

Kostas Nittis Scientific and Strategic Workshop

on a coordinated European observing systems strategy
Honouring the forward thinking of a visionary oceanographer
Athens, 26th and 27th of May 2015



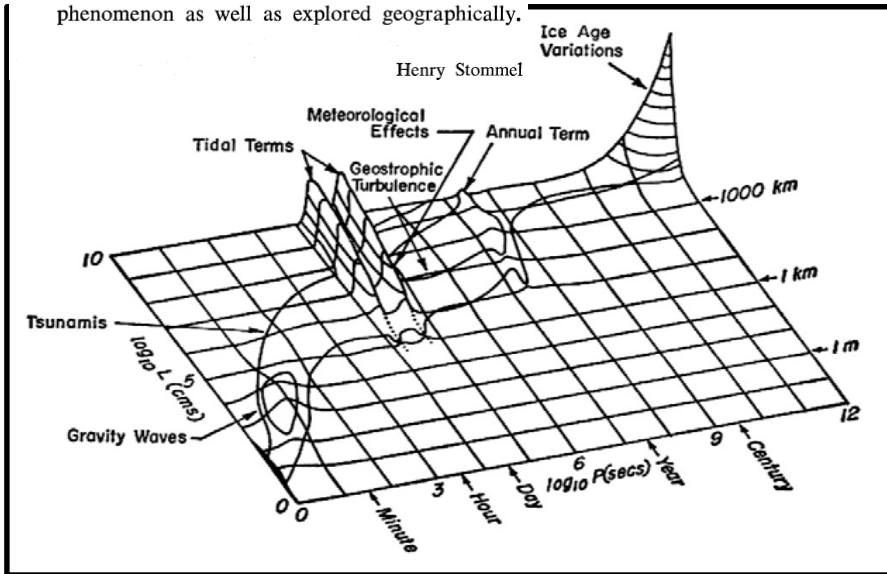
Javier Ruiz. CSIC

***Physical/biological variability and coupling:
from science to society***



Varieties of Oceanographic Experience

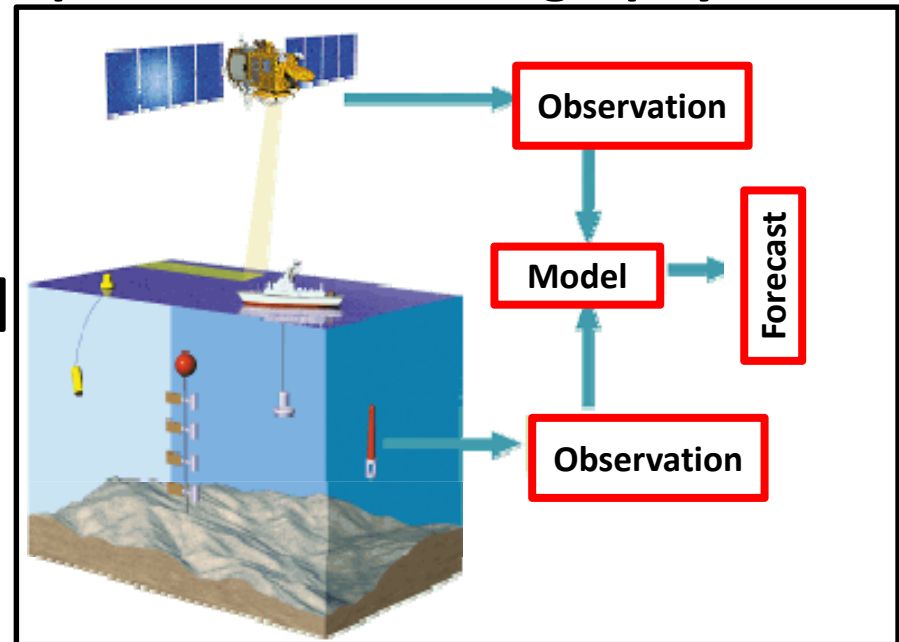
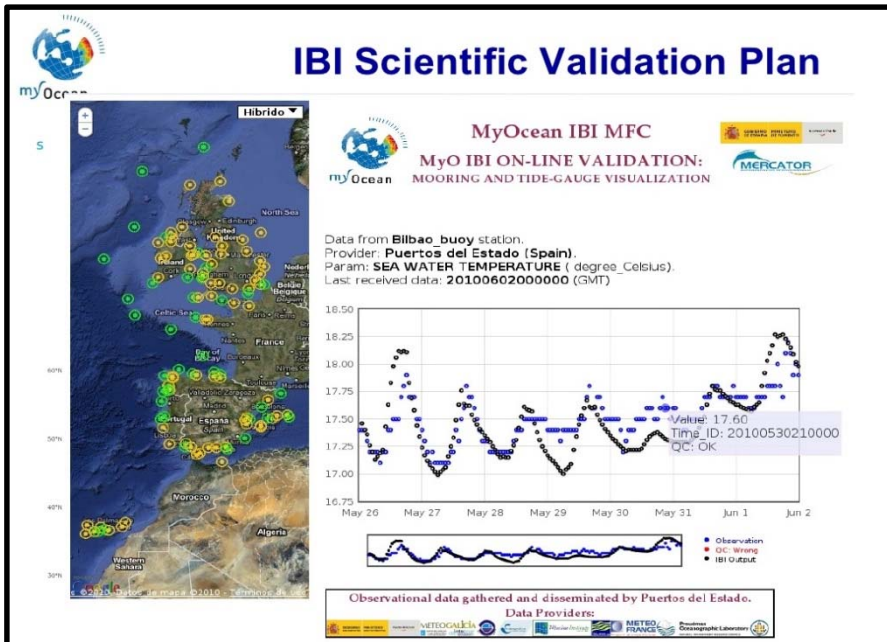
The ocean can be investigated as a hydrodynamical phenomenon as well as explored geographically.



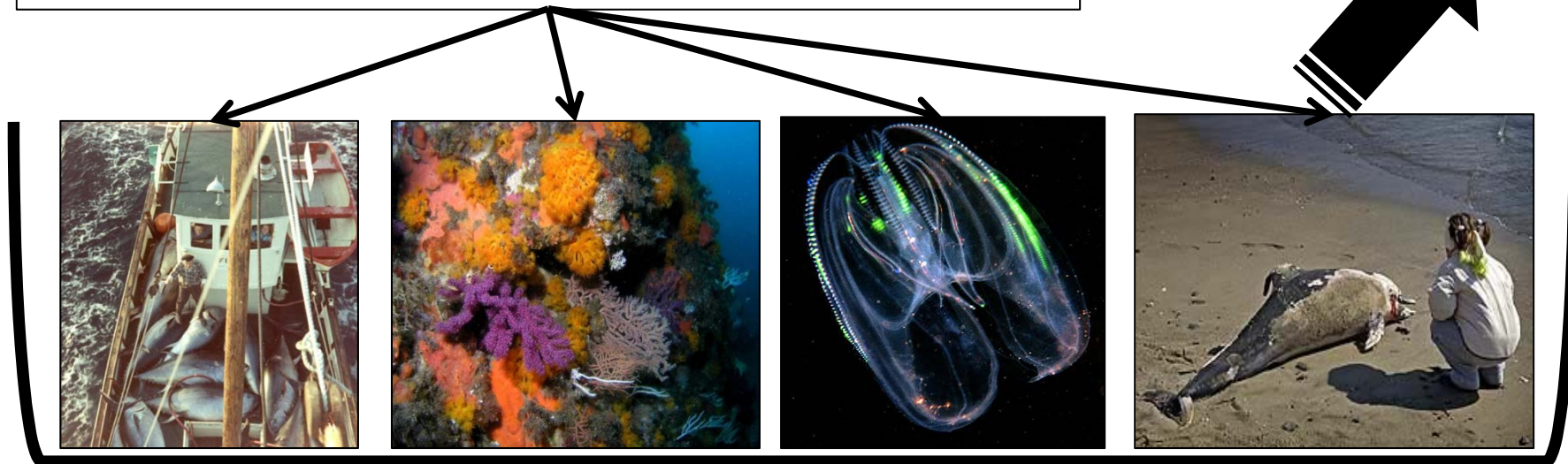
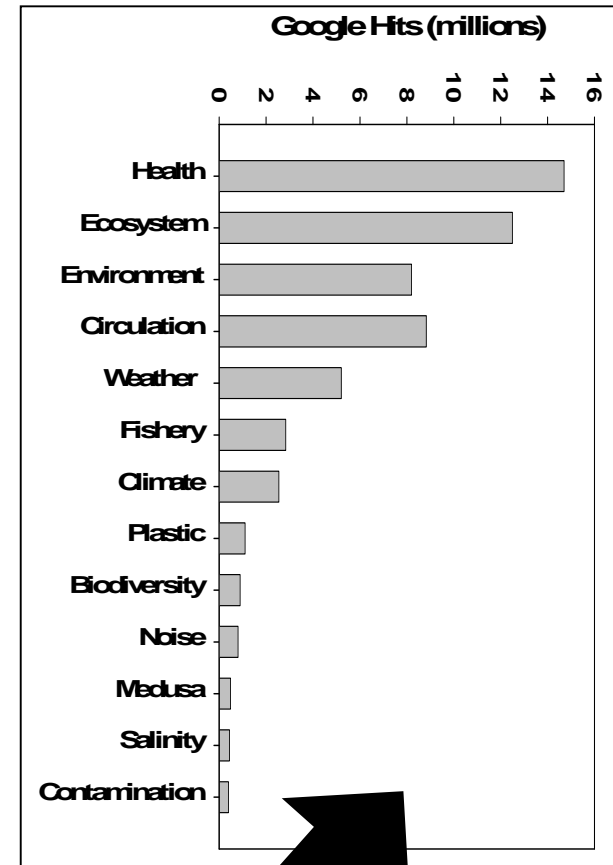
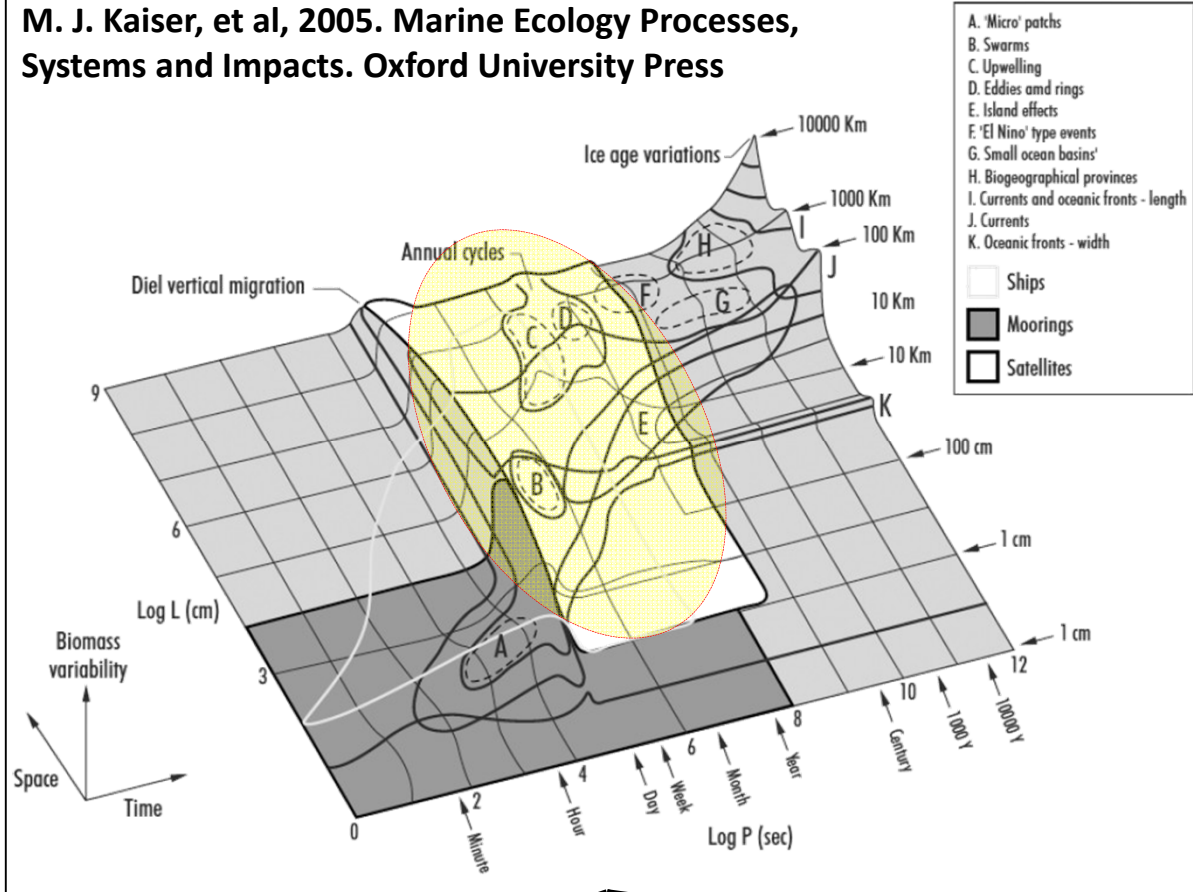
Kostas Nittis Scientific and Strategic Workshop
Athens, 26th and 27th of May 2015

Physical/biological variability and coupling: from science to society

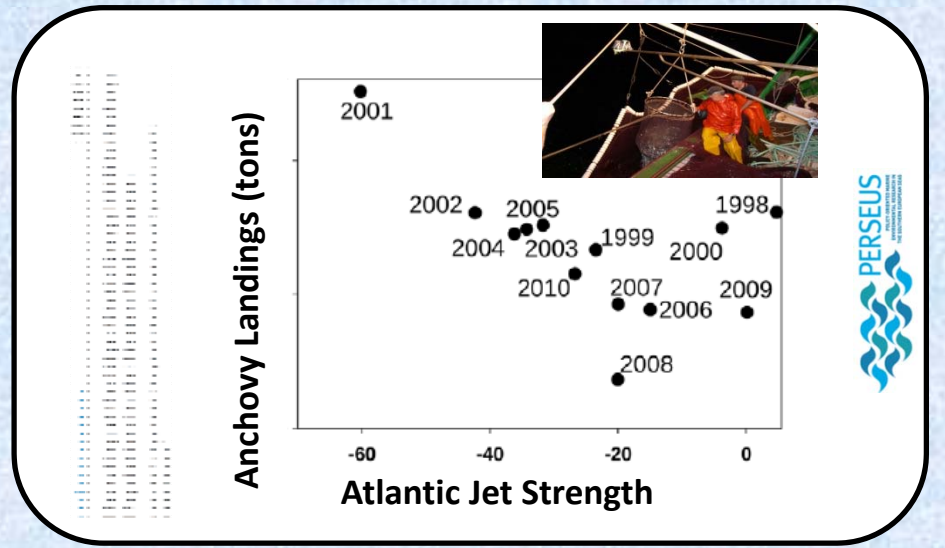
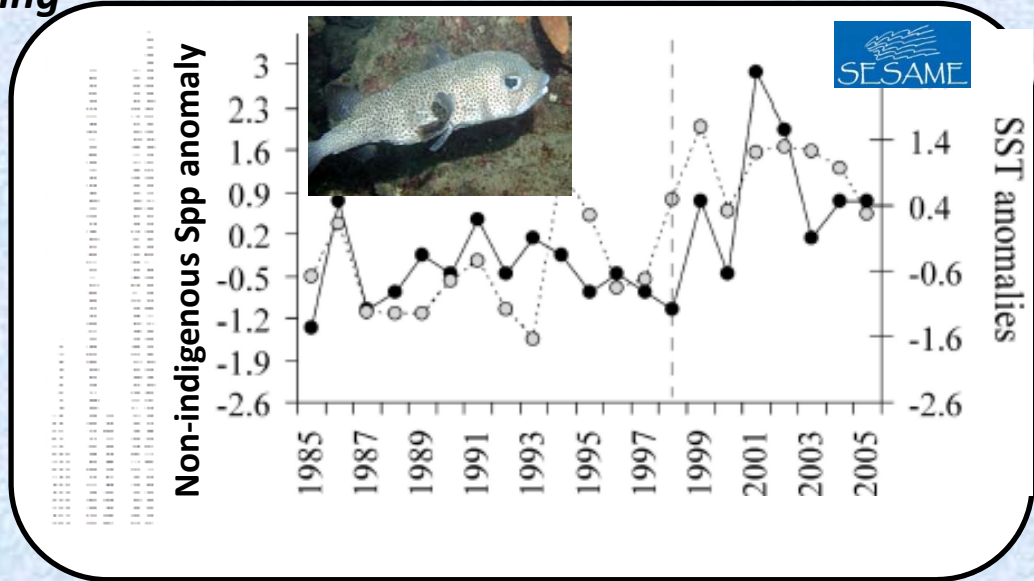
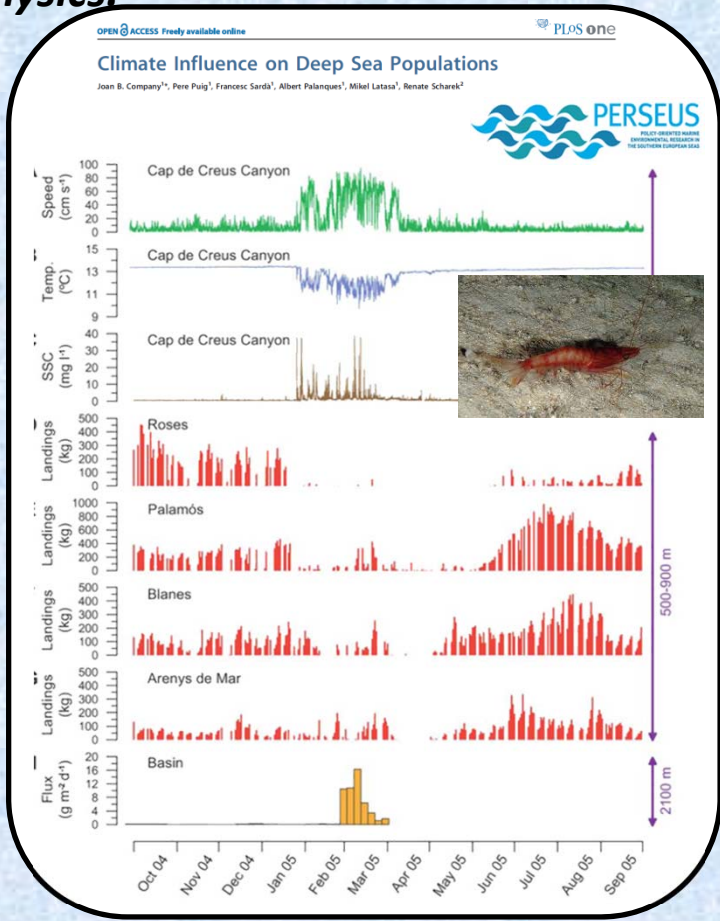
Operational Oceanography



M. J. Kaiser, et al, 2005. Marine Ecology Processes, Systems and Impacts. Oxford University Press

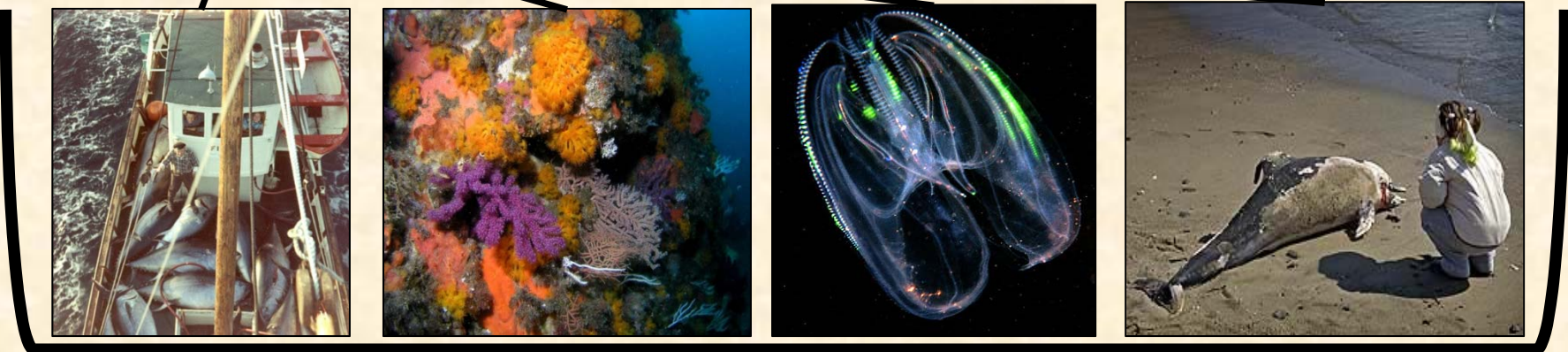
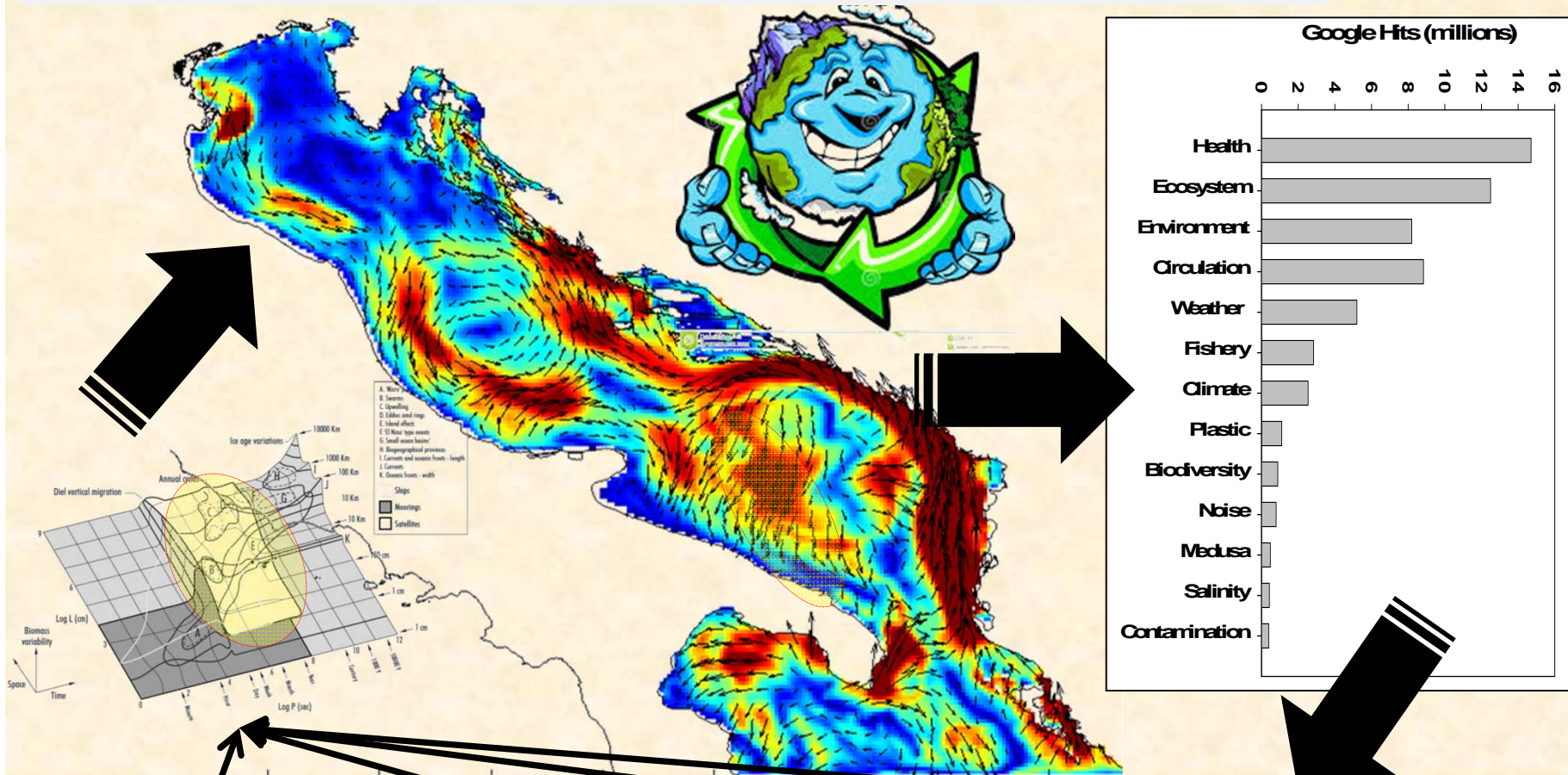


STATEMENT: Physics is the primary forcing of biological variability, biological processes add to what is created by physics.



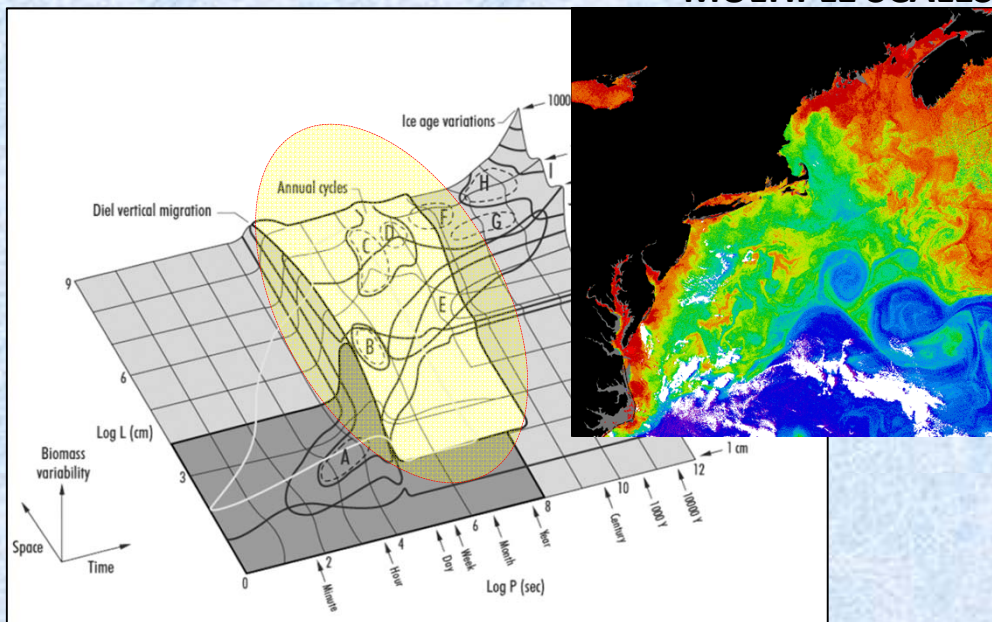
SUGGESTION: An observational strategy for biological processes in the SES must be framed in (and take advantage of) the compelling ability of physical oceanography to understand and reproduce different scales of oceanic variability.

(Lord Rutherford) "All science is either physics or stamp collecting"



Ecosystems: The “Newtonianism” nightmare

MULTIPLE SCALES



MULTIPLE STATE VARIABLES



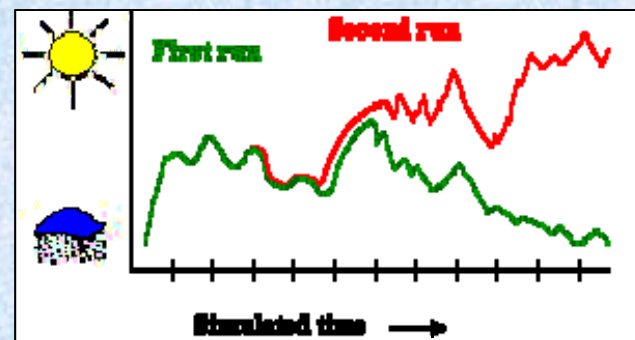
SELF-ORGANIZED



SEVERE NON-LINEARITY



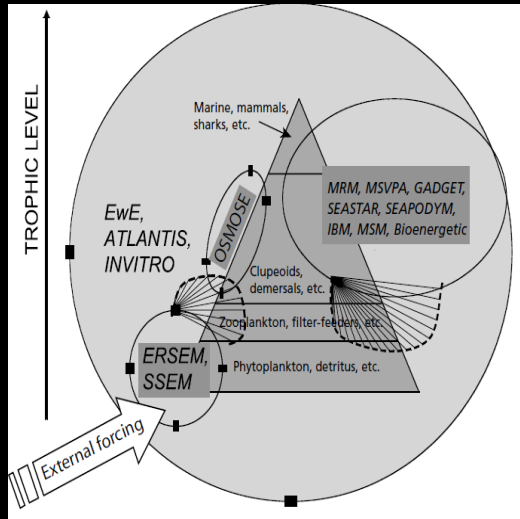
EXTREMELY SENSITIVE TO I. C.



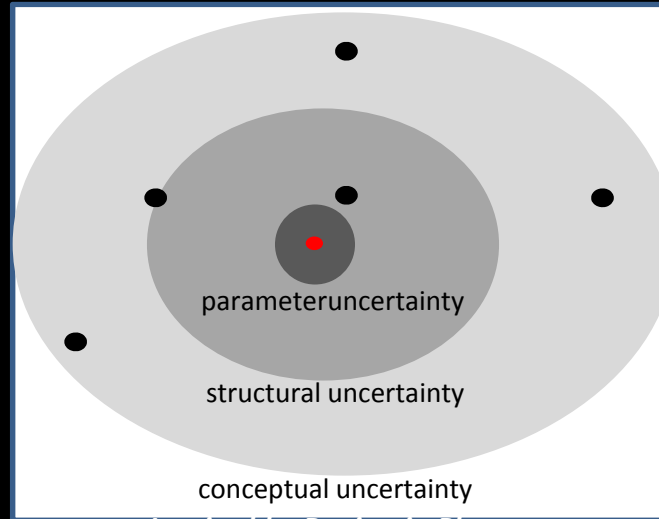
DISTRIBUTED SYSTEMS, DIFFICULT TO SCALE UP, LARGELY IRREDUCIBLE,...

Inspired by Benjamin Planque

SATEMENT: Ecosystems cannot be approached as Newtonian systems



FAO Fisheries Technical Paper 477



Inspired by Benjamin Planque



An indecisive pointer

Observing the ecosystems to describe rather than explain?



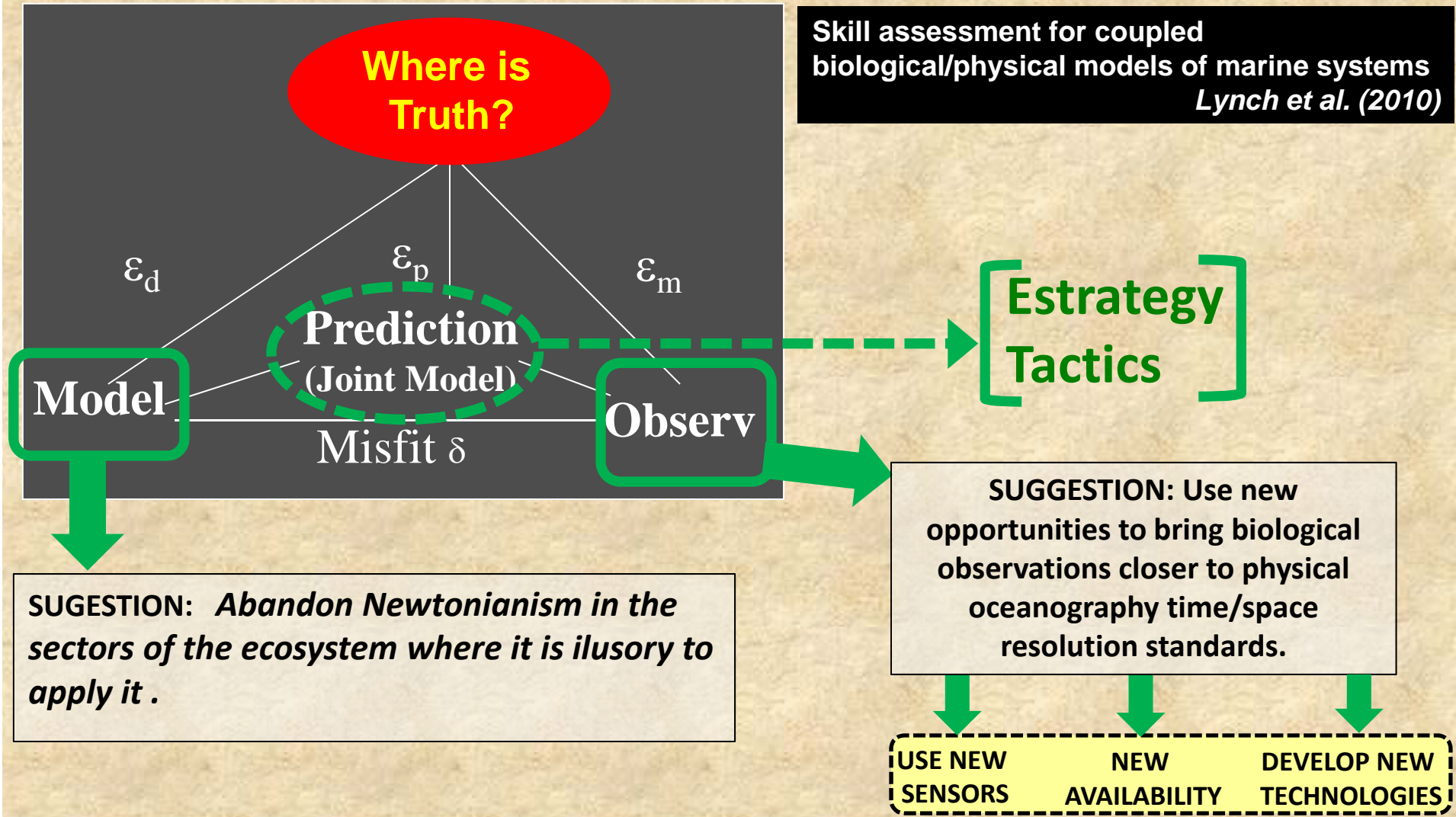
**Not an option
to move from
science to
society**

**Why does it happen?
Whom to (monetary) blame?
What can I do? ...**

**UNDERSTAND
&
FORESEE**

STATEMENT: Observations should be made in the context of a model. A blend of observations and (cause-effect) models will better serve societal demands for science.

**Skill assessment for coupled biological/physical models of marine systems
Lynch et al. (2010)**

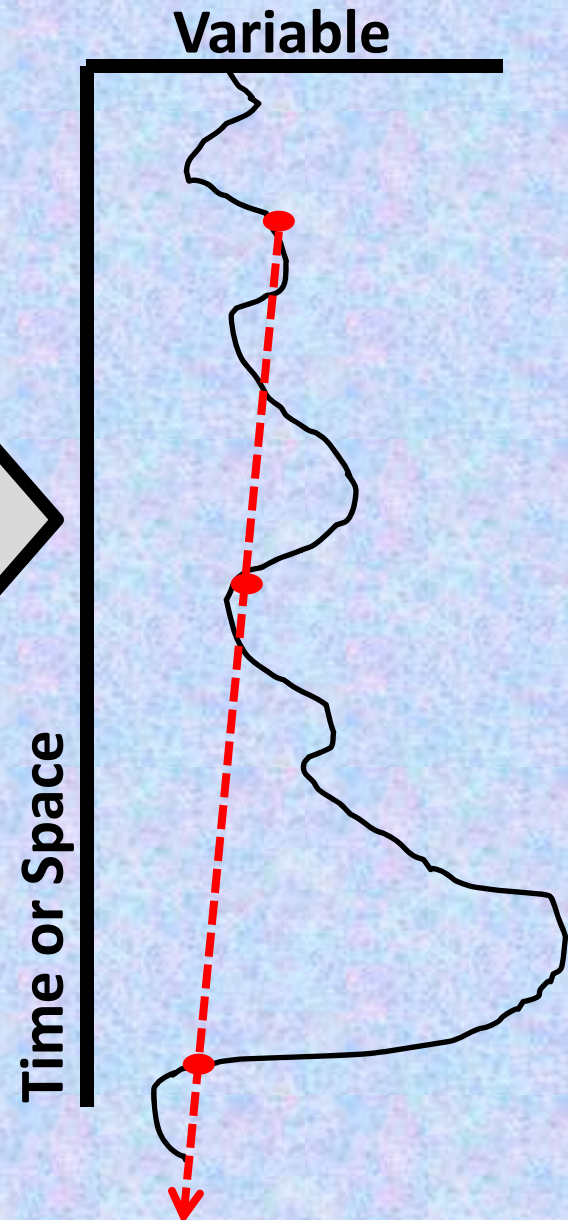


SUGGESTION: Abandon Newtonianism in the sectors of the ecosystem where it is illusory to apply it .

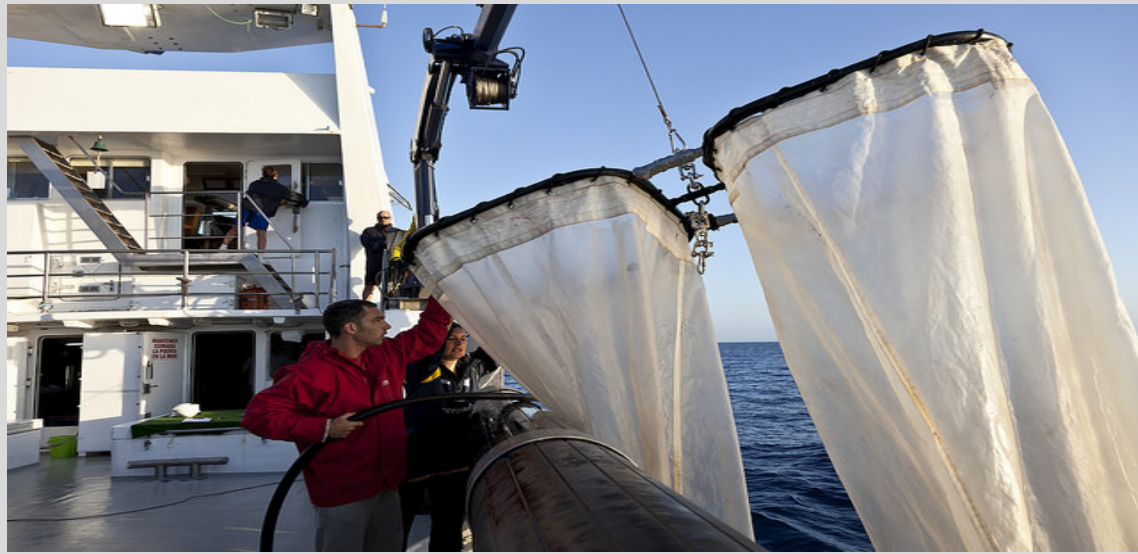
SUGGESTION: Use new opportunities to bring biological observations closer to physical oceanography time/space resolution standards.

USE NEW SENSORS NEW AVAILABILITY DEVELOP NEW TECHNOLOGIES

MAIN GAP: Most biological observation still do not resolve the time/space scale of the underlying process

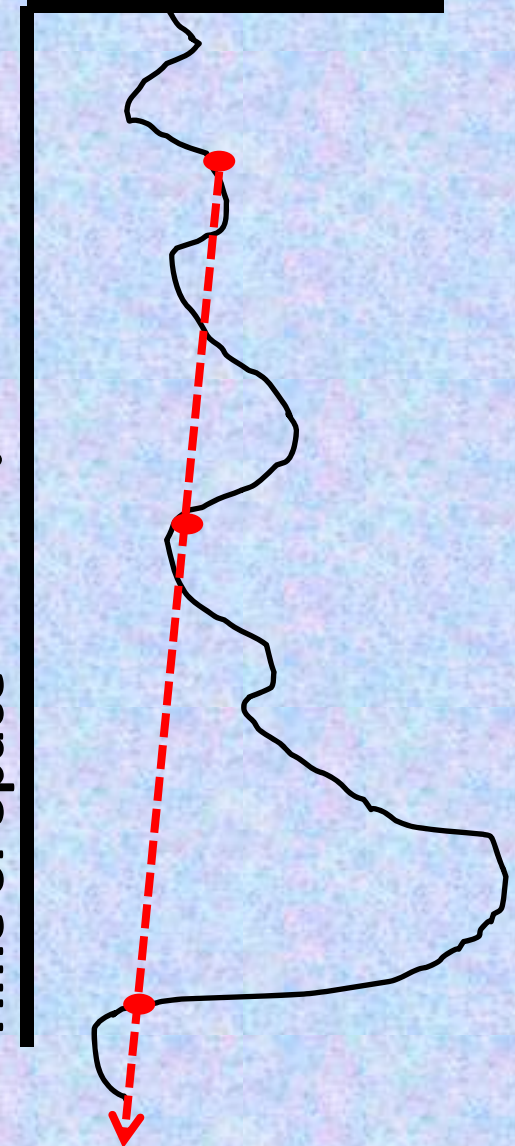


MAIN GAP: Most biological observation still do not resolve the time/space scale of the underlying process



Variable

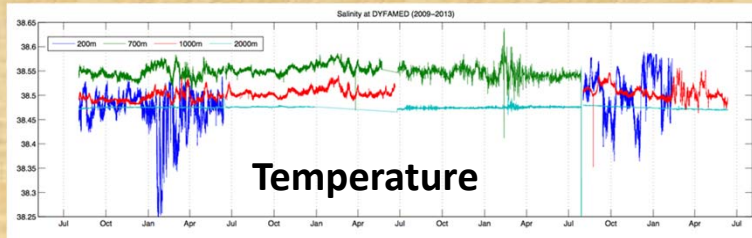
Time or Space



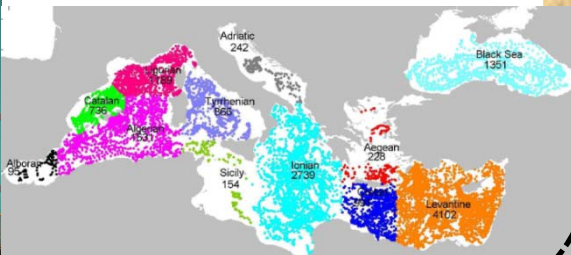
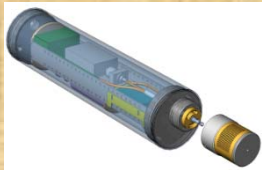
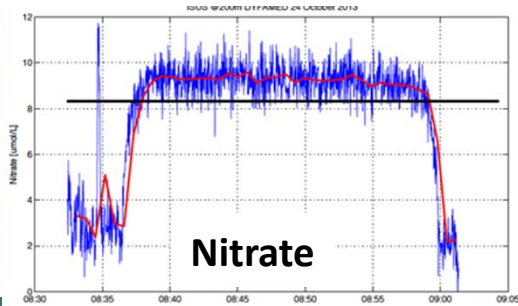
IMPLEMENT NEW SENSORS IN EXISTING PLATFORMS: examples from PERSEUS

Strategic

NITRATE AT DYFAMED

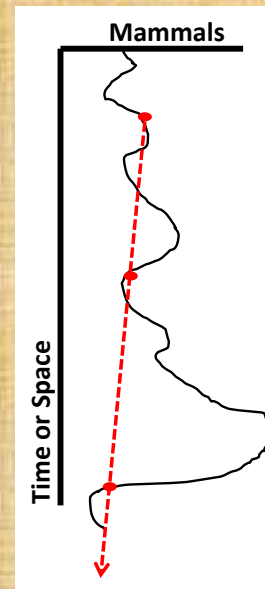
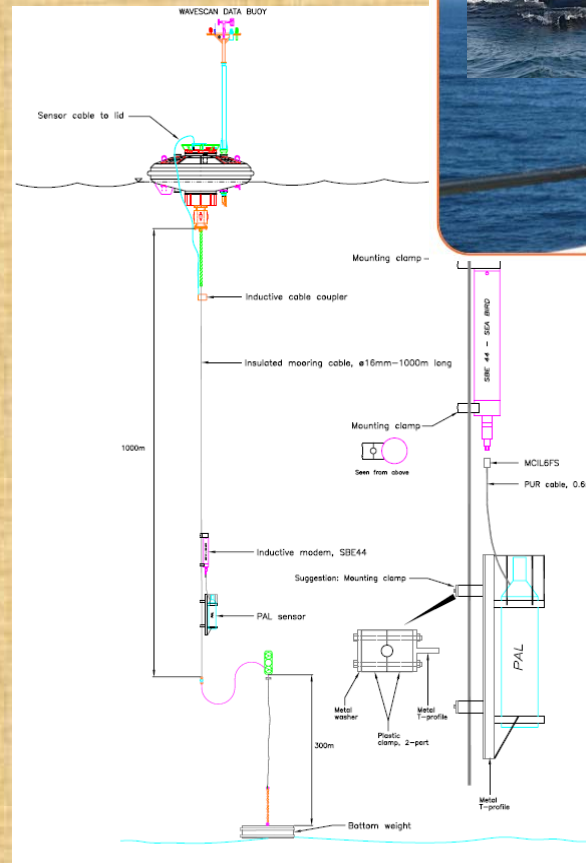


Temperature



MARINE MAMMALS AT POSEIDON

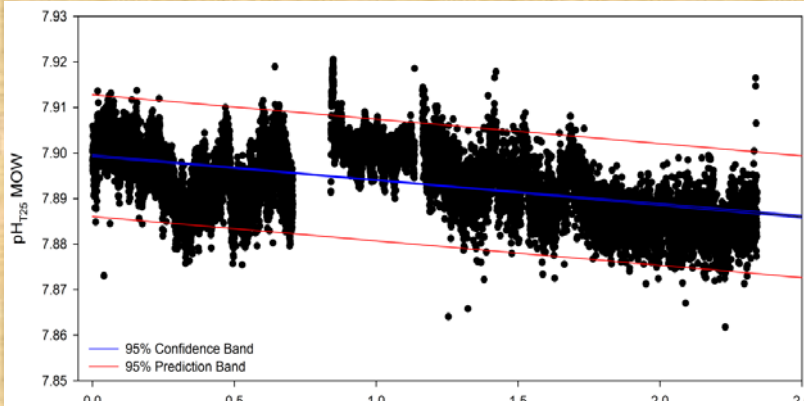
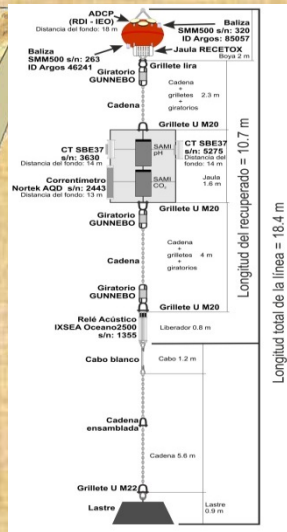
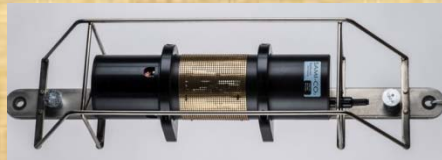
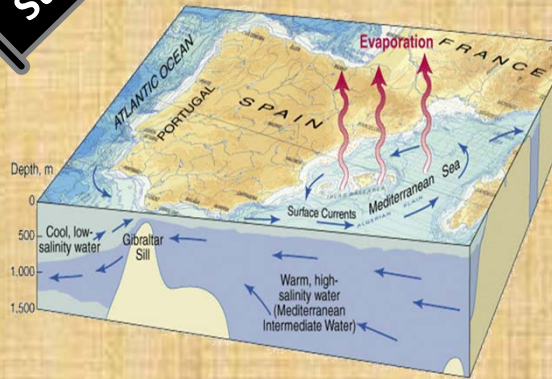
Strategic
Tactical



IMPLEMENT NEW SENSORS IN EXISTING PLATFORMS: examples from PERSEUS/SESAME

Strategic

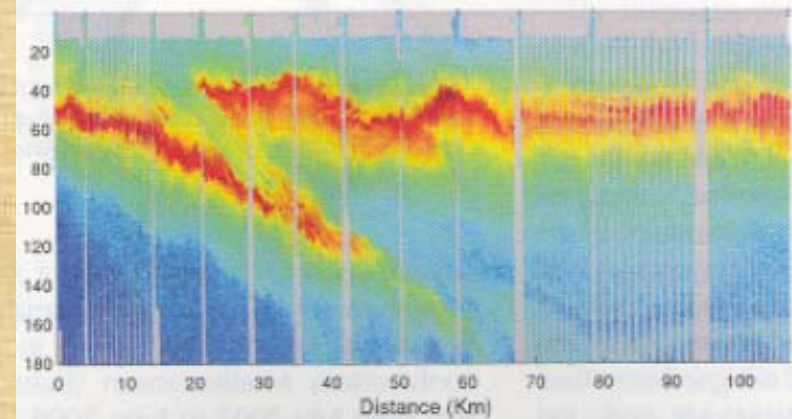
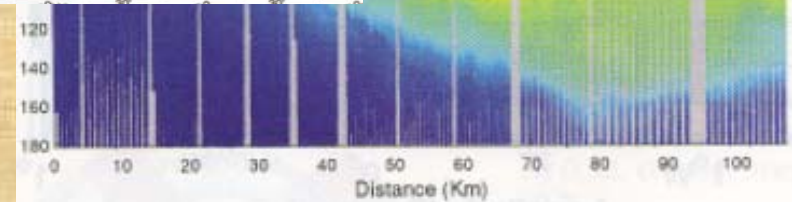
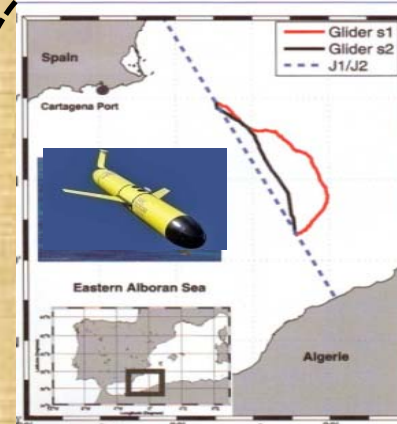
GIFT TIME SERIES



ACIDIFICATION TRENDS IN THE MEDITERRANEAN

GLIDER (MESOSCALE)

Strategic Tactical



INFORCE NEW AVAIABILITY OF EXISTING DATA

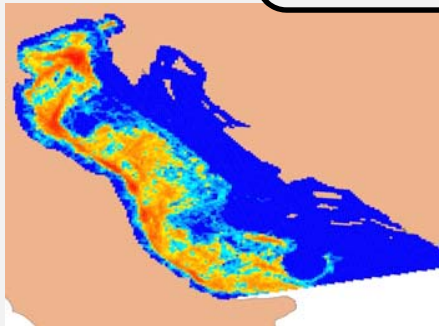
VMS: PERSEUS DELIVERABLE 3.4



Carlo Heip
 “Biologists are like a chicked on an egg with data”

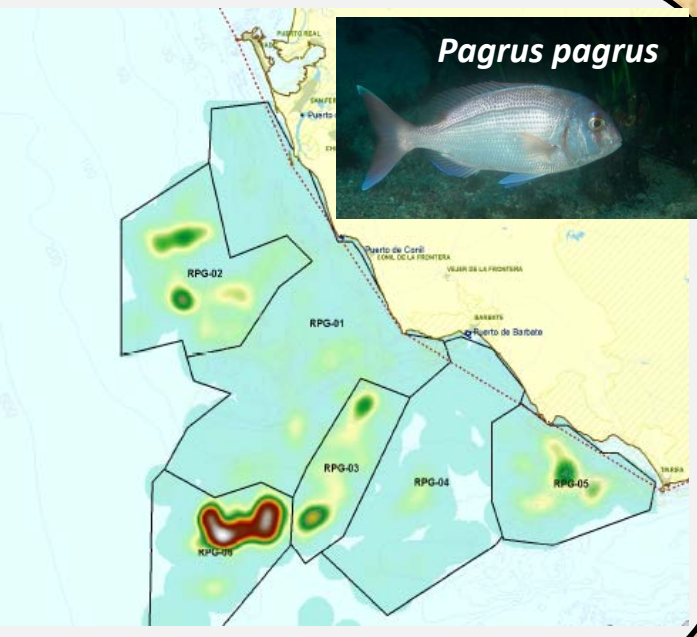
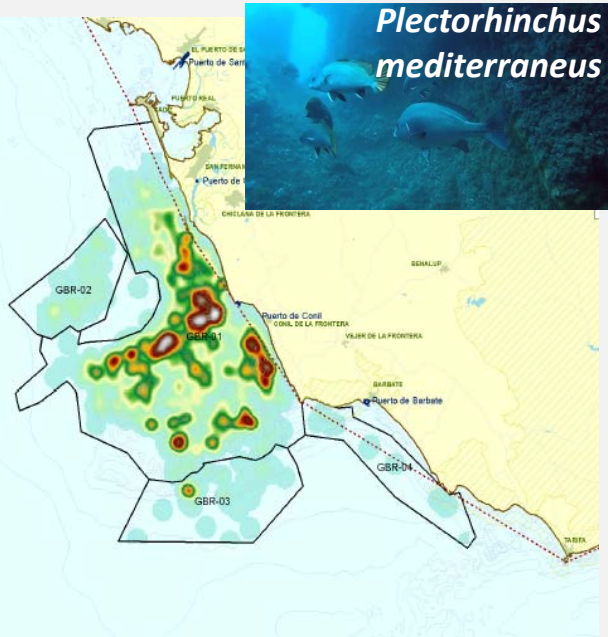


Common methodological procedures for analysis of VMS data, including web-based GIS applications related to the spatial extent and intensity of fishing effort
 Deliverable Nr. 3.4

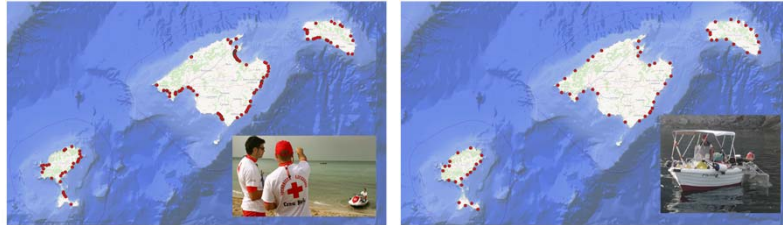


Strategic Tactical

HIGH SPATIAL RESOLUTION & HIGH FREQUENCY BIODIVERSITY RECORDS



NEW AVAILABILITY : COOPERATE WITH STAKE HOLDERS



A new website platform for uploading data from a **SYSTEMATIC JELLYFISH MONITORING** system in the Balearic Islands: a joint science-society approach

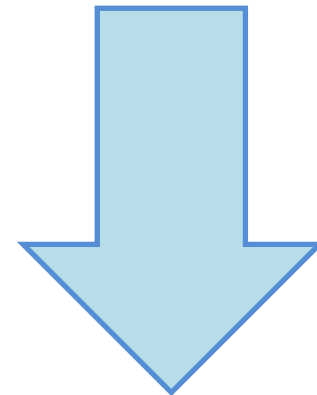
Grumers Observations Observation routes Beach list Administration

Observation Heatmap

Species: all
Created by: User: all
Observation route: Route: all
Observation station: Station: all
Source:
From date:
Filter Export
Show observation list
Show observation map

Tactical

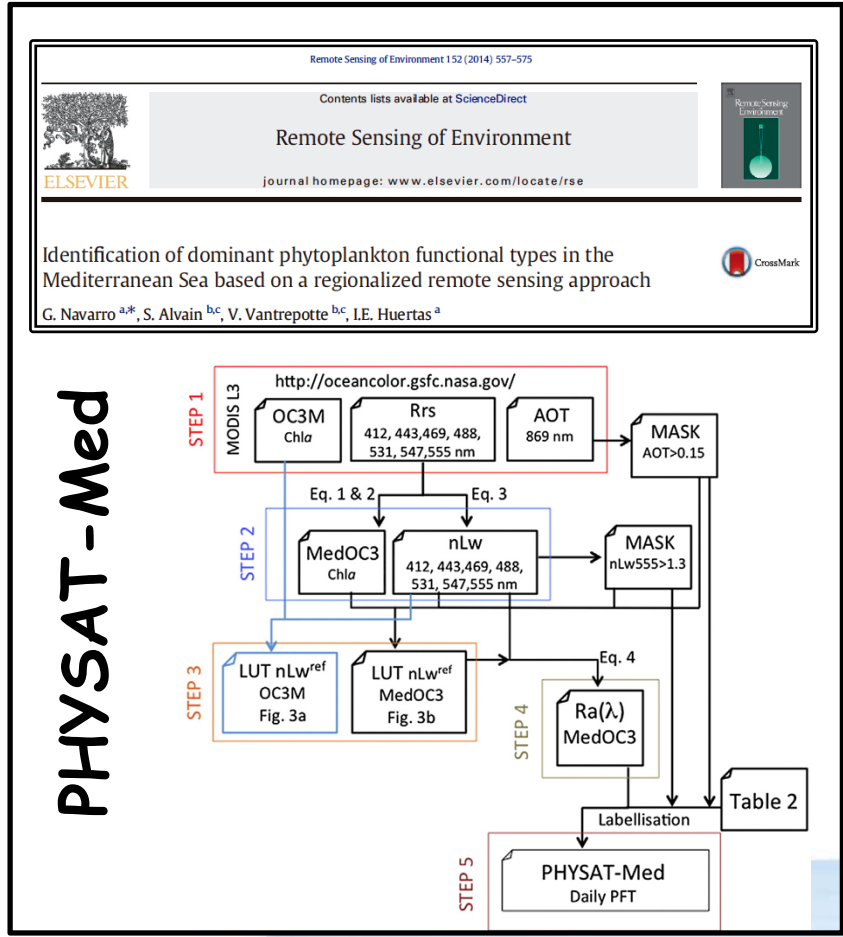
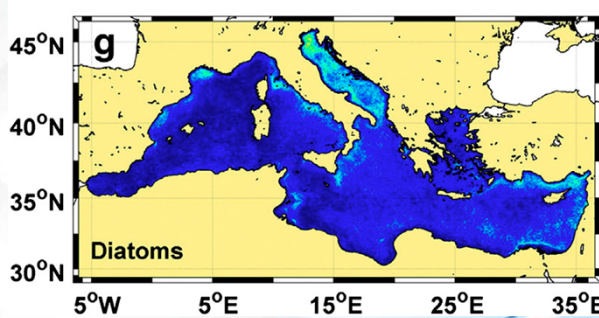
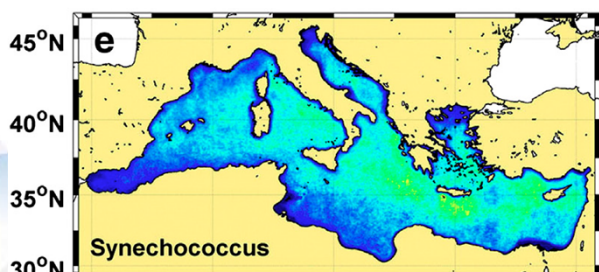
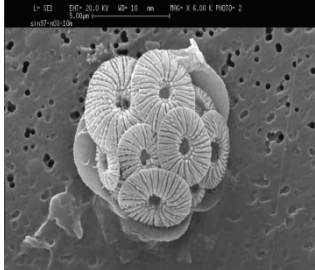
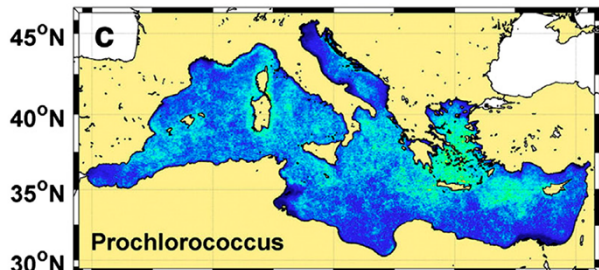
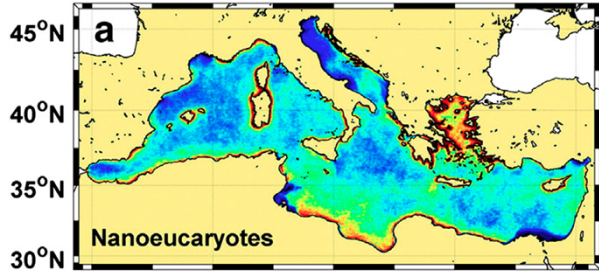
Govern de les Illes Balears
SOCIB Balearic Islands Coastal Observing and Forecasting System
CSIC CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS



HEAR THE STAKE HOLDER TO
CO-CRETATE RATHER THAN
JUST PROVIDING YOUR
“WISE “ SCIENTIFIC ADVICE

NEW AVAILABILITY : SQUEEZE EXISTING TECHNOLOGY

Strategic



INVEST IN NEW TECHNOLOGIES

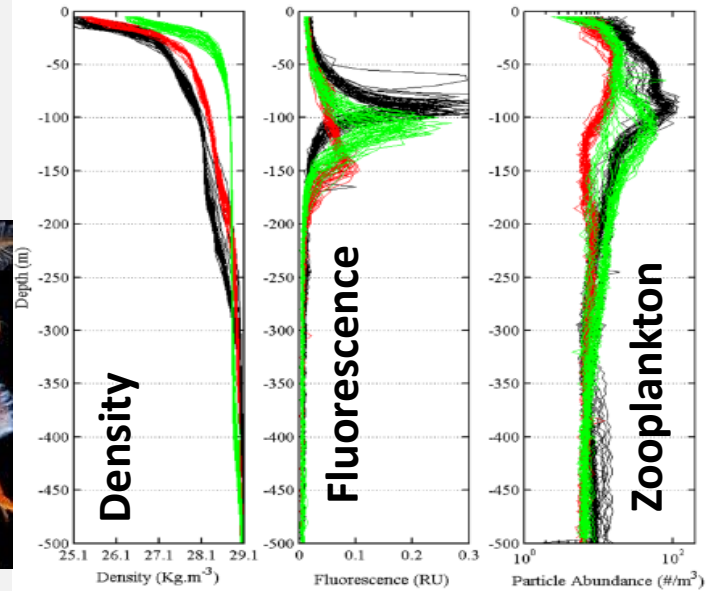
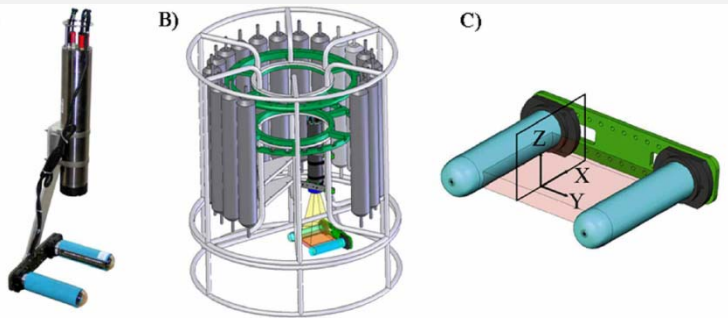
Strategic

MACHINE VISION AND THE ACUTE LACK OF DATA AT MID TROPIC LEVELS

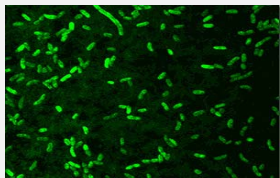
LIMNOLOGY and OCEANOGRAPHY: METHODS

Limnol. Oceanogr.: Methods 8, 2010, 462-473
© 2010, by the American Society of Limnology and Oceanography, Inc.

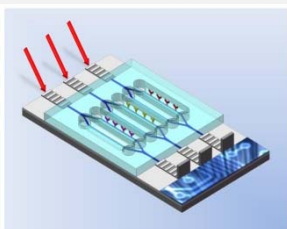
The Underwater Vision Profiler 5: An advanced instrument for high spatial resolution studies of particle size spectra and zooplankton



BIOSENSORS



LAB ON CHIP



POLLUTION

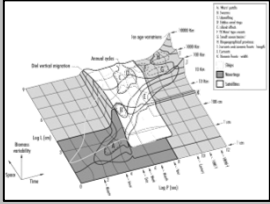


METAGENOMICS

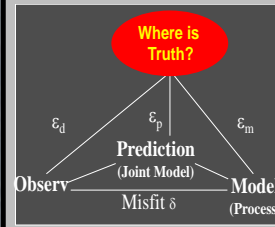


Strategic Tactical

BIODIVERSITY



Physical variability is the primary driver of biological variability, the second cannot be understood without the first.



A blend of observations and (cause-effect) (non-illusory) models will better serve societal demands of science for biological variables and processes.

Use new opportunities to emulate physical oceanography time/space resolution standards, and assimilate this new information to constraint biological uncertainty as operational oceanography does

New Sensors in Existing Platforms

New Technology

New Availability

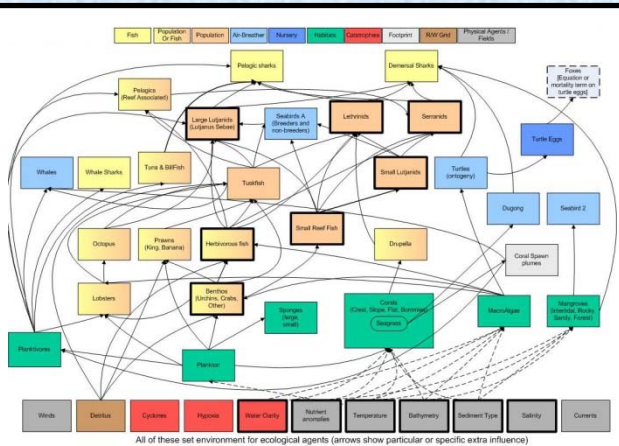
Biogeochemical balances in straits
Role of mesoscale in biology

Strategic

Jellyfish swarms
Biodiversity loss
Fishery collapses
Impact of pollution

Tactical

Scientific Selfishness

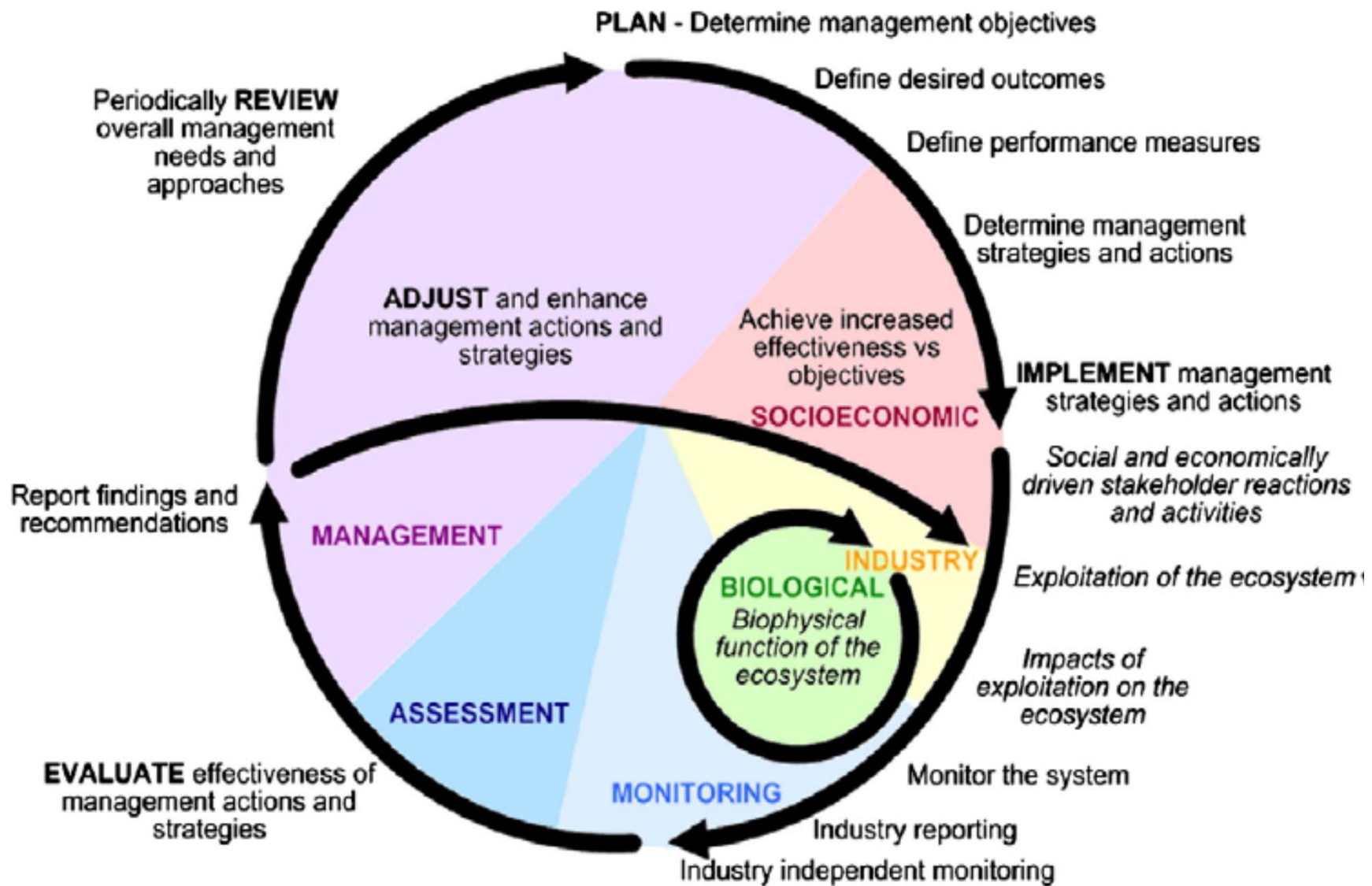


"I already wrote the paper. That's why it's so hard to get the right data."

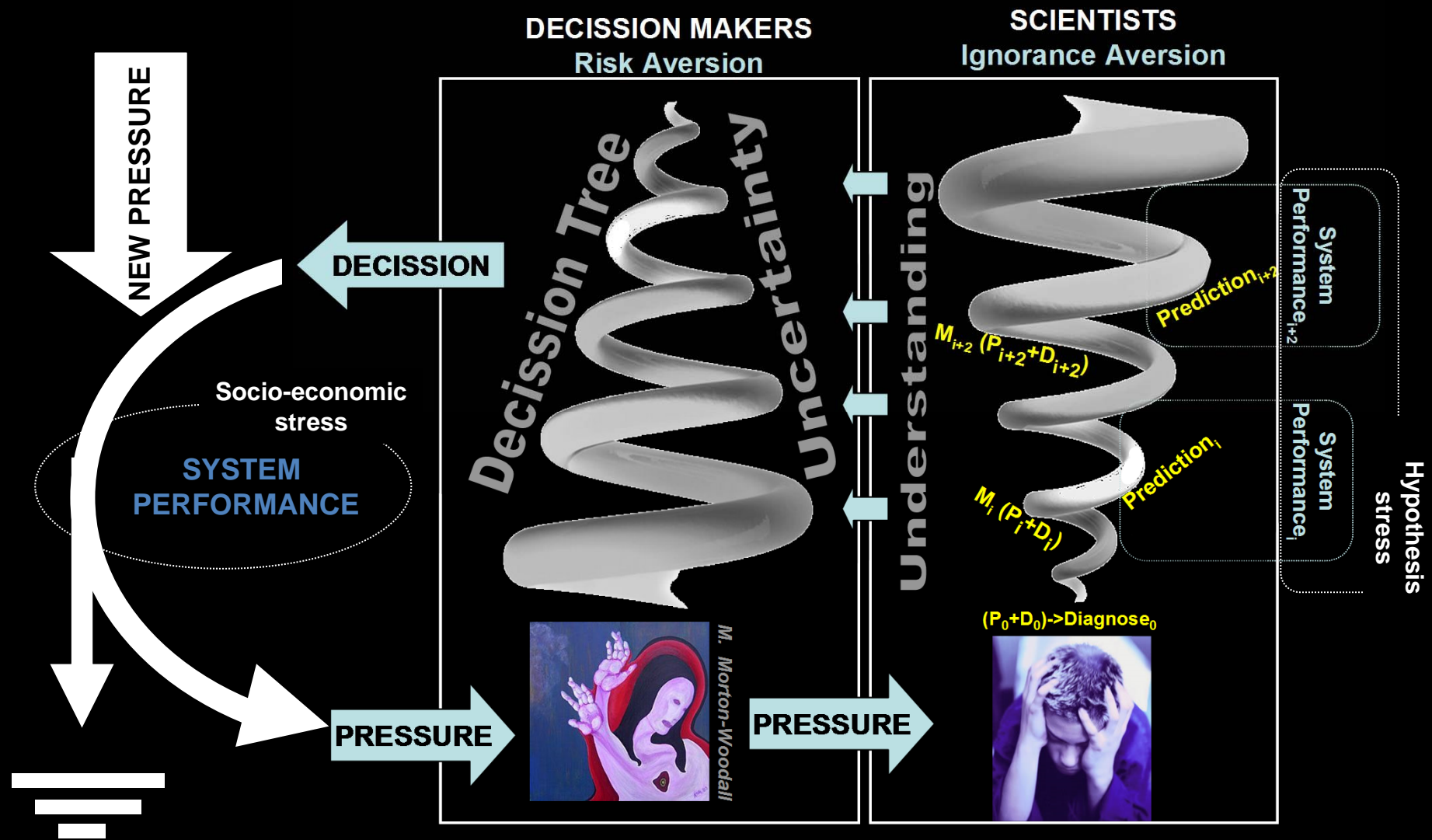


An indecisive pointer

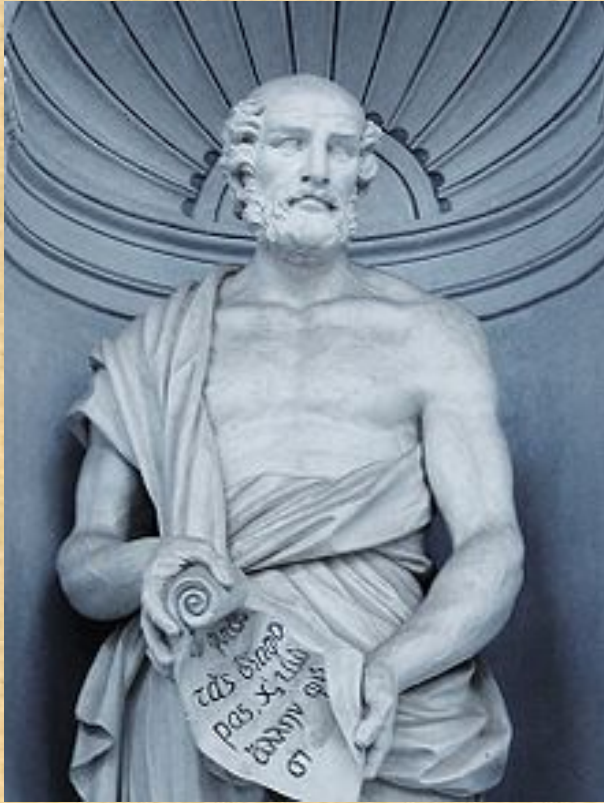




STRATEGIC IMPROVISATION



**Theophrastus of
Ereso (Lesbos)**

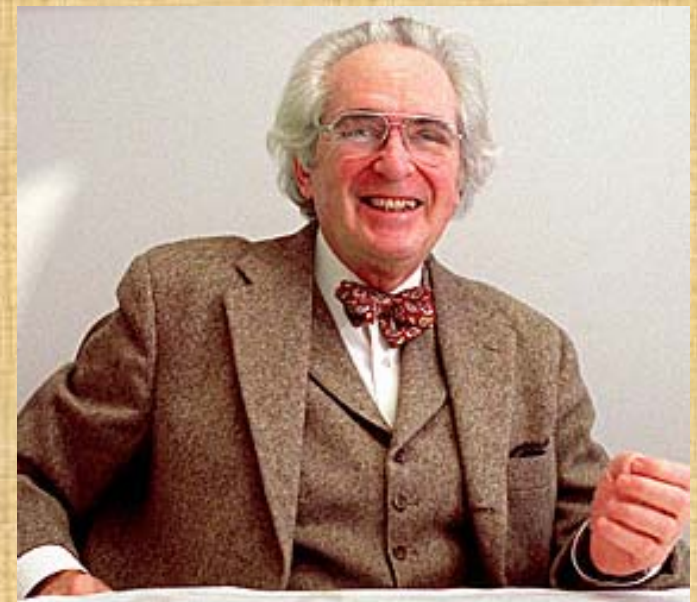


300s BCE

1900s CE

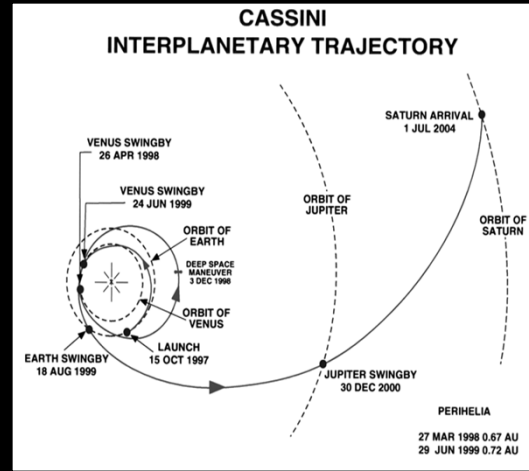
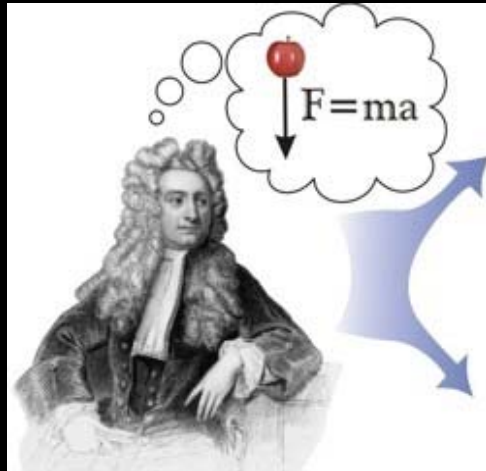


**Robinson of
Lynn (Massachusetts)**

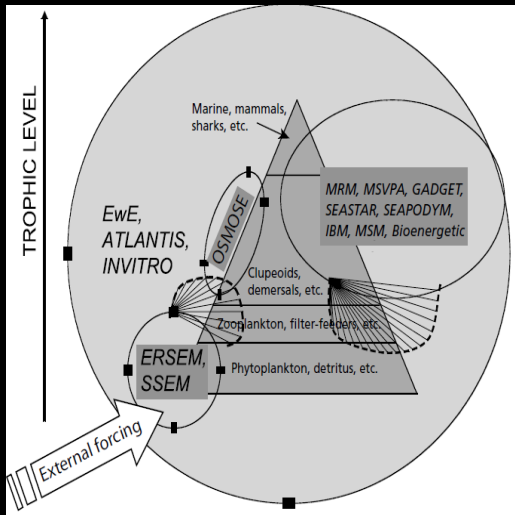


SATEMENT: Ecosystems cannot be approached as Newtonian systems

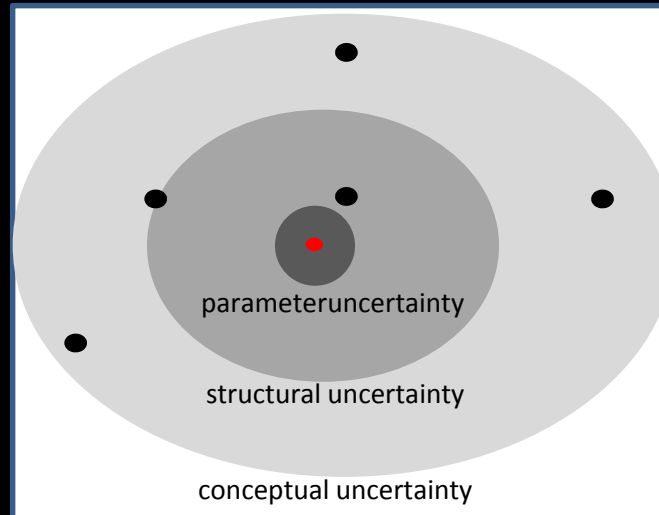
Ecosystems: The "Newtonianism" nightmare



POINT ESTIMATES



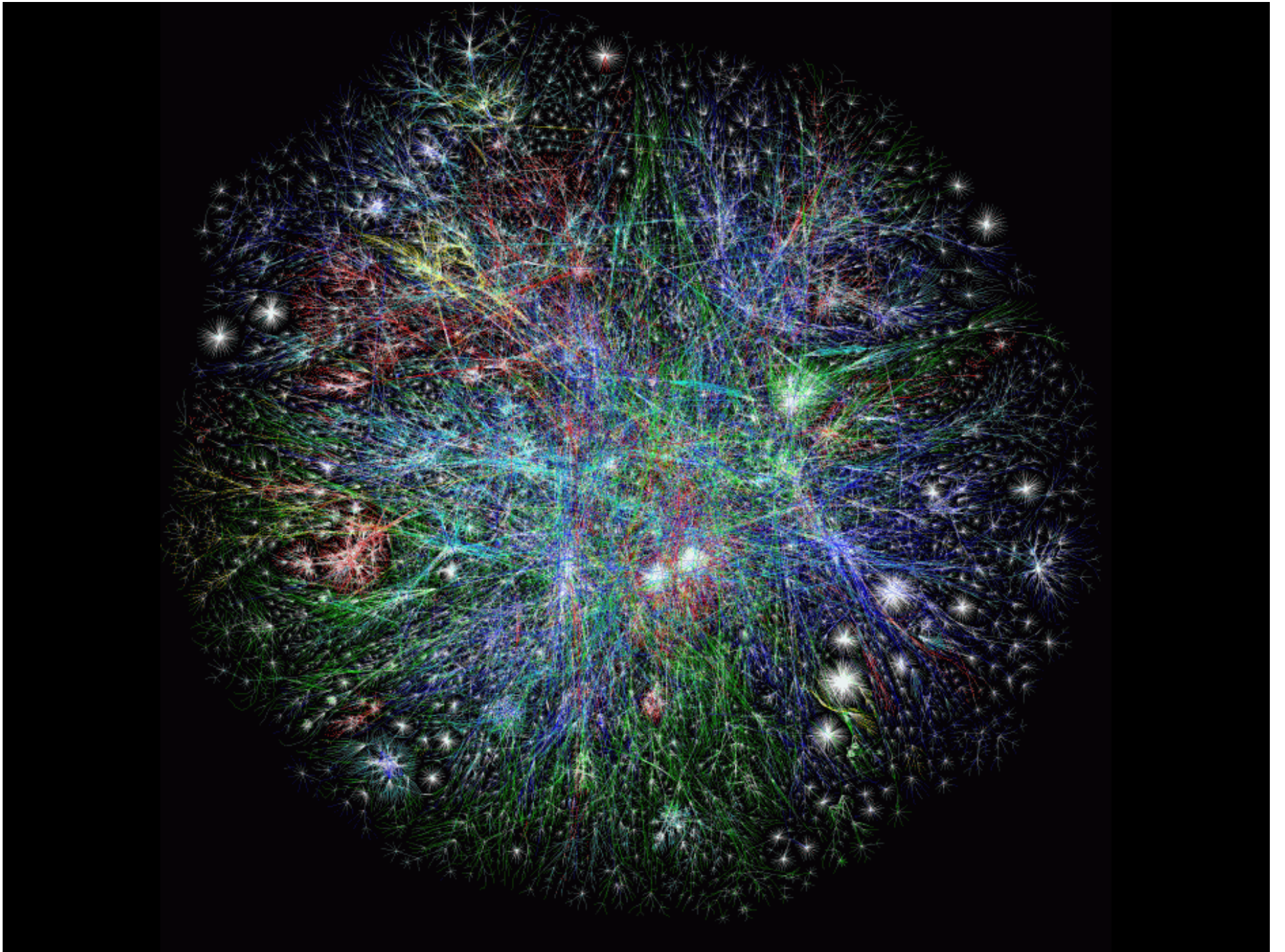
FAO Fisheries Technical Paper 477



Inspired by Benjamin Planque



An indecisive pointer



Research is inspired by:

Considerations of use?

No

Yes

Quest for fundamental understanding?

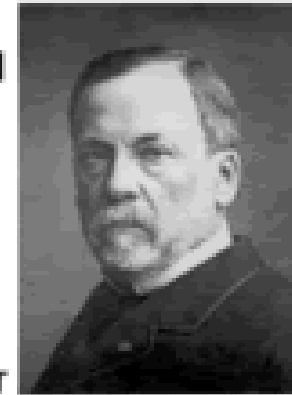
Yes

Pure basic research



Bohr

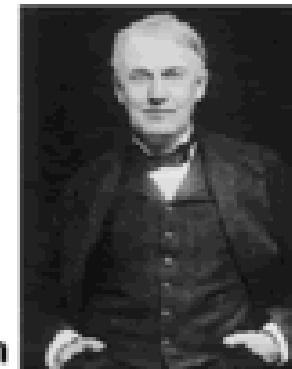
Use-inspired basic research



Pasteur

No

Pure applied research



Edison