TOMORROW
EMERGENT TECHNOLOGIES........CONVERGING IN THE OCEANS
Emergent Technologies.........Converging in the Oceans
==> Exponentially increasing capacity to work within!

www.sharkbait.co.uk/frontstories/front_images/tahitiDrollet.JPG
Microprocessor Transistor Counts 1971-2011 & Moore’s Law

- Curve shows transistor count doubling every two years.

- Transistor count:
  - 2,600,000,000
  - 1,000,000,000
  - 100,000,000
  - 10,000,000
  - 1,000,000
  - 100,000
  - 10,000
  - 2,300

- Date of introduction:
  - 1971
  - 1980
  - 1990
  - 2000
  - 2011

- Processor models:
  - 8086
  - 80286
  - 80386
  - 80486
  - Pentium
  - Pentium II
  - Pentium III
  - Pentium IV
  - Pentium K6
  - AMD K5
  - AMD K6-III
  - AMD K6
  - Cell
  - Itanium 2 with 4 MB cache
  - Itanium 2
  - Core 2 Duo
  - AMD K8
  - AMD K10
  - AMD K10
  - POWER6
  - Dual-Core Itanium 2
  - Dual-Core Xeon 7400
  - Six-Core Core i7
  - Six-Core Xeon 7400
  - Six-Core Opteron 2400
  - 10-Core Xeon Westmere-EX
  - 8-Core POWER7
  - 8-Core Intel Nehalem-EX
  - 6-Core Sparc T3
  - 8-Core IBM POWER7
Robotics

www.shadowrobot.com/images/gallerys/handC-hires/HandC_Bulb_03.jpg
Digital Imaging
DELIVERING ABUNDANT POWER AND BANDWIDTH INTO THE OCEAN WILL DRAMATICALLY ACCELERATE RATES OF TECHNOLOGICAL ADAPTATION & INNOVATION

Regional Scale Nodes
Potential Expansion Nodes
NEPTUNE Canada Nodes
Shore Stations
Coastal Mooring
Cabled Coastal Mooring
Cabled - Newport =>

Uncabled - Grays Harbor =>

http://www.whoi.edu/ooi_cgsn/endurance-array?tid=1621&cid=107169&article=43286
SCIENCE DRIVERS

- Coastal Upwelling
- Ocean Acidification
- Dissolved Oxygen
- Carbon Cycle
- Coastal Upwelling
- Subduction Zone
- Spreading Centers
- Bathymetric Forcing
- Seismic Activity
- Gas Hydrates

Wednesday, October 9, 13
AXIAL SEAMOUNT

Juan de Fuca Plate

Neptune Canada

Portland

Newport

Pacific City

Seattle

Regional Scale Node

Upscope Node

NEPTUNE Canada Node

Shore Station

Coastal Mooring
BIOGEOCHEMICAL FLUX ARRAY

LONGTERM MAPPING OF AXIAL SEAMOUNT'S ENTIRE ECOSYSTEM INCLUDING RESPONSE TO UNDERWATER ERUPTION

SURFACE BUOYS WITH RF COMMUNICATIONS

AUV MULTI-DEPTH MAPPING MISSIONS
**Deep Profiling Mooring:** include an instrumented McLane profiler making multiple trips daily - inductive couple allows recharge and data download, changing of sampling.
ADAPTIVE SAMPLING WITH HIGH POWER & BANDWIDTH Moorings
RSN SHALLOW PROFILER: a novel two-legged mooring with an instrumented platform at 200 m and an instrumented shallow winched profiler. Cable allows real-time adaptive sampling.
200 m DEEP PLATFORM: A 12 ft across (7 ton) instrumented platform will be positioned 200 m water depth - highly expandable for future instruments (e.g. flow cytometers, DNA analyzers)
SEAFLOOR PLATFORM: The junction boxes provide 1 Gbs and 374 kV to an array of instruments on the seafloor to measure water column properties.
Cascadia Margin RSN-EA Arrays: Real-time adaptable measurements of key environmental parameters (e.g. CO$_2$, pH, nitrate, O$_2$, chlorophyll) from 3000-80 water depth.
**AXIAL CALDERA:** Infrastructure outlined in blue was deployed during the VISIONS’13 expedition and fully tested. All is functional and awaiting connection to PN3B.
Earth's Carbon Reserves: Importance of Methane Hydrates

Quantities in gigatons of carbon

- Atmosphere: 4
- Detrital organic: 60
- Peat: 500
- Terrestrial biosphere: 830
- Dissolved organic matter: 980
- Soils: 1400
- Fossil fuels: 5000
- Gas hydrate: 10,000

Total: 10,000 gigatons of carbon