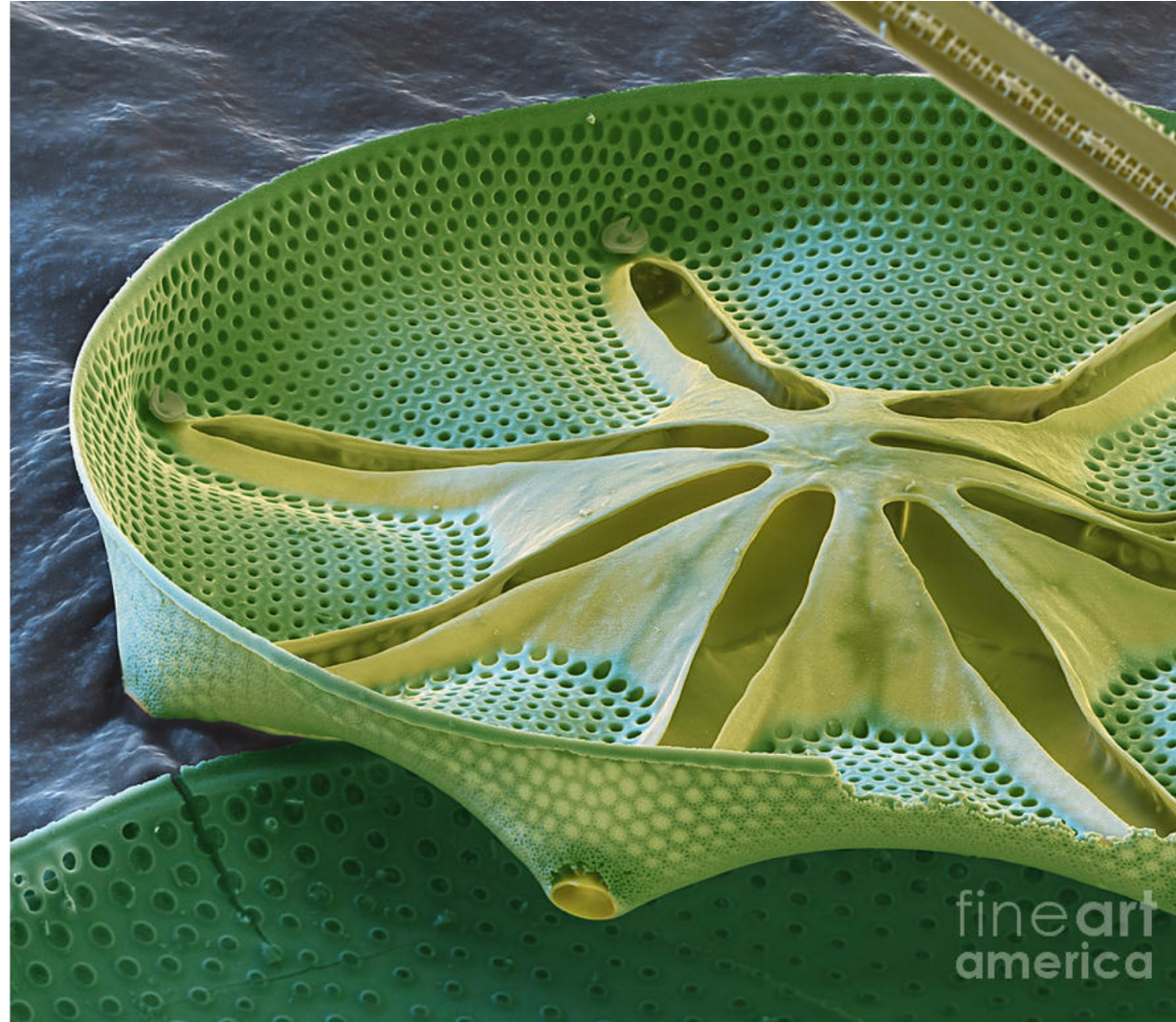
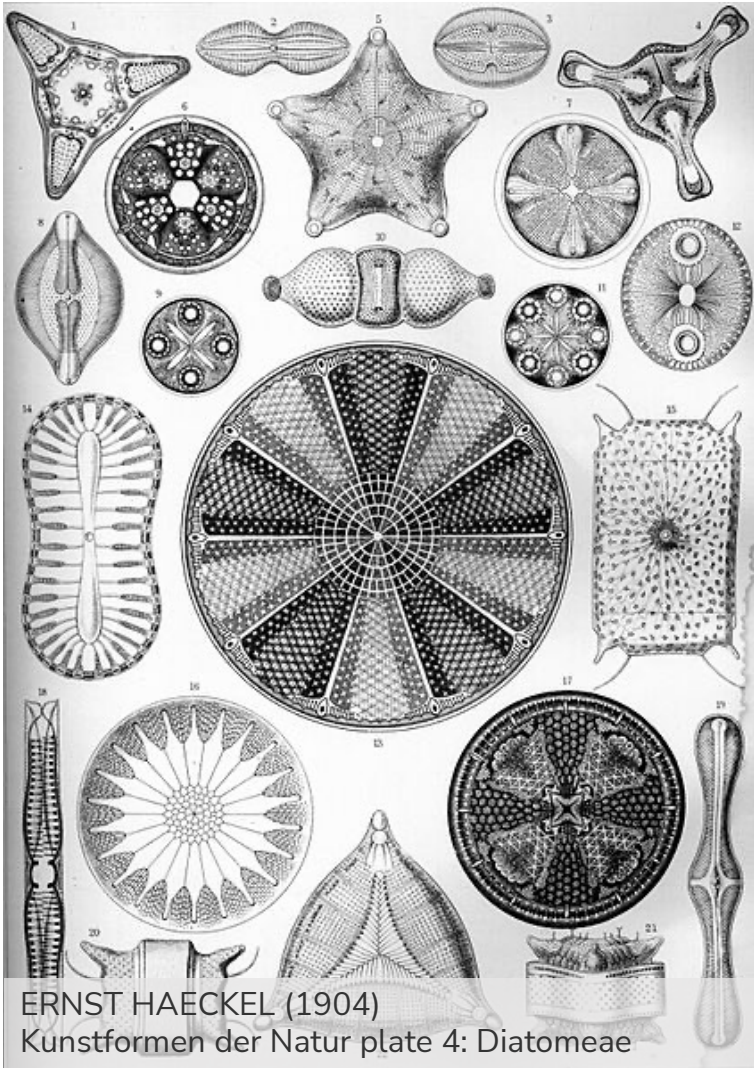


W. H. OVEREND (1887)
Examining a haul on board the Challenger

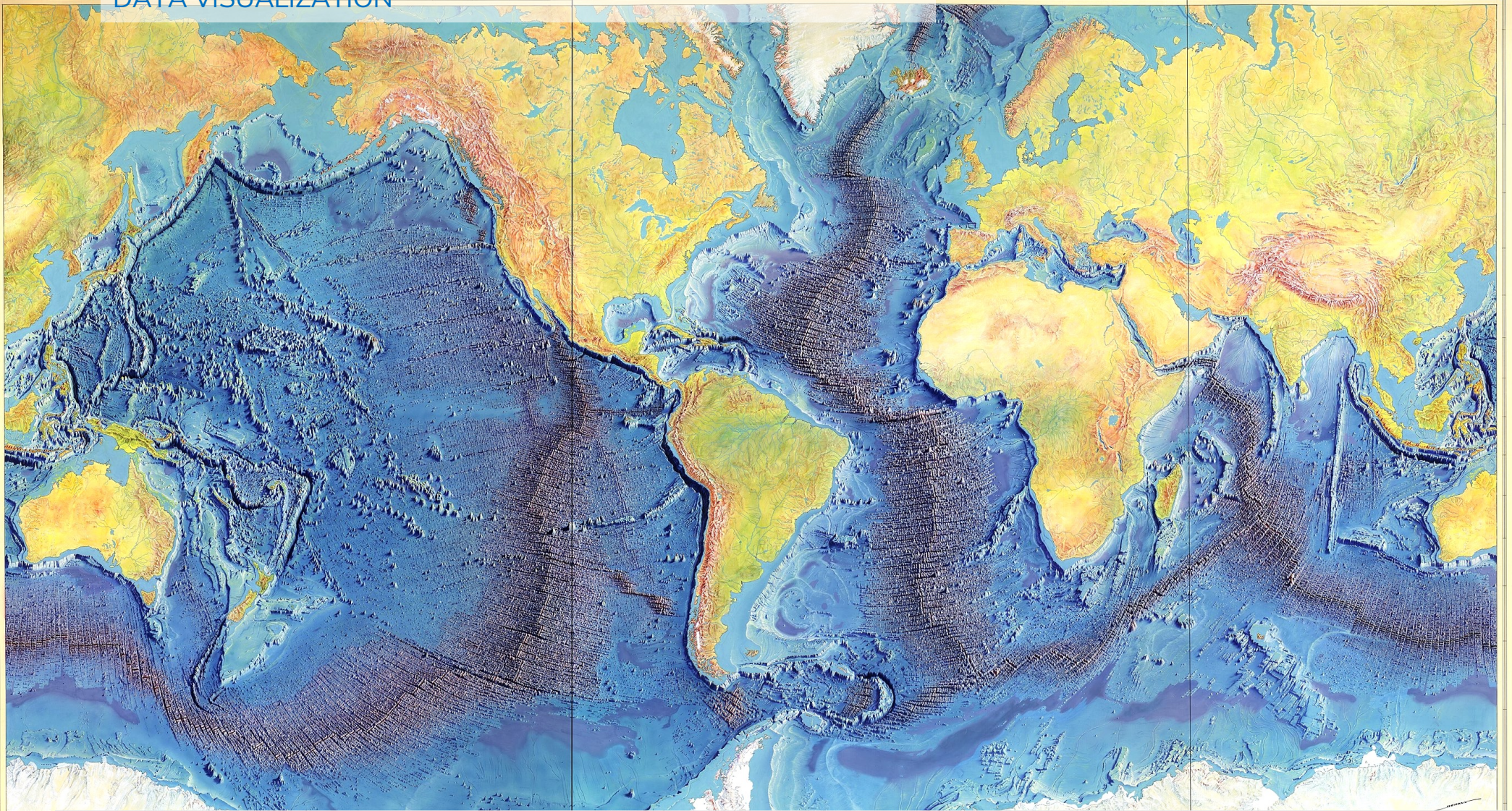


LAROUSSE Lithograph (1897)
43 examples of marine creatures

SCIENCE AND TECHNOLOGY ILLUSTRATION MEETING FINE ART

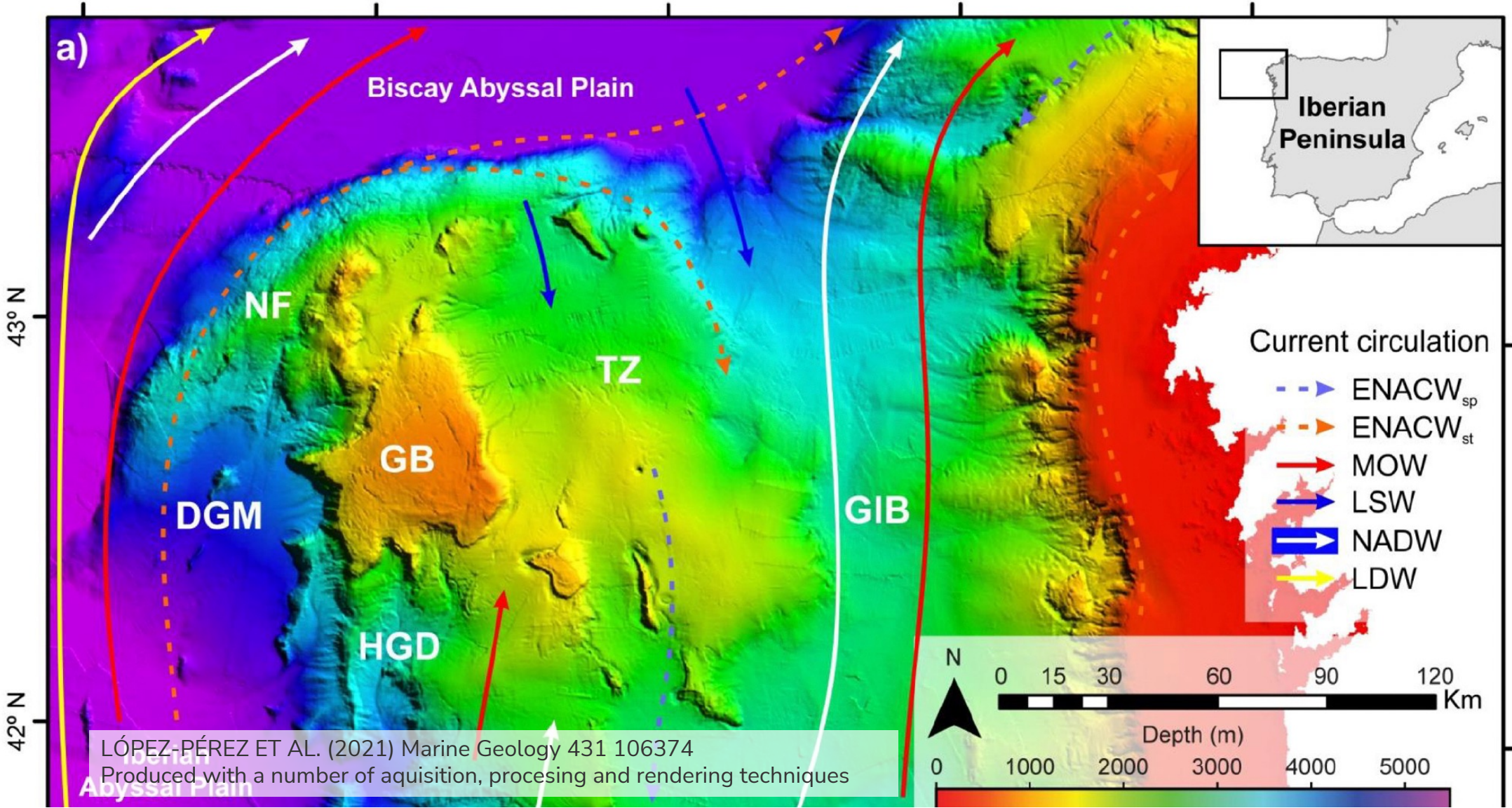


DATA VISUALIZATION

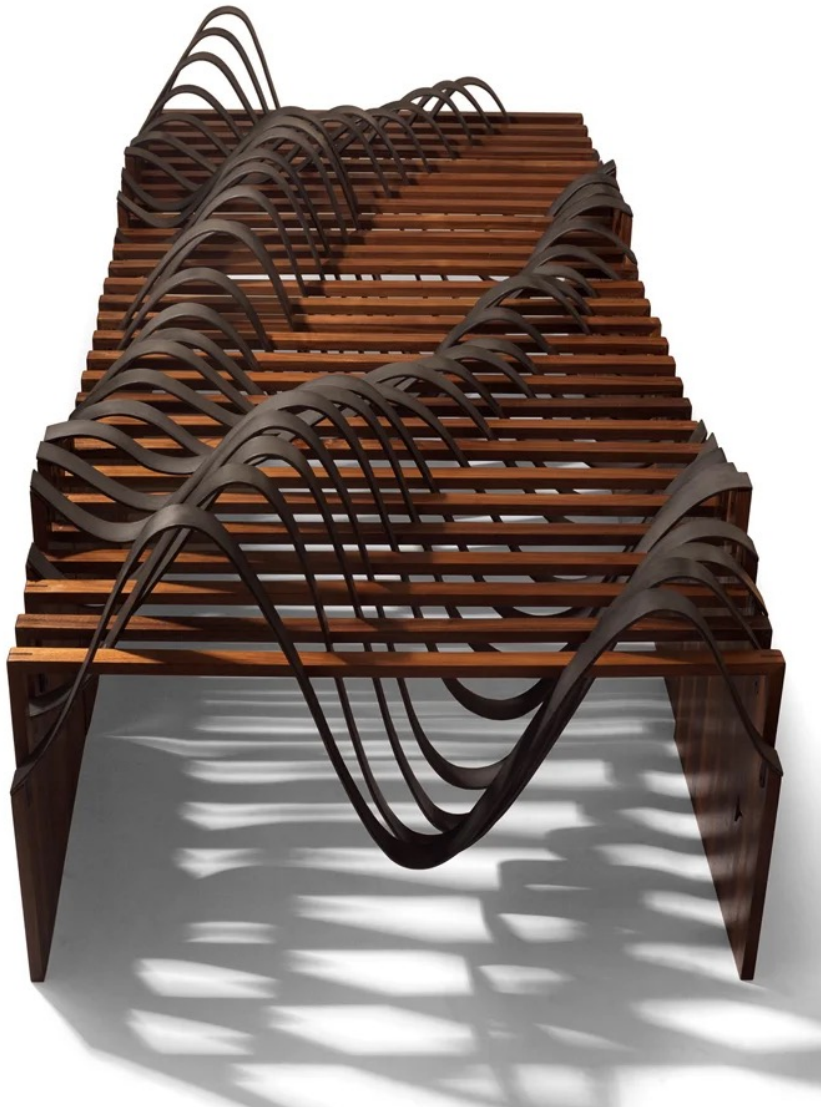


Painting of the Mid-Ocean Ridge by HEINRICH BERANN (1977) based on the scientific profiles of MARIE THARP and BRUCE HEEZEN

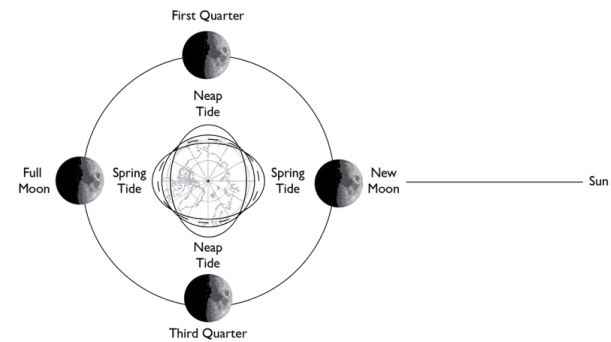
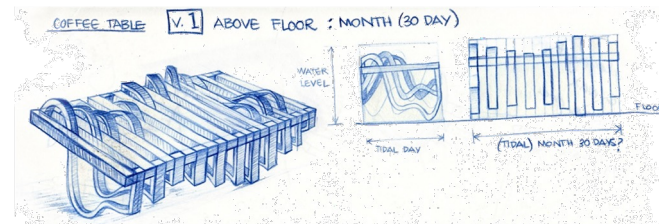
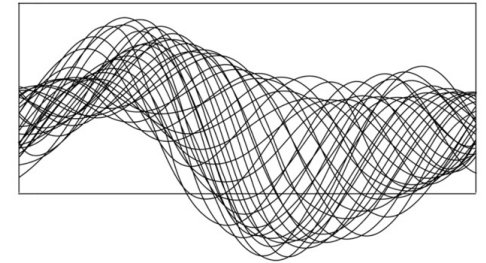
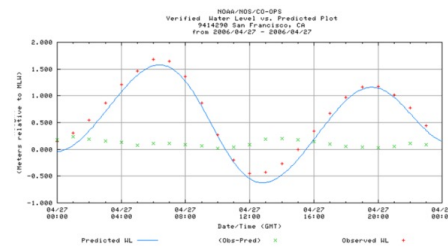
DATA VISUALIZATION



DATA VISUALIZATION



ADRIEN SEGAL (USA)
TIDAL DATUM SERIES : COFFEE TABLE
changing patterns in the ocean's tides as the sea level rises
and falls in a daily and monthly cycle



THE NECESITY OF COMMUNICATING SCIENCE: INFOGRAPHICS



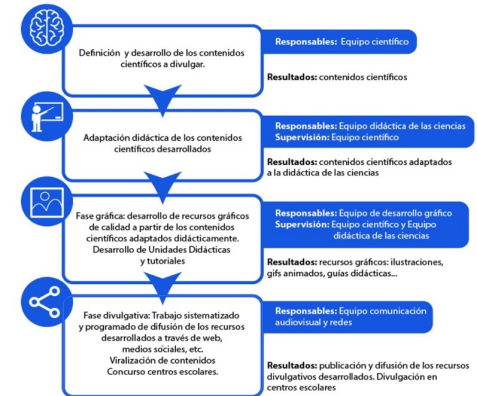
OCEANS OF PLASTICS

IMPACTOS DE LOS MICROPLÁSTICOS

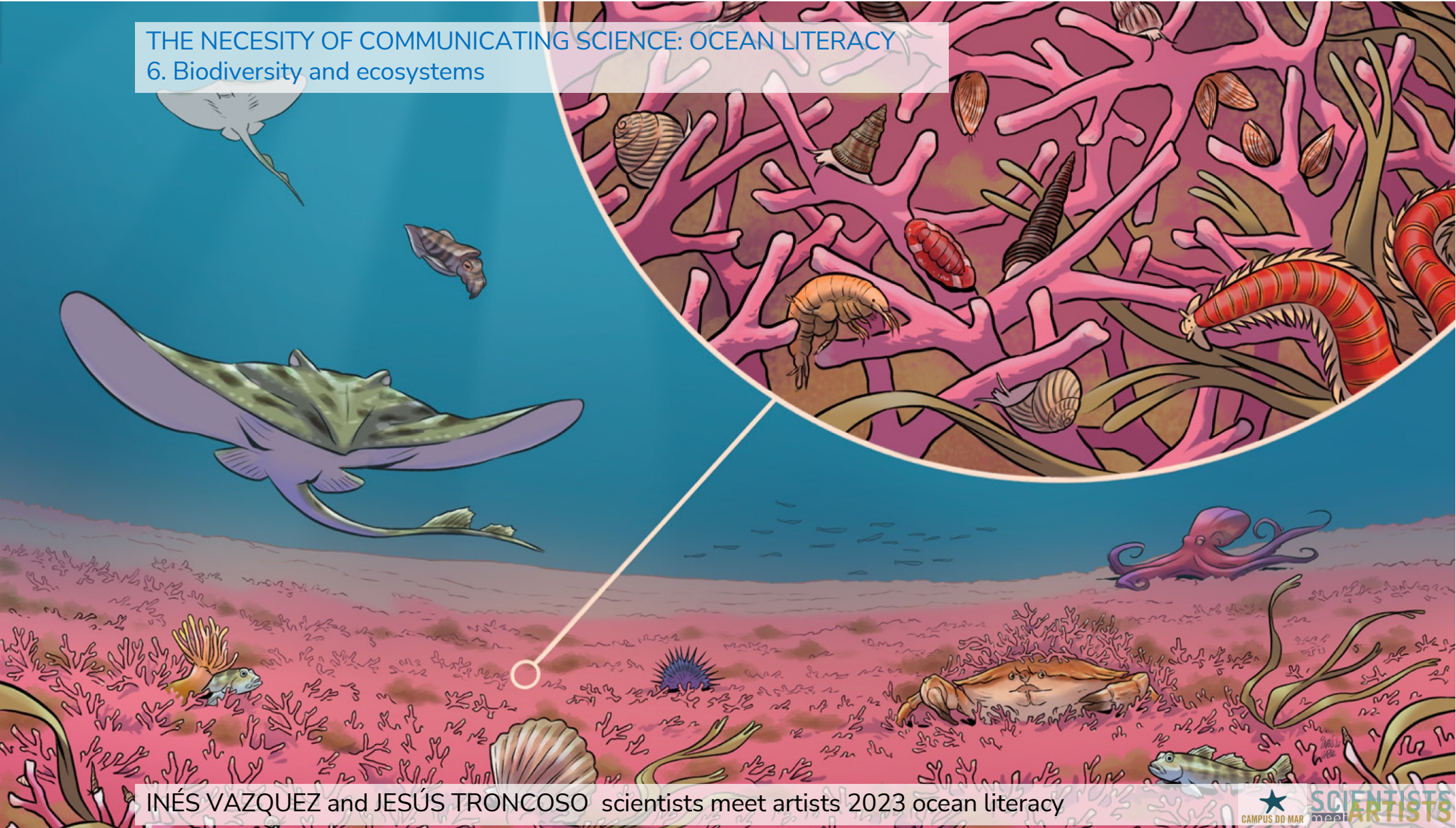
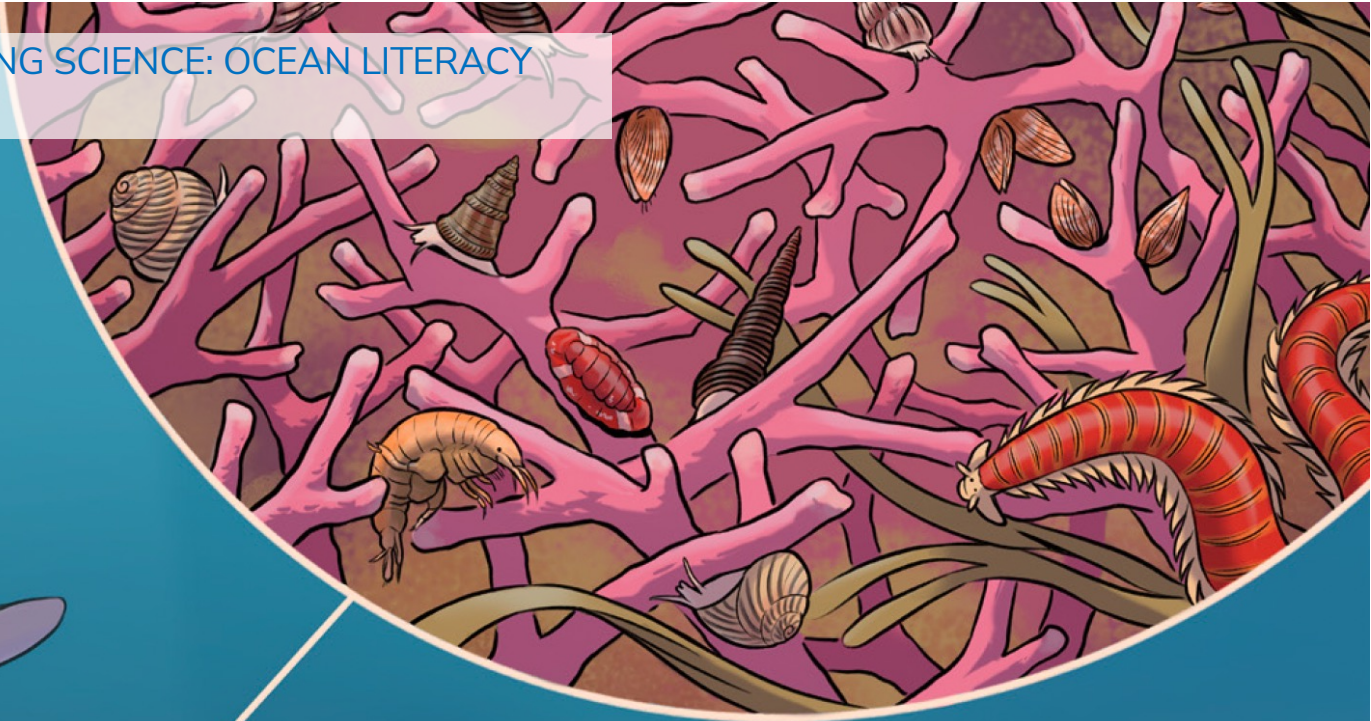
Se han encontrado **microplásticos** en casi **todos los hábitats marinos del mundo** y se distribuyen tanto en la columna de agua como en los sedimentos bentónicos.

La gran abundancia de estos microplásticos en el océano puede causar impactos de diversas formas:

- Ingestión directa
- Transferencia trófica
- Bioacumulación
- Incorporación de contaminantes químicos a los organismos
- Liberación de químicos al medio marino
- Degradación de hábitats marinos



THE NECESITY OF COMMUNICATING SCIENCE: OCEAN LITERACY
6. Biodiversity and ecosystems



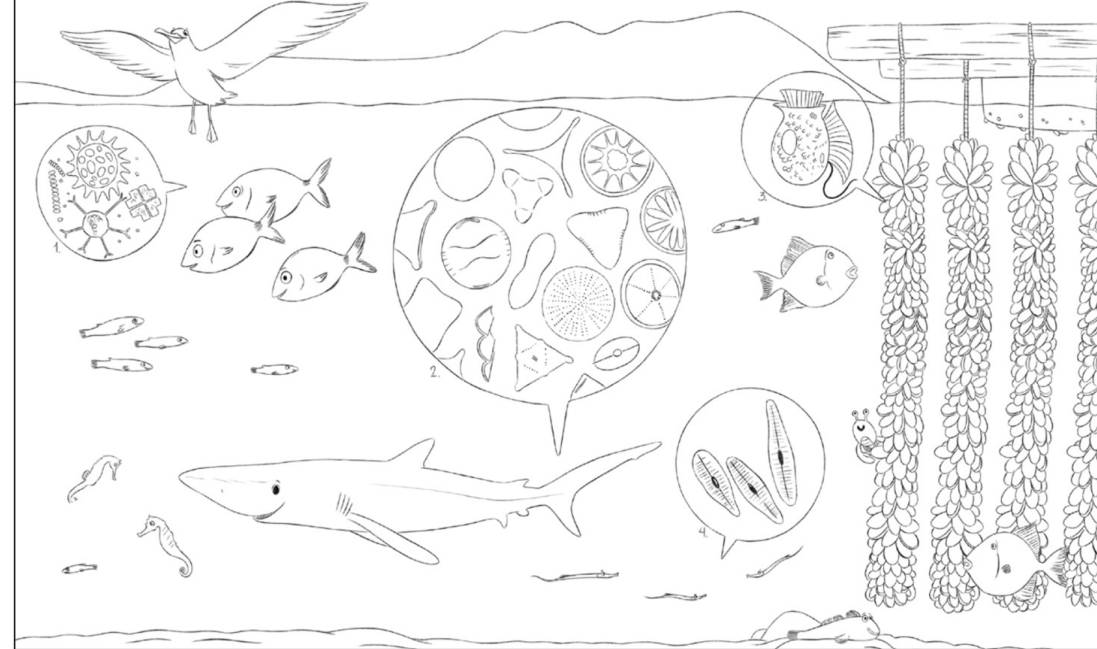
INÉS VAZQUEZ and JESÚS TRONCOSO scientists meet artists 2023 ocean literacy

THE NECESSITY OF COMMUNICATING SCIENCE: INFOGRAPHICS



Phytoplankton, our amazing microscopic friend

Phytoplankton (1, 2, 3 and 4) are the small microorganisms that live floating in watery environments. They are the foundation of the aquatic food web and marine ecosystems. In addition, they are so crucial for the life of the whole planet because they photosynthesize. Phytoplankton are extremely diverse, varying from diatoms (2 and 4) to dinoflagellates (1 and 3) and different in shape, size and color (1, 2, 3 and 4). They are the food of many fishes (1, 2 and 4) and mollusks (3) in the ocean. Also, phytoplankton are responsible for the release of 50% of the oxygen that we breathe on the planet. They consume CO₂ and are a good mechanism of absorption of CO₂. In fact, phytoplankton absorb a quarter of CO₂ that humans generate every year.



Illustrator: Pablo Rosendo | Researcher: Luís Paulo Alcaraz



During the pandemic 12 illustrators from Spain and Portugal meet 12 researchers from the Campus do Mar to promote ocean literacy in society, especially among children

DOCUMENTARIES: BUILDING EQUALITY



Desafíos del Océano
científicas al mando



CONCURSO ESCOLAR DESAFÍOS DEL OCÉANO
¡Graba tu vídeo y participa!


Desafíos del Océano
científicas al mando

Los desafíos



Especies invasoras

Dra. Celia Olabarria

Centro de Investigación Mariña de la Universidade de Vigo



Microplásticos

Dra. Lucía Viñas

Instituto Español de Oceanografía



Erosión costera

Dra. Ana Bernabeu

Centro de Investigación Mariña de la Universidade de Vigo



Acidificación oceánica

Dra. Marta Álvarez

Instituto Español de Oceanografía



Eventos extremos

Dra. Silvia Torres

Centro Tecnológico del Mar – Fundación CETMAR



Sostenibilidad de la pesca

Dra. Carmen González Sotelo

Instituto de Investigaciones Marinas del CSIC



Con la colaboración de:



GOBIERNO DE ESPAÑA

MINISTERIO DE CIENCIA E INNOVACIÓN



Universidade de Vigo

OCEAN LITERACY: GAMIFICATION



Blu



Hosi



Doctora Mar



Abuelo



"El Cuñado"



Conferencia divulgativa:
El cambio climático y la vida en los océanos

Mariela Des Vilamuna
Centro de Investigación Mariña da UVigo

30 de setembro, 13:15h
Campus remoto da UVigo
inscrición: web.vigo.es



Instrumentos exóticos e innovadores para poner banda sonora al videojuego del proyecto Misión Azul

Alumnado de primaria y secundaria hacen sus aportaciones al videojuego "Misión Azul: Pleamar"

Misión Azul. Alfabetización oceánica y cambio climático
Nivel educativo: ESO, 2022

Unidad didáctica de secundaria

1.ª Acidificación de los aguas
Si el nivel de CO₂ en la atmósfera sigue aumentando, aumentará asimismo la acidez del agua de mar, creando océanos ácidos. En capítulos anteriores hemos visto cómo influye esto en el conjunto de los organismos que utilizan el carbonato para formar sus esqueletos u otras estructuras.

2.ª Aumentar el nivel del mar
El nivel del mar cambia por movimiento de las placas tectónicas porque se está el volumen de las cuencas oceánicas y por el aumento de la temperatura global. Actualmente, el nivel del mar global está aumentando aproximadamente 3 mm por año en todo el mundo. Los científicos todavía están tratando de predecir con exactitud qué aumento del nivel del mar podemos esperar para el siglo XXI.

3.ª Aumentar la temperatura del océano
Cuando los tormentos de gran intensidad tocan tierra, un nivel del mar más elevado provoca tormentos de mayor tamaño e intensidad que pueden destruir todo lo que encuentran a su paso.

4.ª Aumentar la temperatura del océano
El calentamiento de los océanos provoca cambios en la distribución de las especies marinas, lo que puede afectar a la pesca y a la acuicultura. También puede provocar cambios en la química del agua, lo que puede afectar a la salud de los organismos marinos.

5.ª Aumentar la temperatura del océano
El calentamiento de los océanos provoca cambios en la distribución de las especies marinas, lo que puede afectar a la pesca y a la acuicultura. También puede provocar cambios en la química del agua, lo que puede afectar a la salud de los organismos marinos.

6.ª Aumentar la temperatura del océano
El calentamiento de los océanos provoca cambios en la distribución de las especies marinas, lo que puede afectar a la pesca y a la acuicultura. También puede provocar cambios en la química del agua, lo que puede afectar a la salud de los organismos marinos.

7.ª Aumentar la temperatura del océano
El calentamiento de los océanos provoca cambios en la distribución de las especies marinas, lo que puede afectar a la pesca y a la acuicultura. También puede provocar cambios en la química del agua, lo que puede afectar a la salud de los organismos marinos.



SCENIC ARTS: ARTIST SCIENTIST ACTIVATING CONCIENCES FROM WITHIN

BLUE FEAR

climate change and uncertainty among the people of the sea



G-Night 2023

29 de septiembre



Galician Night of Researchers

EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions

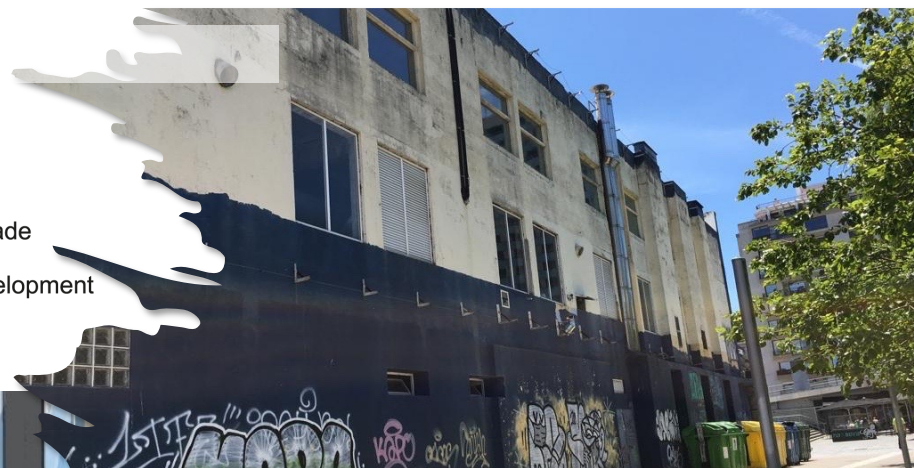


URBAN ART & ARCHITECTURE



Marine Street Art - Surfing walls Project OBSERVING THE OCEAN

2021 United Nations Decade
2030 of Ocean Science
for Sustainable Development



SCIENTISTS
meeli **ARTISTS**

DELIO RODRÍGUEZ

Puerto de Vigo
Autoridad Portuaria de Vigo

cim

CAMPUS DO MAR

gus^R



Cofinanciado por
la Unión Europea

Fondos Europeos

ECO-ART AND CULTURAL DIVERSITY



ENDANGERED



PORKY HEFER (SOUTH AFRICA)
embraces Africa and the skills that are readily available
indigenously



PLASTOCENE AGE
Marine Mutants From a Disposable World

ARTIST DRIVEN COMMUNICATION AND CULTURE: THE CROCHET CORAL REEF

ever-evolving nature-culture hybrid created by Margaret Wertheim and Christine Wertheim, that resides at the nexus of art, science, mathematics, community practice, and climate change



50 COMMUNITY-BASED
SATELLITE REEFS WORLDWIDE

A QUICKLY EVOLVING INTERRELATION BETWEEN ART, SCIENCE, TECHNOLOGY, AND SOCIETY

HISTORICALLY

VISUAL ART DOCUMENTATION DATA REPRESENTATION SCIENCE COMMUNICATION
 ILLUSTRATION INFOGRAPHICS

LAST 20 YEARS

VERY INTRICATE RELATIONSHIP

2008 ECONOMIC CRISIS	ECONOMIC CRISIS INTENSIFICATION OF INTERACTIONS WITH ARTISTS NECESITY OF EXPLAINING SCIENCE EXPENDITURE DIVERSIFICATION EXPLAINING COMPLEX GLOBAL ISSUES: ENVIRONMENTAL EMERGENCY ETHICAL AND PHILOSOPHICAL EXPLORATION: SOCIAL CONCERNS
2020 PANDEMIA	DIGITAL MEDIA ECLOSION VIRTUAL REALITY NEW GENERATIONS
2022 IA	ARTIFICIAL INTELIGENCE REGULATION FURTHER ENCOURAGEMENT OF CIVIC ENGAGEMENT AND DIALOGUE FOR INCLUSION



SOCIETY

CHALLENGES

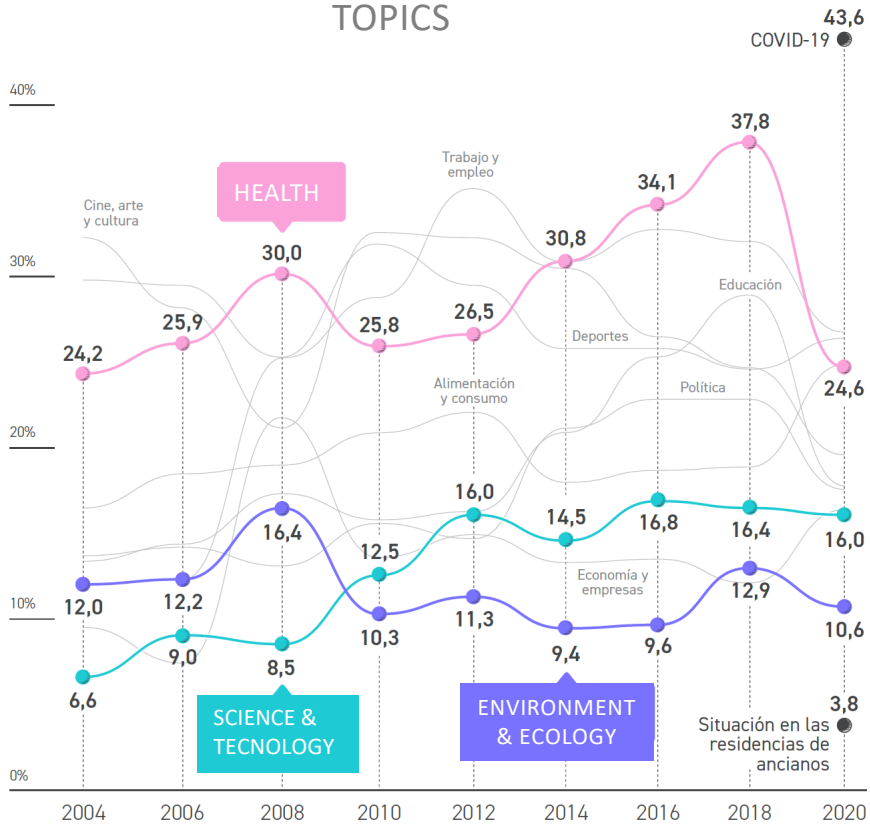
INCLUSION:
 EQUITY AND DIVERSITY

CULTURALLY-SENSITIVE
 SCIENCE OUTREACH
 MIGRANT SCIENTISTS
 SCHOOL CHILDREN
 (STEM+LANG)
 PERSONS WITH DISABILITIES

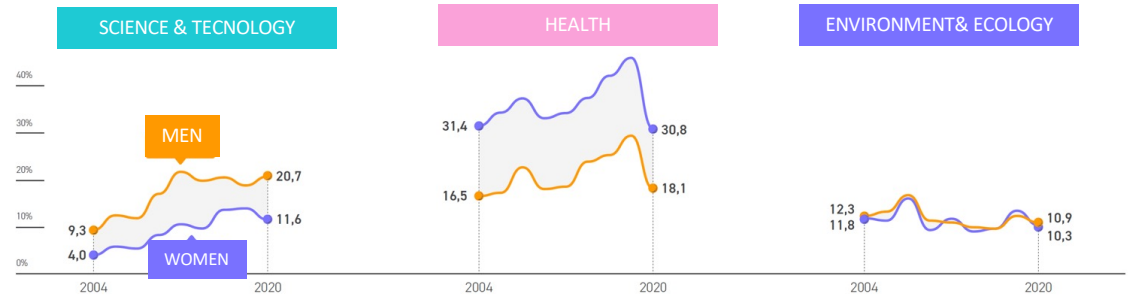


SOCIETAL INTERACTION: THE PUBLIC INTEREST

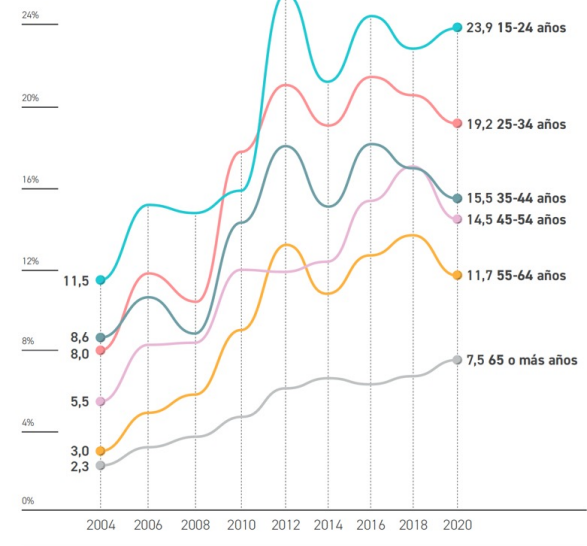
TOPICS



DIFERENCES BETWEEN MEN AND WOMEN



INTEREST IN SCIENCE & TECNOLOGÍA BY AGE GROUP

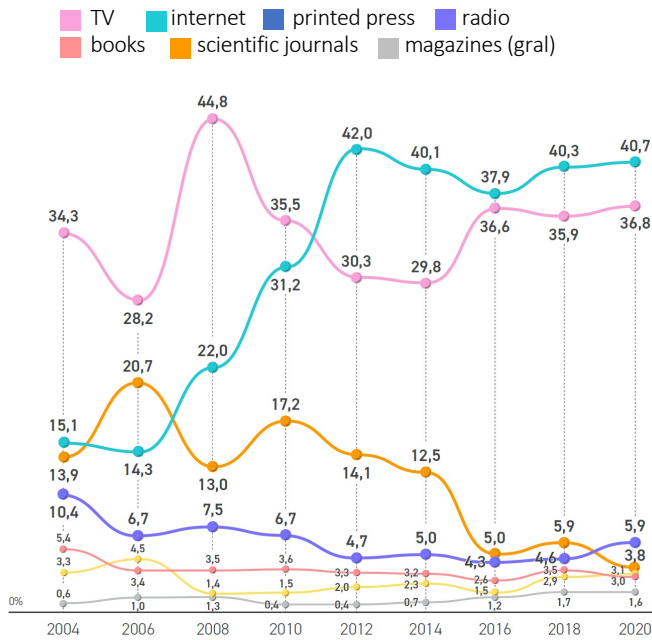


DOES NOT FULLY ADDRESS DIVERSITY

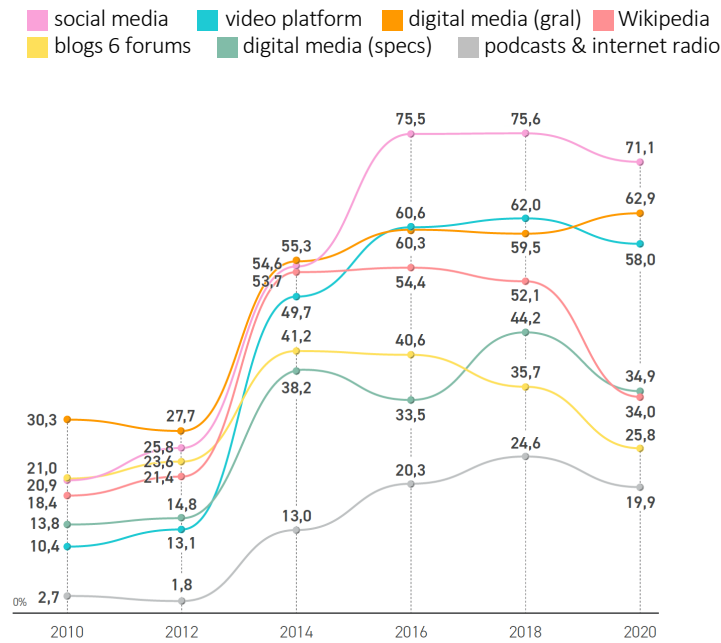


SOCIETAL INTERACTION & MEDIA: TV & INTERNET

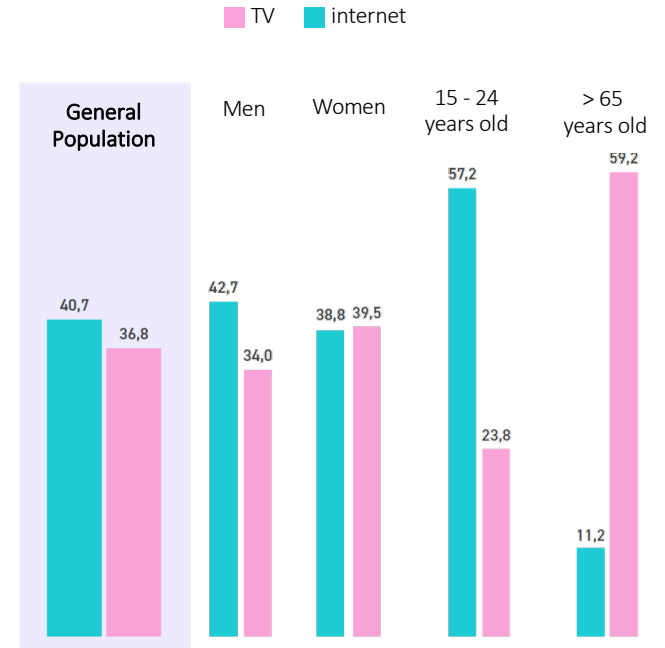
FIRST MEDIA TO GET INFO ABOUT SCIENCE & TECNOLOGY



INTERNET MEDIA TO GET INFO ABOUT SCIENCE & TECNOLOGY



TV & INTERNET MAIN MEDIA TO GET INFO IN ALL GROUPS



MEASURING IMPACT

QUANTITATIVE IMPACT

IN-PERSON IMPACT (135 attendees)

Project presentation and dissemination events educational institutions visited

VIRTUAL IMPACT (23.000)

Visits project's website, videogame downloads, educational unit's downloads followers and interactions on the social networks

MEDIA PUBLICATIONS

Press releases
(audience indicators)

METRICS OF DIRECT INTERACTION

QUALITATIVE IMPACT

STUDENTS

Knowledge about the oceans feelings towards the importance of the sea self-assessment of their training and use of results

TEACHING STAFF

Type of content related to the importance of the marine world reaction perceived in students, type and quality of materials and resources impact of the educational units and the video game

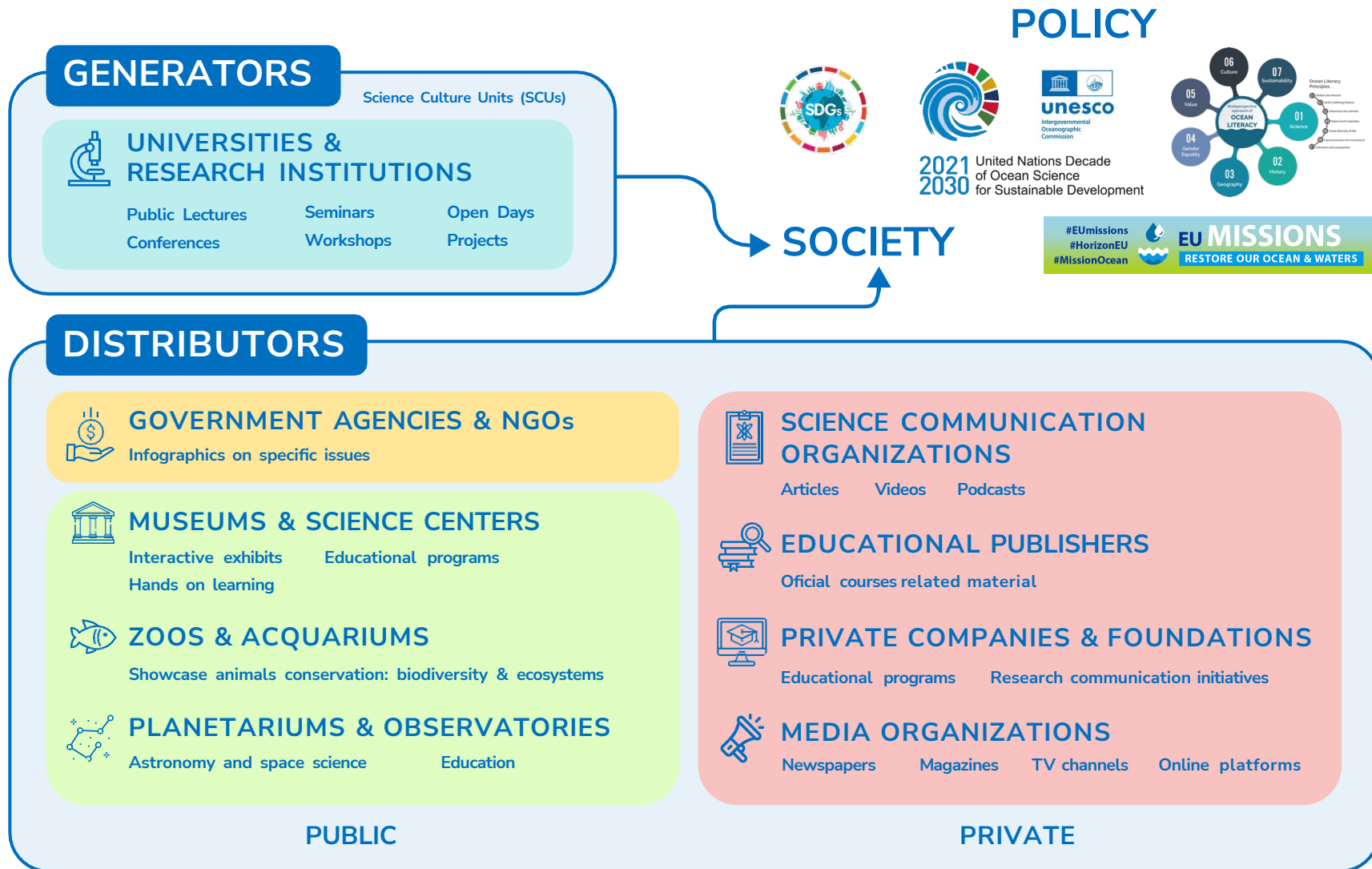
DISCUSSION GROUPS

With teaching staff and students

QUESTIONNAIRES: PERCEPTION OF CHANGE

The image displays a collage of digital content related to the 'Misión Azul' project. At the top left is the website's header with the 'azul' logo and navigation links: 'Proyecto', 'Equipo', 'Juego', 'U. Didácticas', 'Actualidad', and 'Contacto'. The main banner features the title 'MISIÓN AZUL' and subtitle 'Alfabetización oceánica y cambio climático', with a 'Descargar' button for the 'Versión Beta 2.0 ya disponible!'. Below this, the text 'Nuestra misión es...' is followed by a blue hand icon. The central part of the collage includes three main content blocks: 'Divulgar el medio marino' (with a quote from the 'Cuaderno de las Ciencias Docentes para el Desarrollo Sostenible'), 'Luchar contra la desinformación' (with a quote about climate change and human impact), and 'Sensibilizar sobre el cambio climático' (with a quote about learning and experimentation). To the right, there are three illustrations: a person on a beach, a person in a boat, and a person holding a smartphone. Below these are five character icons labeled 'Blu', 'Holi', 'Doctora Mar', 'Abuelo', and 'El Calabero'. At the bottom right, there are three educational unit covers: 'Unidad didáctica de secundaria', 'Actividades de la unidad didáctica', and 'Guía didáctica para profesorado'. The bottom left shows a photograph of a classroom with students at computers.

COMMUNICATING SCIENCE: BRIDGING THE GAP BETWEEN COMPLEX SCIENCE AND THE GENERAL PUBLIC



CONCLUSIONS

21st century has witnessed rapid strengthening of the interplay among art, science, technology, and society



Phenomenon fueled by technological advancements
interdisciplinary collaborations
improved communication
focus on global challenges such as the climate crisis and pandemics



Convergence stimulated innovation,
promoted creative expression
facilitated a deeper understanding
of complex issues.



Vital force in our
interconnected world.



Further promotion of civic
engagement and dialogue must
prioritize culturally sensitive science
outreach to enhance inclusivity,
equity, and diversity also disability



Additionally, assessing the impact of
these outreach efforts is crucial in
navigating this new communication
landscape effectively.



THANKS FOR YOUR ATTENTION!

A CHANGING INTERPLAY BETWEEN ART, SCIENCE, TECHNOLOGY, AND SOCIETY

Daniel Rey,
Centro de Investigación Mariña, Universidade de Vigo
and Campus do Mar

REFERENCES A CHANGING INTERPLAY BETWEEN ART, SCIENCE, TECHNOLOGY, AND SOCIETY

SLIDE 2

LEFT: KATSUSHIKA HOKUSAI (1831):The Great Wave Off Kanagawa (Cropped)

Museo Metropolitano de Arte, New York, USA

RIGHT: LEOPOLD AND RUDOLF BLASCHKA (1863 -1880): Glass marine invertebrates (10.000, 700 sp)

Caliphylla mediterránea, Photo by Guido Mocafo, Natural History Museum of Ireland

SLIDE 3

Divers with humpback whales off the coast of Mexico's Roca Partida Island (cropped)

Winner of the 2015 Traveler Photo Contest, National Geographic

SLIDE 4

LEFT: W. H. OVEREND (1887): Examining a haul on board the Challenger (cropped)

From page 8 of the 1887 book The Sea: its stirring story of adventure, peril & heroism., Volume 1.

Uploaded by the British Library to Flickr

RIGHT: LAROUSSE Lithograph (1897):

Antique lithograph published by Larousse in France in 1897, beautifully detailed, depicting 43 examples of MARINE CREATURES.

SLIDE 5

LEFT: ERNST HAECKEL (1904)

Kunstformen der Natur plate 4: Diatomeae

The 4th plate from [Ernst Haeckel's](#) "Kunstformen der Natur" (1904), depicting diatoms (Diatomea), Wikipedia

RIGHT:

Diatom SEM photograph , Eye of Science, uploaded on October 25th, 2020, Fine Art America

SLIDE 6

Painting of the Mid-Ocean Ridge by HEINRICH BERANN (1977) based on the scientific profiles of

MARIE THARP and BRUCE HEEZEN which has played an important role in explaining plate tectonics

and ocean bathymetry; Wikipedia

SLIDE 7

LÓPEZ-PÉREZ ET AL. (2021) Marine Geology 431 106374

SLIDE 8

ADRIEN SEGAL (USA), TIDAL DATUM SERIES : COFFEE TABLE

<https://www.adriensegal.com/tidal-datum>

SLIDE 9

OCEAN OF PLASTICS, Campus do Mar, FECYT

<https://oceansofplastics.campusdomar.gal>

SLIDE 10

The role of maerl in the Ría de Vigo, INÉS VAZQUEZ and JESÚS TRONCOSO (CIM), scientists meet

artists 2023 ocean literacy, Campus do Mar, FECYT

<https://campusdomar.gal/scientists-meet-artists/recursos-didacticos-de-ocean-literacy/>

SLIDE 11

Phytoplankton our amazing microscopic friend, PABLO ROSENDO Y LUIS PABLO ALCARAZ (CIM),

Campus do Mar, FECYT

<https://campusdomar.gal/scientists-meet-artists/recursos-didacticos-de-scientists-meet-artists/>

SLIDE 12

Ocean Challenges: female scientist in charge is a six-episode, documentary miniseries, Campus do Mar, FECYT

<https://desafios.campusdomar.gal>

SLIDE 13

'Mission Azul', an ocean-themed video game, Centro de Investigación Mariña, Universidade de

Vigo, FECYT

<https://misionazul.webs.uvigo.es/juego/>

SLIDE 14

'Blue Fear,' choreography by Xochitl Elías (FOL,CIM) performed during the European night of

researchers 2023

G-Night 2023, Univerisdade de Vigo, HORIZON-MSCA-2022-CITIZENS-01

SLIDE 15

OBSERVING THE OCEAN, Mural by Delio Rodríguez and CIM scientists (2023)

Puerto de Vigo, Centro de Investigación Mariña (CIM) da Universidade de Vigo, Xunta de Galicia

SLIDE 16

Endangered (left), Plastocene Age, PORKY HEFER (SOUTH AFRICA),

<https://www.animal-farm.co.za>

SLIDE 17

Crochet Coral Reef, Margaret Wertheim and Christine Wertheim (Australia), The Institute For Figuring

<https://crochetcoralreef.org>

SLIDES 18-22

Libro Blanco de la interrelación entre Arte, Ciencia, Tecnología y Sociedad en España 2023,

FUNDACIÓN ESPAÑOLA PARA LA CIENCIA Y LA TECNOLOGÍA, FECYT

<https://www.fecyt.es/es/publicacion/evolucion-de-la-percepcion-social-de-la-ciencia-y-la-tecnologia-en-espana-2002-2020>

Evolución de la percepción social de la ciencia y la tecnología en España 2002–2020, FUNDACIÓN

ESPAÑOLA PARA LA CIENCIA Y LA TECNOLOGÍA, FECYT

<https://www.fecyt.es/es/publicacion/libro-blanco-de-la-interrelacion-entre-arte-ciencia-tecnologia-y-sociedad-en-espana-2023>

European citizens' knowledge and attitudes towards science and technology, SCIENCE AND

TECHNOLOGY | September 2021 | EUROPEAN COMMISSION

<https://europa.eu/eurobarometer/surveys/browse/all/series/27731>