THE OCEAN WE WANT
HOW ADVANCED TECHNOLOGIES DRIVE
A ZERO-POLLUTION BLUE ECONOMY

Fraunhofer-Gesellschaft | SINTEF Ocean

EU GREEN WEEK 2021 PARTNER EVENT

ZERO POLLUTION
for healthier people and planet
10:00 a.m. The ocean we want – How advanced Technologies drive a Zero-Pollution Blue Economy
FRAUNHOFER-GESELLSCHAFT AND SINTEF: THEIR RESPECTIVE MISSION AND JOINT COOPERATION
Speakers: Dr. Steffen Knodt and Dr.-Ing. Bård Wathne Tveiten

10:15 a.m. How can state-of-the-art infrastructure help us innovate faster to facilitate a sustainable future through applied research, environmental observations and ecosystem understanding?
SMART OCEAN TECHNOLOGY, FRAUNHOFER-GESELLSCHAFT, GERMANY
Speaker: Dr.-Ing. Marcus Siewert
OCEANLAB TRONDHEIM FJORD, SINTEF OCEAN, NORWAY
Speakers: Kristin Rist Sørheim and Dr. Emlyn Davies

11:00 a.m. Panel Discussion: If you had an ocean lab, what would you do with it?
DISCUSS WITH US AND EXPERTS FROM THE INDUSTRY

11:45 a.m. Momentum for change – How cross-linked applied research enables a Zero-Pollution Blue Economy
EUROPEAN INNOVATION PLATFORM SUSTAINABLE SUBSEA SOLUTIONS
Speakers: Dr. Johannes Nowak
Smart Ocean Technologies @ Ocean Technology Campus Rostock

How can state-of-the-art infrastructure help us innovate faster to facilitate a sustainable future through applied research, environmental observations and ecosystem understanding.

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Dr.-Ing. Marcus Siewert
Innovation Platform Sustainable Subsea Solutions
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Fraunhofer Institute for Computer Graphics Research, Rostock
General information
The Fraunhofer-Gesellschaft at a glance

75 institutes and research units
(1/2021)

Approx. 29,000 employees
(12/2020)

Our name is synonymous with applied research. Together with companies, we transform original ideas into innovations – for the benefit of society as a whole and to strengthen the German and European economy.

- Approx. 30% of base funding from Germany’s federal and state governments
- Approx. 70% industrial contracts and publicly funded research projects
- Total business volume €2.8b
  - Contract research €2.4b
  - Major infrastructure capital expenditure and defense research

EU Green Week 2021, Marcus Siewert (public)
© Fraunhofer
Subsea@Fraunhofer: Bundling interdisciplinary research for ocean technology

- Association of 13 Fraunhofer institutes
- Coordinated by Fraunhofer IGD in Rostock
- Covering a broad range of technological and methodical expertise
From applied research and technologies to commercial success (tech-transfer)

DeDave: strategic light-house project of Fraunhofer on underwater technologies
Ocean Discovery Xprice about the global, autonomous seafloor mapping
Finalist: ARGGONOUTS collaborative team effort from Fraunhofer and industry
Complete Vision: „Ocean Technology Campus Rostock“

- Objective: Innovation campus in Rostock with international visibility
- Digital Ocean Lab of Fraunhofer IGD as a nucleus for attracting specialized companies
- Offering optimal environment for innovation
- Covering the whole innovation chain from education to market
- Joint initiative of regional stakeholders
  - Economy
  - Academia
  - Government
- KPIs
  - Scientific excellence
  - Economic growth
Ocean Technology Campus Rostock
Creating an Innovation Eco System for Sustainable Subsea Solutions

- Regional Capacity Building
  - Skills
  - Knowledge
  - Data
  - Infrastructure
  - Ideas
  - ...

- Aims
  - Broader networking
  - Scientific excellence
  - Economic growth
Ocean Technology Campus Rostock
BMBF Cluster4Future for the sustainable usage of the ocean

- Innovation areas
  - Subsea Mobility & Autonomy
  - Digital Mission
  - Ocean Lense
  - Sustainable Ocean Use

- Instruments
  - Expansion of Research Capacities
  - Open Innovation
  - Public Engagement
  - Promotion of Young Talent
Underwater Technology: A growing topic of (applied) research

**Challenges**
- High Pressure
- Hydrodynamics
- Salt water
- Bio fouling
- Lighting conditions
- Poor accessibility

**Application areas**
- Technical inspection (offshore wind, oil & gas)
- Exploration and mining of mineral resources (deep sea mining)
- Detection and clearance of underwater unexploded ordnance (UXO)
- Biological monitoring (marine aquaculture)
- Analyzing ecosystems (marine research)
- ...
Research group „Smart Ocean Technologie“ (SOT)

Scientist with different academic backgrounds
Applied research from prototypes to „offshore ready“ solutions
Minilab – agile subsea platform

LABORATORY MODULE
basic equipment of sensors and lighting

COMMUNICATION
live and remote

CONTROL STATION
workshop and control room in close proximity

Low-threshold transition from test basin to realistic conditions
Fraunhofer Smart Ocean Technologies: Tackle the microplastic environmental challenge

Investigation of fragmentation and weathering of polymers

Understanding the behavior

Identification

In-situ microplastic detection

Support the EU Marine Strategy Framework Directive
Underwater Maintenance
Digital Ocean Lab

UXO: Detektion und Bergung

Offshore-Plattform

Seebras, Aquakultur
Projected Offshore Infrastructure Rostock – Digital Ocean Lab

CABLE YARD
PIPELINE YARD
UXO YARD
OPEN SPACES
OFFSHORE YARD
CURRENT YARD
OBSTACLE YARD
ROCK BORDER & BUFFER ZONE
NATURAL REEF

SUBSEA TEST SITE
Modular structure
Flexible use
Reproduction of specific applications
Free expansion areas
Thank you very much!
OceanLab – "Ocean Space field laboratory Trondheimsfjorden"

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SINTEF Ocean
Kristin R. Sørheim and Emlyn J. Davies
OceanLab, Trondheim fjord

Aquaculture

Marine observatory

Autonomous shipping

Communication and e-infrastructure

Subsea facility

The Research Council of Norway

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OceanLab infrastructure project is funded by the Research Council of Norway, and investments from SINTEF Ocean and Industry.

OceanLab consortium is led by SINTEF Ocean in cooperation with NTNU and SINTEF Digital.

Estimated timeline OceanLab (Phase I):
- 2020- 2022/2023: Purchasing, installation & testing phase
- 2023: Operational phase for all nodes

Animation on website:
http://www.sintef.no/oceanlab
OceanLab, Trondheim fjord

Subsea facility – Trondheim fjord

Test area for autonomous shipping – Trondheim fjord

Aquaculture facility – Trondheim fjord and beyond
OceanLab: Marine Observatory

Frøya

Ålesund

Trondheim

OceanLab Phase 1
2020-2024
The observatory node will also support:
• Communication gateways to underwater vehicles & autonomous ships
• Education and science communication
• Data supporting local environmental policymaking

The unique platforms will provide:
• Sites for in-situ lab experiments
• Sensor technology innovation platforms (plug-and-play sensor integration)
• Mobile sensors available to projects
• Data for fundamental research & model development
In-situ, online time-series will include:

- Imaging flow cytometry
- Plankton imaging
- High-precision echosounding
- Water column hydrodynamics
- Salinity
- Temperature
- Turbidity
- Chl-a
- Nutrients
- pH
- O2
- CDOM
- Light propagation
- Weather
- …and more!
Rapid prototyping

Example technology development roadmap:

Problem → Gap → Concept → Benchtop testing

Munkholmen Buoy → Online data → Rapid verification → Refinement

Auxiliary & environmental data

Platform adaptation

Product

AUV → ROV → Deck-box

UAV/Satellite

Lander/Bedframe

Float/buoy
530m depth

Ingdalen

OceanLab
OceanLab, Trondheim fjord

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Innovation Platform Sustainable Sea and Ocean Solutions (ISSS)
Intelligent Technologies for the blue economy

Application Areas
- Aquacultures
- Energy Harvesting
- Ocean Cleaning

Technologies
- Robotics and actuators
- Communications and sensors
- Materials and logistics
THANK YOU FOR YOUR INTEREST AND PARTICIPATION!

Further information:

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