<table>
<thead>
<tr>
<th>Robert Knox</th>
<th>SIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean Class SMR Input</td>
<td>Other requirements &amp; general comments</td>
</tr>
</tbody>
</table>

- **1 Physical Oceanography**
  - Ocean circulation - But I'm going to use this form mainly to insert some overall observations or workshop discussion items into the mill, based on my reading of inputs thus far (7/1/02)

- **Other Science Requirements**
  - Some other input items to date that could be design drivers:  
    1. (a) non-CFC lubricants in HVAC systems, 
    2. (b) ease of small boat ops. (launch/recovery methods), 
    3. (c) competing calls for low freeboard and safe deck work in bad weather (does some form of split-level deck make any sense?), 
    4. (d) ice class selection.

- **Comments**
  - We may want/have to play off SMRs against integral constraints such as (i) estimates of construction cost (if raw size creeps up) and (ii) estimated operations costs. A 30-40 year ship costs 3-4 times as much in annual ops. cost as in initial construction.

<table>
<thead>
<tr>
<th>Ed Carpenter</th>
<th>SFSU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>phytoplankton ecology, nutrient cycling</td>
</tr>
</tbody>
</table>

- **Other Science Requirements**
  - Each vessel should have a minus 80C freezer. Radvan should have an automated scintillation counter (not manual). MilliQ deionized water with redundancy in case of problems.

- **Comments**
  - Ability to carry out lab work in rough seas is paramount. A ship with limited rock and roll is highly desirable.

<table>
<thead>
<tr>
<th>Anthony Michaels</th>
<th>USC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>Role of biological community structure in the cycling of biogenic elements in the ocean.</td>
</tr>
</tbody>
</table>

- **Other Science Requirements**
  - small boats for blue water dive ops, easy deployment and recovery.

- **Comments**
### Other Science Requirements

- **Paul Hargraves**
  - URI: Biology
  - Comments: phytoplankton

- **Mary-Lynn Dickson**
  - URI: Biology
  - Comments: Plankton ecology (primary and community production and respiration rate measurements)

- **Grace Klein-MacPhee**
  - URI: Biology
  - Comments: Fishery Science

- **Edward Durbin**
  - URI: Biology
  - Comments: Zooplankton

### Comments

- **Other Science Requirements**
  - stable microscope platform

- **Other Science Requirements**
  - ice-strengthen hulls??

- **Other Science Requirements**
  - Deionized water, small boats (Zodiac with 40 hp motor) smaller inflatable with 15 hp motor, dive locker, temperature control room

- **Other Science Requirements**
  - Plenty of clean, ambient temperature SW for deck incubations. Walk-in cold room would be nice but perhaps not feasible on a ship of this size.
**Other Science Requirements**

Large open area that can be used for deck incubations. Should be located on foredeck or on higher levels where shading from ship's structure is minimized. Hold downs on 2-ft centers for securing large incubators! Need to supply and drain large volumes (50 gal/min) of uncontaminated ambient seawater (+/- 1C) for flow-through temperature control of incubators.

**Comments**

**Other Science Requirements**

freezer space essential -- clean and separate from food!

**Comments**

**Other Science Requirements**

a good electronic repair shop is worth its weight in gold

**Comments**

on cruises I've participated on in the last few years, limiting factors were (1) large volumes of cooling water on the fantail to cool simulated in situ incubators, (2) wide bandwidth communication to receive satellite images and (3) electronic maintenance and repair capabilities.
### William Cochlan
**- SFSU**
**Biology**
Phytoplankton and bacterial productivity, nitrogenous nutrition

### Other Science Requirements
Uncontaminated seawater system for continuous sampling in lab. Inlet must be located deep enough on ship's hull to minimize atmospheric contamination when travelling through rough seas (i.e., no bubbles). Also ample flow in continuous seawater system (needn't be as clean) for use in on-deck incubators. These seawater outlets must be separate from ship's fire-fighting requirements and should be located near open-deck areas most likely to be used for shade-free incubator placement.

### Comments
Ice-strengthen hulls would add significant flexibility for polar research capabilities

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### Sharon Smith
**- RSMAS**
**Biology**
zooplankton ecology

### Other Science Requirements
much careful thought went into the class of ship that includes Thomas Thompson. In my 30 years of field work, I never experienced a better ship than the Thompson. Clone it; save money.

---

### Elizabeth Venrick
**- SIO**
**Biology; Chemical**
Physics, chemistry and biology of the California Current with emphasis on fishery oceanography, planktonic ecosystem structure and function and climate-ocean interactions

### Other Science Requirements
The needs of the CalCOFI core program can be fairly well anticipated. However, we are being joined by an increasing number of ancillary programs with diverse requirements. Flexibility is probably the key to accommodating these.

### Comments
### Other Science Requirements

| Biology/Other | Living Marine Resources life histories, population structures, and stock assessments. Ecology and dynamics of Large Marine Ecosystems. Identification and description of Essential Fish Habitats and endangered species Critical Habitats |

**Other Science Requirements**

- Scientific sounder (such SIMRAD EK-60)
- Fish finder system (such as SIMRAD ES-60)
- Scanning sonar (such as SIMRAD SD-570)
- Thermosalinograpf with GPS interface (such as SEABIRD SBE-21)
- Water column multibeam (such as SIMRAD SM2000FR)
- Acoustic net mensuration system (such as SIMRAD ITI)
- Hard wire net sonde system (such as SIMRAD FS-925 or WESMAR TCS 700E)
- Trawl ramp
- ADCP
- Doppler speed log

**Comments**

- Centerboard for transducer mountings
- Self-noise hydraphones
- Closed circuit TV system w control and display on the bridge. With view of the winches, water surface at side sampling station, fore and aft angle of cast wires, working decks, engine room.
- Scientific Inertial Navigation System (POS/MV)
- DGPS (can be combined with navigational GPS)
- Entertainment system

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| Rana Fine | Chem. Oc. | Tracer Oceanography |

**Other Science Requirements**

- ship clean as possible as regards CFCs, e.g. in A/C, lubricants, etc

**Comments**

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<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
<th>Other Science Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frank Sansone</td>
<td>Hawaii</td>
<td>Hydrothermal plume biogeochemistry; trace gas biogeochemistry</td>
</tr>
<tr>
<td>Other Science Requirements</td>
<td></td>
<td>Easy access to shipboard network (including file sharing and access to CTD data) by PC and Mac notebooks brought aboard by scientists -- this includes having two ethernet jacks in each stateroom, and numerous jacks in each lab. Easy network access to laser and color printers.</td>
</tr>
<tr>
<td>Mark Altabet</td>
<td>Massachusetts</td>
<td>marine biogeochemistry; oceanic nitrogen cycling, N and C isotope biogeochemistry</td>
</tr>
<tr>
<td>Other Science Requirements</td>
<td></td>
<td>Walk-in environmental room (refridge), walk-in freezer, protected deck storage of compressed gas cylinders with conduits for gas supply lines to labs. Liquid N2 generator. Low-temp. freezer</td>
</tr>
<tr>
<td>Stephen Miller</td>
<td>SIO</td>
<td>mid-ocean ridges</td>
</tr>
<tr>
<td>Other Science Requirements</td>
<td></td>
<td>The seafloor mapping community needs to make sure that the naval architecture takes advantage of lessons learned from hull design vs. bubble sweep down on other vessels with multibeams. Some of the newer designs are worse than older ones.</td>
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Comments:

Other Science Requirements:

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- Walk-in environmental room (refridge), walk-in freezer, protected deck storage of compressed gas cylinders with conduits for gas supply lines to labs. Liquid N2 generator. Low-temp. freezer

- The seafloor mapping community needs to make sure that the naval architecture takes advantage of lessons learned from hull design vs. bubble sweep down on other vessels with multibeams. Some of the newer designs are worse than older ones.
### Ocean Class SMR Input
**Other requirements & general comments**

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Science Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Collins</td>
<td>WHOI</td>
<td>G &amp; G: Seismology</td>
</tr>
<tr>
<td>Fred Spiess</td>
<td>SIO</td>
<td>G &amp; G: seafloor deformation measurement, seafloor work systems, plate tectonics, etc.</td>
</tr>
<tr>
<td>Peter Lonsdale</td>
<td>SIO</td>
<td>G &amp; G: structure and geomorphology of oceanic crust, defined by geophysical surveys</td>
</tr>
</tbody>
</table>

**Other Science Requirements**

Dynamic Positioning with reference point at aft A-frame.

**Comments**

- Modest-sized compressors for firing a small airgun array.
- SIMPLICITY, adaptable to many tasks, do not let one task (e.g. swath echo sounding) overly influence the design, modest crew size compatible with ship's maintenance. Sorry not to be at the meeting - celebrating 60th wedding anniversary.

**Other Science Requirements**

well or trunk through to the water from the main deck for temporary installation of experimental acoustic equipment. Not too much superstructure - minimize GPS multipath effects. Stiff upper structure for mounting measuring equipment (e.g. GPS antennas)

**Comments**

- simplicity, adaptable to many tasks, do not let one task (e.g. swath echo sounding) overly influence the design, modest crew size compatible with ship's maintenance. Sorry not to be at the meeting - celebrating 60th wedding anniversary.

**Other Science Requirements**

There is a need for a modest-sized ship that is stable and acoustically quiet enough for wide-ranging geophysical surveys using a combination of CHIRP sonar, multibeam sonar, gravimeter, magnetometer, and modest-sized seismic profiling systems. A key improvement over existing vessels (even larger "global class" ones) is a hull design that has enough area for large multibeam sonar arrays (e.g. EM-120), free from the region vulnerable to bubble sweep-down in rough to very rough seas (or 'bubble diverters' built into the hull from the start, to shield sonars from bubble streams without increasing hull drag prohibitively.
Other requirements & general comments

Robert Ballard  -  URI
G & G; Other  Deepwater Archaeology

Other Science Requirements

support of television production crew

Comments

John Orcutt  -  Scripps Institution of Oceanography
G & G; other  Marine seismology

Other Science Requirements

Comments

A ship of this size and capability would be well-suited for exploration of continental margins and near-shore environments as well as associated science. The ship is likely to be limited for maintenance of observatories given limited size, likely modest ROV capability and limited fantail space. For exploration, a multibeam system would be a great addition.

John Bash  -  URI
Other  Research Vessel Management

Other Science Requirements

Comments

One design does not fit all. An Ocean Class ship designed for the North Atlantic/Pacific would not be the best design for the Mid Atlantic/Pacific. A compromise would be the worst of both worlds. Efficiency of design and operation is very important. These ships need to operate as inexpensively as possible. This means fuel efficiency, crew reduction, and hull/machinery maintainability. The ship should be able to operate with a crew of 9 surging to 12 when cruise demands require. Life cycle costs must be a major consideration. In addition the design must allow for future requirements including weight additions.
Other Science Requirements

Work boat, like a 12' RIB, perhaps the newer version foam collar Al boat design.

Comments

Design to minimize operating costs, which may be incompatible with minimum construction cost.

Other Science Requirements

Anticipate that every place on vessel may be potentially a spot to place a sensor/instrument and collect data, so would need extensive network/fiber runs thru out- just about where ever power goes-so does the network. Along this line provide separate cable trays/runs from ship's power/controls thru out vessel - with own transit blocks etc. Again, where ever ship's power is run (and some places it doesn't) should have provision for science data & power & acoustic power cables.

Comments

Atmospheric studies will need unshadowed areas - This many times will run counter to what the Coast Guard requires in terms of masts & platforms and navigation lights. But none the less need to plan on having large deck areas or large platforms that can be used easily on temp basis for instrumentation looking skyward (clouds,precip,color,etc). Why not have a small lab area built over the bridge? All the analog,optic, etc signals would then have very short runs to a computer or network.
### Other Science Requirements

**Ship must be responsive to unanticipated science needs.** This will dictate a vessel that is flexible and adaptable. The important thing is to design into the ship this flexibility so that future operators and scientists are able to easily adapt it.

#### Comments

- Ice and cold weather capability - able to operate independently in ice-infested water and in very cold weather. Able to withstand being beset. Able to operate safely at higher latitudes when accompanied by icebreakers.
- More additional comments:
  - Cost of operations is an important factor and should be designed/built into the vessel (this is often/usually not done).
  - Major factors that affect cost of operation include:
    - Manning.
    - Ease of maintenance including cleaning, painting, repair, layout.
    - Ease of operations - engineering systems as well as ship control and science support.

---

### Other Science Requirements

**Work boat**

#### Comments

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### Other Science Requirements

**Ocean circulation with emphasis on the Gulf Stream and North Atlantic Current system.** Perhaps work farther north in future.

#### Comments

- Consider having a lowered ADCP dome. Also give serious thought to a 38 kHz ADCP for greater range and a 150 kHz for high resolution closer to the surface.
### Other Science Requirements

**Ashtech GPS, 150 and 30 khz ADCPs, must be able to work near ice edge**

**Comments**

- capable of ROV work at full ocean depth on demand

---

**James Ledwell**  
**WHOI**  
**Physical Oceanography**  
**Tracer release experiments**

### Other Science Requirements

**Comments**

Please consider making the endurance greater than 40 days. 45 to 50 days would be good. A question of food stores, mostly. Tracer release experiments that I do, and also perturbation experiments that others will be doing much more require the ship to be with a patch of water for long periods of time, surveying and sitting doing experiments. It's not so much a matter of fuel as of food, I think. I would opt for the most commodious ship possible for a given crew size (11 or 12?). 11 or 12 knots is plenty, but a little more is welcome. 70 meters is much much better than 55 meters. Those extra 50 feet are all useable.

---

**Bill Johns**  
**RSMAS**  
**Physical Oceanography**  
**Large-scale Ocean Circulation, Western Boundary Currents and Mesoscale Processes**

### Other Science Requirements

**Comments**

Large stern A-frame, >= 20 ft height; high-quality, full redundancy Met package (including multi-channel radiometers upward and downward looking); shipwide data archival system that records all underway data (NAV/MET/thermosalinograph/TOPO/etc.) in one place w/ multi-platform accessible data format and uniform time base) extensive clean power avaialility w/ UPS, shipwide network ports; modular wall/floor bench space system in labs - solid but easily reconfigurable
**Other Science Requirements**

Data/power connections to deck area instrumentation.

**Comments**

I find the present Ocean class vessel ideal for my shipboard operations. A smaller vessel would not be useful. A significantly larger vessel would represent an inefficient use of resources.

**Other Science Requirements**

coastal physical oceanography especially fronts and jets

**Comments**

This vessel should be beamier than the existing intermediate class, hence more volume and stability. It should not be so large that going into and out of ports becomes cumbersome. It should also be capable of operating in shallow water, say a minimum of 30m. As more and more interdisciplinary projects go to sea in the coastal and adjacent deep waters, we need berths for 25 or so scientists and more lab space than the current intermediate class offers.

**Other Science Requirements**

mesoscale dynamics, Lagrangian (RAFOS) floats

**Comments**

Most of my responses ranged about 10-50% larger than the URI's current ship, the Endeavor. A Knorr-class ship is typically too large for our needs, but often the Endeavor/Oceanus/Wecoma is too small.
### Other Science Requirements

John Toole  
WHOI  
Physical Oceanography  
observational physical oceanography

**Comments**

a viable sea-going capability is vital to my future research efforts

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Michael McCartney  
WHOI  
Physical Oceanography  
Abyssal circulation, thermocline ventilation, convection, and climate change

**Other Science Requirements**

On WHOI ships we not support the SEABIRD acquisition system. I would like to see the next level of post processing available on the shipboard computer. In PO department here at WHOI we use a slightly modified version of a system developed at PMEL by Greg Johnson and Cristy McTaggert. Having such a package on line would lead to an improvement in the quality of data emerging (into the database!) from shipboard CTD operations.

**Comments**

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Brian Guest  
WHOI  
Physical Oceanography  
Neutrally Buoyant floats and subsurface moorings

**Other Science Requirements**

**Comments**

Ship speed should be considered not just a luxury but a safety necessity. Red Sea pirates and medical emergencies have shown how important speed can be. Comfort should also get more attention. Networks have become indispensable so a top of the line system should be in place.
### Other Science Requirements

<table>
<thead>
<tr>
<th>Charles Flagg</th>
<th>-</th>
<th>BNL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Oceanography</td>
<td>Continental Shelf Processes, Shelf-ocean exchange, fronts</td>
<td></td>
</tr>
</tbody>
</table>

**Other Science Requirements**

A reasonably quiet and secluded library is a must for crew and science party use.

**Comments**

Control of the ship should be possible while overseeing deck operations. Enclosed bridge wings would be one approach.

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<table>
<thead>
<tr>
<th>Ruth Curry</th>
<th>-</th>
<th>WHOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Oceanography</td>
<td>Water mass properties and ocean circulation in the context of global and regional climate</td>
<td></td>
</tr>
</tbody>
</table>

**Other Science Requirements**

Wet labs for nutrient analyses and carbon chemistry

**Comments**

Over the next ten years, my research programs will require an Oceanus class vessel for subsurface moorings and CTD work in the subtropical North Atlantic. But to carry out similar work at higher latitudes where storms and heavy seas are frequent, a larger vessel (such as Knorr) is essential. Past attempts to use smaller vessels in these regions have resulted in the loss of significant amounts of station time and (in hindsight) measurements that would have provided data critical to understanding ocean/climate extrema.

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<table>
<thead>
<tr>
<th>Randy Watts</th>
<th>-</th>
<th>URI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Oceanography</td>
<td>dynamics of large scale current systems</td>
<td></td>
</tr>
</tbody>
</table>

**Other Science Requirements**

seek flexibility for follow-on developments of Sea-Soar-like vehicles with greater depth capability

**Comments**