Chapter II: Enhancing Ocean Value and Vitality
- **Marine-Related Commerce And Transportation**

Chapter III Improving Ocean Health
- **Oceans and Human Health**

Chapter V: Promoting Ocean Awareness and a Stewardship Ethic
- **Informal Education**

Chapter IV: Advancing Our Understanding of the Ocean
- **Satellite and Remote Sensing**

CHAIRMAN WATKINS: We have Ballard here, so we have a quorum. If the Commissioners will return to their seats up here on the dais, we will start the next session.

The third item on our agenda today is marine-related commerce and transportation. We are asking the acting chairman of Research, Education and Marine Operations Group, Dr. Ballard, if he would let us know what your working group has come up with on that issue before we go into your other three items.

DR. BALLARD: Thank you, Mr. Chairman.

Yes, our working group is reporting out on

four of its 16 areas of responsibility. Those four areas today being: oceans and human health, informal

education, marine transportation, and satellite remote sensing for earth observations.

Before going into those four, I wanted to sort of place them in a total context of our committee which, as you said, is the Working Group on Ocean Research, Education, Exploration and Marine Operations, with marine operations covering two real separate areas, marine transportation and ocean technology.

So far, we have already reported out on seven areas of responsibility, those being: setting national priorities; long-term integrated science approach; government, academic and private sector involvement; integrated and sustained coastal and ocean observing and prediction system; data management; K-12 education; and

undergraduate and graduate education.

We still have five other areas that we are not yet ready to present to the Commission at large. We have three that we have been working on considerably: funding for academic research; ocean exploration, a program for the U.S.; and U.S. leadership role in ocean science. In most of those cases, we are waiting for important documents. For example, we just received from

the Academy last night their interim report on ocean exploration.

We also then have two final issues that we have not discussed within our working group yet, because we are also waiting for major reports, those two being ocean sciences infrastructure needs and ocean sciences technology development.

Having said that, let me know move forward and present the four areas that we will present out, the first one being oceans and human health.

OCEANS AND HUMAN HEALTH

(A slide presentation in progress.)

DR. BALLARD: There we go. The Federal Government should establish an aggressive, fully-funded

and coordinated oceans and human health program that fosters and supports academic-private-sector-government partnerships to: One, conduct research that leads to understanding of the complex interrelations, pathways and causal effects of marine pollution, harmful algal blooms, ecosystem degradation and alteration, and human health.

Two, monitor and assess pollution inputs,

ecosystem health and human health impacts.

The next one is establishes a marine biotechnology R&D program that fosters private sector investment and sets a clear policy governing biotech activities.

Next is develop new technologies for measuring human and environmental/ecological health parameters in the marine environment.

Finally, develop models and strategies for predicting and mitigating pollution loadings, harmful algal blooms, and infectious disease potential in the marine environment. Those are the main recommendations we are making in the area of oceans and human health.

INFORMAL EDUCATION

DR. BALLARD: In informal education, we make the following recommendations: Federal ocean agencies should coordinate with and provide funding for academia and informal education centers to foster an interlocking and interactive network of educational programs on the oceans.

Academic institutions, informal education centers, and federal agencies should implement a common

communications strategy and work together to increase timely delivery of information to the public.

Finally, evaluation and assessment criteria for all informal education programs should be developed and implemented including specifics on effectiveness of programs in reaching traditionally underrepresented groups.

MARINE-RELATED COMMERCE AND TRANSPORTATION

DR. BALLARD: Next, in the area of marine transportation, preparing for the future: The first recommendation is to develop a national transportation and freight policy that will institutionalize and coordinate a program within USDOT with appropriate inputs from other federal departments, state governments

and the private sector.

This national program should, one, cut across federal stovepipes; two, unify our vital transportation modes into a coherent intermodal freight transportation system; three, ensure broad stakeholder input; four, require coordination with regional and local planning bodies and coastal zone managers; and, finally, promote an environmental stewardship

philosophy.

In the area of transportation research and development, the Department of Transportation should establish and fund a research and technology development program that addresses near- and long-term MTS needs.

Marine transportation and research, the second category, specifically the R&D program should: one, develop economic models that project trade and traffic growth and determine the impacts of this growth on throughput and capacity at national ports, waterways and on intermodal connections.

Two, develop system models and guides to identify current bottlenecks and capacity shortfalls.

Three, develop consistent and nationally

accepted definitions and protocols for measuring capacity and other applicable phenomena.

Four, improve trade and transportation data collection efforts by creating and instituting innovative data collection technology and research and development methods to fill critical data gaps.

Five, foster the development of new technologies that enhance system performance while

advancing environmentally responsible outcomes.

Finally, integrate with other applicable federally-supported research and development programs in the coastal zone and watershed regions.

We have a fourth, do you want me to go ahead with this, Frank?

DR. MULLER-KARGER: (Nodding head.)

SATELLITE AND REMOTE SENSING

DR. BALLARD: Finally, our fourth area of work today, satellite remote sensing for earth observations. Number one, the Nation requires a coherent strategy for linked research and operational earth observation programs.

Two, a single agency should be responsible for

coordinating research and science, and design and implementation of operational missions, including collection and distribution of products on an operational basis.

Three, develop a coastal observing program that satisfies the requirements of an integrated coastal zone management program and which -- whoa, here we go. We are out of here.

(Whereupon, from 11:15 a.m. to 11:40 a.m., there was a pause in the proceedings due to an emergency fire alert.)

CHAIRMAN WATKINS: The Commission will now come back to order. What I would like to do here is go back through the final item that REMO was presenting, which was the satellite remote sensing. I have asked Dr. Muller-Karger, who although he comes from another working group, was actually assigned tentatively to the Research Working Group in view of his background and personal knowledge of this whole field. I will ask him to go back and start the satellite remote sensing once again.

Then, we will transition to Dr. Ken Turgeon,

who you see up here on the podium with us now, who is the associate director on our staff for research. He will field the subsequent questions from the commissioners about the various papers, and we will take those papers one at a time in the order that they were presented starting with health and human oceans.

With that, I will ask Dr. Muller-Karger to go back through the satellite remote sensing papers again.

DR. MULLER-KARGER: Thank you, Mr. Chairman.

I just want to make sure that we understand. I was talking to Bill Ruckelshaus outside, and it was the straw governance model that caught fire.

(Laughter.)

DR. MULLER-KARGER: Going back to satellite remote sensing for earth observations, the conclusion that the group got to was that the Nation requires a coherent strategy for linked research and operational earth observation programs.

Again, this is something that is in flux, but there is some feeling that a single agency should be responsible for coordinating research and science, and design and implementation of operational missions,

including collection and distribution of products on an operational basis.

The next slide.

A coastal observing system program needs to satisfy the requirements of an integrated coastal zone management program. This should fully incorporate satellite observations and mission design with the Integrated and Sustained Coastal and Ocean Prediction

System, or it is also called "ISOS" or "ISCOPS" by other people. The idea here is that the planning for the integrated observing system bring remote system into the process.

Finally, an important and growing problem of lack of science and operational personnel trained in the use and design of satellite systems, and so I think this needs to be addressed with a robust educational strategy. Those are the recommendations on the remote sensing.

CHAIRMAN WATKINS: Dr. Ehrmann, if you will pick up now and take these one at a time, oceans and human health first, the way they were presented today by Dr. Ballard who had to leave.

COMMISSION DISCUSSION ON:

OCEANS AND HUMAN HEALTH

DR. EHRMANN: Yes, let's start, as the Chairman indicated, and go back to the oceans and human health, the first issue that Dr. Ballard presented earlier. I know some of the commissioners were asking to speak as we went through all four presentations. I would ask to have cards up for those who want to make

comments at this point on oceans and human health, and then we will move on to informal education, marine transportation, et cetera, and give you a chance to ask to be recognized on those topics.

Mr. Chairman?

CHAIRMAN WATKINS: I would like to start the questioning by finding out whether or not the working group has taken into consideration the very important National Academy report on human health and the oceans?

DR. TURGEON: Yes, sir, that is one of the documents that we, the staff, looked at and used in the preparation of the issue paper for this topic.

CHAIRMAN WATKINS: I would also like to ask the question of whether or not you have reviewed the

renewed interest on the part of NIEHS and the National Science Foundation in their memorandum of understanding to approach this in a much more structured and programmatic way?

DR. TURGEON: Yes, sir, we did see that. I am not sure actually where they stand on that, but I had seen the plans for their program.

CHAIRMAN WATKINS: Do we think in the working

group that there program is a good program that this Commission can help endorse, support, and that kind of thing? Have we looked at it enough to know whether it fits our own ideas of what needs to be done here to get on with this important aspect, particularly as it relates to climate change projection models?

How can human health be looked at in that context, where we know that there is research work that has been ongoing, particularly with the director of the National Science Foundation herself and others in the areas of the relationship between even modest temperature changes and human health and its relationship to coastal ocean temperature, for example?

DR. TURGEON: Yes, there are sort of two

answers to that question. I think that the Commission can endorse that. I think that it is a very worthwhile plan and program they have. Having said that, it is only one component of what the working group is proposing. Actually in the issue paper, and I believe it is still in there, I am not going to look it up now, we actually talked about enhancing the NSF/NIEHS model to bring it up to meet these.

When we pulled this together, we came at it in the sense that ocean health, using that term very broadly, and human health are absolutely intertwined. What the humans do to the oceans in terms of pollution and the impacts that pollution has on the ocean resources could come back and, in a sense, haunt humans in the form of infectious disease, harmful algal bloom biotoxins, bioaccummulation of metals in seafood.

It is a circle, it is all intertwined, and that is what we were trying to capture in this. A lot of this is being done, but it is either being done independently within individual agencies, federal and state, or pollution is separate from biotechnology, which is separate from infectious disease. You have to

look at it in a very holistic manner, and that is what we were trying to capture.

CHAIRMAN WATKINS: Thank you.

DR. EHRMANN: Okay. Dr. Sandifer?

DR. SANDIFER: Thank you, John.

I was very pleased to see this particular area of emphasis come out of REMO and obviously have some interest in the research areas myself. There are two

things that I was a little concerned about not seeing any detail on here. One is nothing explicit about the U.S. establishing and moving internationally in the area of oceans and human health. International leadership is something we have talked about in a number of areas. This is clearly one with all kinds of emerging, not only water quality and pollution issues, but disease issues.

Human health issues related to ocean and coastal environments, I believe the U.S. should take the leadership in, human health disease issues and marine organism disease issues particularly. There are a whole lot of other things that are related to the health piece.

First of all, does REMO intend to include

something very straightforward and up front here about the U.S. establishing not only a coherent program for the country, but to establish some international leadership in this arena?

DR. TURGEON: Yes, because we wrote it we know what we meant to say.

(Laughter.)

DR. TURGEON: Unfortunately, you don't.

DR. EHRMANN: That is very reassuring.

DR. TURGEON: When we wrote this, we actually had the letters E-E-Z in there, and after discussion yesterday about the international aspect we took those out. This is a worldwide view, and it envisions working with other nations and working with the World Health Organization. One of the things that I have seen is mostly related I think to the concept of global warming, global climate change is distribution expansions of certain diseases. We need to be aware of that.

We also need to be aware, especially when we are talking about things like accumulation of biotoxins, accumulations of persistent organic pollutants, metals, that a lot of those are found, to the levels where they

are detrimental to humans are found, at high levels of predatory fish, which are your highly migratory fish. In a nutshell, yes, we will definitely have an international flavor to this.

DR. SANDIFER: All right. I think that is reflected in the full write-up, but I believe it is somewhere in our recommendation clearly that the U.S. should take international leadership.

The second point on this, I am again very pleased to see you right up front say that you want to foster and support academic, private sector and government partnerships in this arena. Having promoted these kinds of partnerships for a long time, I believe very strongly in them. There is nothing in the material that was presented to us, that Bob presented earlier, that suggests if you have any specific mechanisms in mind to do that.

Along with having some kind of coherent program, and as you talk about in some of the other areas having some agency take the lead to push this, you really have to have some kind of mechanism in mind that does in fact foster partnership.

I don't know if the REMO group has had any discussions about how to go about doing that, or you are going to leave that to later or what, but I do think that is important that they again be a very, very strongly emphasized point here. If there are mechanisms that you have in mind, I would like to see them.

DR. TURGEON: Okay. We touched on that, and, quite frankly, it was very brief. I think it is fair to

say that we actually put aside because, again, we were waiting to see what was coming out of the Governance, and especially what would be at regional levels.

Going back to the point that Admiral Watkins raised, I think if we look at the NSF/NIEHS model and look towards augmenting that to bring it up to this, that is at least something to start with at the national level. In terms of the finer detail, we have not touched on that yet, we will.

The realization, too, is a lot of what we are trying to cover in this overarching program is spread among many federal agencies and many state agencies, and we have not yet put a handle on how to bring those together.

DR. EHRMANN: Okay. Commissioner Koch?

MR. KOCH: I have two governance-related issues, remote sensing.

CHAIRMAN WATKINS: Can we hold to human health and the oceans for now? We are trying to get at these one at a time.

MR. KOCH: Yes. Let me talk about the health one. I am still a little confused from a governance

perspective. We are talking about establishing an oceans and human health program and establishing a marine biotechnology R&D program. Is there any concept of where this would go in the government?

DR. TURGEON: Well, obviously there would have to be a lead agency, but the biotech program is a component of the overall oceans and human health program. We kind of culled that out a little separate from the others. If you look at pollution, you look at harmful algal blooms and you look at toxins, you are dealing with detrimental impacts to human health.

Whereas, when you are looking at marine biotechnology, you are looking at beneficial potential for human health be it pharmaceuticals or bioenzymes for

laboratory assays. In terms of who that lead should be, again we have not made that decision. Does that address your question?

MR. KOCH: As we are trying to put together governance models, I would think human health issues, we would have to have an awfully compelling case to move it out of an NIH or Centers for Disease Control type responsibility, but we can consider that as we go

forward.

DR. TURGEON: I don't think what we are trying to do here is bring together the groups that are already working in these arenas. Granted maybe NEIHS is the big player, the 800-pound gorilla, but there are components of this scattered throughout the federal government as well as components of this scattered throughout state governments.

States do an awful lot of coastal monitoring for infectious disease organisms, both pollutants, and the federal government does the same. Even USDS has a marine biotechnology program, they have a water quality monitoring program, NOAA does the same and EPA does the same. We need to bring them together.

Now, if NIEHS is the appropriate lead, and again we haven't discussed that, then it would be the lead but the others would come into there in a partnership bringing in, as we best can, the states and the private sector and maybe other stakeholders.

DR. EHRMANN: One thing I would add to this, just picking up on that comment, is I think the Commission needs to be, and in a way I think it is the

thrust of the question, clear about areas on these kind of cross-cutting issues where you are considering recommendations about cross-coordination among existing entities that would still be existing entities but need to work together versus various combinations and consolidation options, where you might literally be recommending taking folks from someplace and putting them either in one existing agency or potentially even a new place.

I think that is a caution to everyone to be, as everybody thinks about these to be, clear about which model you are talking about. I think that is at least implicit in the discussion.

DR. TURGEON: We haven't gone there. Again, we

were waiting on Governance. If the national --

DR. EHRMANN: Let me advise a different strategy.

(Laughter.)

DR. EHRMANN: Let me go to next question.

Commissioner Borrone?

MRS. BORRONE: I think it is a follow on drilling down maybe a little bit more. Ken, as we think

about the governance structure that we did describe this morning and as you have just described there are existing agencies with existing functional areas. As you say, it is hard in shorthand in this kind of slide to communicate it all, that we need to better coordinate as well as fully fund program activities.

I think it would be helpful for us in Governance if, as you get to some areas of combination of functional activities or coordination, you describe for us in the Phase I, II or III categories what you think the timing or accomplishment might be in each of those areas.

In particular, for example, where you talk about establishing programs or setting research agendas,

do you mean them at the national level solely, or do you mean them to be national in goal but perhaps carried out in regional contexts, where individual states or even individual academic institutions may be leading in certain areas of either study, like model development, or research activities in terms of new technologies?

DR. TURGEON: What we see is a national program. By saying that, it is the "national spine"

that covers the nation. It lays out what are the objectives, what are the goals, what must be accomplished and then brings in the appropriate players to participate in that.

We are not going to take everything and consolidate it at the national level and then go tell others, "Here we come, we are from the Federal Government, again we are here to help you," but we need to involve them.

There is so much being done out there that is not being integrated or coordinated. I am sure there is lots of information that addresses distribution of diseases, distribution of pollutants that resides in individual databases that are not being pulled together.

That is what the national part would do, would be to pull this together into a cohesive hole so that it makes sense at the national, and as Paul Sandifer said, even at the international level.

MRS. BORRONE: Okay. But if you could, help us with the stages that would be important.

DR. EHRMANN: Okay. Dr. Hershman?

DR. HERSHMAN: Again, sort of following up,

one of the lines says, "Establish a marine biotechnology R&D program that fosters private sector investment and sets a clear policy governing biotech."

Again, thinking about Governance's role, does your research show that within either state waters, territorial sea or Exclusive Economic Zone that there is a need for a regime that is actually legal, a legal kind of regime, that would in effect foster the protection for private sector investment that goes out there, or at least a process for private sector development that would protect their interest if they invest in this area?

Any observations about that or maybe some of the studies already address this that can feed back to

us? Because at some point I think we are going to have to address what is still lacking in terms of the legal framework for the area beyond state waters.

DR. TURGEON: Yes, we did look at that. I think that is going to be a -- it is a non-trivial task. As an example, in California state waters, you virtually cannot take anything unless you have a special permit or there is a law that says you can like fishing. Anybody

that would want to do biotechnology research in state waters in California has to go through and get explicit permissions and permits to do so, and that will say what they can take, where they can take it, and how much they can take.

On federal waters, legally defined as the outer continental shell, you can go out there and unless it is covered under fisheries management plan and it is not in a marine-protected area, you can collect anything you want and as much as you want. One of the issues, and I have discussed this with NSF and NIEHS, is how do you foster this type of development and not stifle the research necessary by, let's say, putting too much restriction on it, too much requirement?

DR. HERSHMAN: Do you see a recommendation coming forward to try to address that problem from your group?

DR. TURGEON: Yes. The difficulty is I don't know if we want to say much about the state waters. For the federal waters, we think there needs to be some sort of a regulatory regime, one that ensures some level of protection as we see on land on the national parks, and

I was involved in that when -- I forget the name of the company -- Diversa was trying to collect some bacteria in Yellowstone and the Interior got sued on that. We need to come up with a legal regime for that.

I think the government should favor biotechnology activities on federal lands under water, but it needs to be done in some sort of a framework that affords protection to the environment. You have got to realize that is a public trust, and we just can't let industry go out there and --

DR. HERSHMAN: As your ideas develop, that would be useful for us to know about.

DR. TURGEON: Yes. Again, we are not at that stage yet.

DR. EHRMANN: Is this a direct follow up?

DR. ROSENBERG: Yes. I suddenly realized when you said you can go out and do anything you want in fisheries in federal waters as long as it is not fisheries management planning, I no longer know what you mean by marine biotechnology. I am wondering if the working group defined what marine biotechnology is?

DR. TURGEON: No. Let me give you one example.

Let's say there is a particular seaweed or an algae growing out on the OCS and it is found to have some sort of a modern drug capability just like the, was it the yew tree, with the anti-cancer drug.

Fortunately the yew tree is considered a scrub tree. For a while, that drug could not be produced in the laboratory, and so they actually had to go out and chop down an awful lot of yew trees and take the natural product.

Let's say on the OCS someone goes out and finds that same situation with an algae or with an invertebrate that is not protected by a fisheries management plan. Until a plan is put into place, assuming again it is not in a marine-protected area,

they can just harvest as much as they want. It could be possible at least locally an ecosystem is seriously affected detrimentally.

DR. ROSENBERG: I am not sure I think that is true. My question was, What do we mean by "marine biotechnology"? Do we also mean, for example, the production of genetically modified organisms?

DR. TURGEON: No.

DR. ROSENBERG: Is that marine biotechnology, or are we simply talking about harvesting? The statement says we should establish an R&D program. So here I am and I want to produce a genetically modified fish. Does that mean that the Oceans Commission is saying we want to foster the development of that program? We need to be careful with the terminology "marine biotechnology."

DR. TURGEON: Yes.

DR. ROSENBERG: That is, I guess, my point. I don't know if the working group has defined it.

DR. TURGEON: What we were referring to, and I realize biotechnology is a very difficult term, we were really talking about the harvesting of natural products

for testing in the laboratory and possibly synthesizing in the laboratory. We are not talking about recombinant DNA experiments out on the OCS.

DR. ROSENBERG: Then, I don't think that you have used the word correctly, because that is more bioprospecting than it is biotechnology.

DR. TURGEON: right. When I use the terms "bioprospecting" and "bioharvesting," people say, "Oh,

God, those have terrible connotations, let's just call it biotechnology."

(Laughter.)

DR. TURGEON: Trust me, we will define it. It is just here, again, it is a catchall term.

DR. ROSENBERG: I am not suggesting that you don't make a recommendation about biotechnology fully, but I don't think this is the recommendation that covers all aspects of biotechnology.

DR. TURGEON: Okay.

DR. EHRMANN: I think that point is well taken. Admiral Gaffney and then Mr. Ruckelshaus.

ADMIRAL GAFFNEY: Mega dittoes on what Andy said.

DR. EHRMANN: (Laughter) Okay. Thank you.

MR. RUCKELSHAUS: Ken, I am listening to what you are saying here. There are a number of recommendations in these two slides, some of which involve activities that are heavily in an existing agency, others are in no agencies, and some of which are being done by multiple agencies now.

I don't think the Governance Committee can

take this information and make a recommendation back to the Committee about how it should be structured. It seems to me John has pointed out, Are you talking about coordinating the existing programs, or are you talking about consolidating into one agency? I mean, is that what you are suggesting the Commission recommend?

I think we need a recommendation from you, who are more familiar with these specific issues that are raised, rather than asking the Governance Committee to take this on and determine how it ought to be addressed in the form of some kind of structure.

I don't think we are in a position to do that. I mean, we have got a big load left obviously to accomplish. Other than saying it is suited or not

suited for a national ocean council, were it to be created, and we were to recommend it, I don't know how we address that. I mean, does your working group intend to make a recommendation on how this problem should be governed?

DR. TURGEON: Yes, sir. I am sorry, I didn't mean that this is the role that the national ocean council should do, decide how this should be. What I

meant is in terms of national policy and priority setting this could be something that the national ocean council would put forward as a high priority as part of, say, a national ocean policy.

MR. RUCKELSHAUS: One of the functions the national ocean council would have, as we envision it, is an identification of major problems or issues that are not, in this case maybe, opportunities that are not being adequately coordinated and move to do that. I don't know whether that is what you would have in mind for this or not?

DR. TURGEON: Yes. What we will do is come up with that recommendation of consolidation or coordination. I need to look more, and I need to find

out more about the NSF/NIEHS model. Personally, there are components of this as a program that probably are better off sitting in the agencies they are in, and there are probably parts of this that are better off being combined in a single agency, so it is going to be a mix and match. An example --

MR. RUCKELSHAUS: Your working group will undertake that?

DR. TURGEON: Yes, sir. I didn't mean to imply that was the role of the council.

CHAIRMAN WATKINS: I think we should proceed to the next one.

DR. EHRMANN: Yes. Just a couple of quick comments on this one, and then we will move to informal education. Clearly, things have been helpful as it relates to this topic, but more generically the interplay between the various substantive issues that the Commission and the work groups are dealing with and the overall governance framework.

It is going to take a combination of inputs from the groups on these individual issues to be able to assemble whatever set of recommendations on integration

and consolidation. I think this was helpful in illustrating that, as well as obviously getting some clarification particularly on the biotechnology-related issues. I think that was very helpful.

Let's take any commissioners who wish to comment on the recommendations that Dr. Ballard presented on informal education. Dr. Sandifer and then Dr. Hershman.

DISCUSSION ON INFORMAL EDUCATION

DR. SANDIFER: Thank you. I was very pleased with this recommendation on informal education. I would only ask that if the working group has considered specifically the zoos and aquaria across the country as a major informal education mechanism that that be also included very clearly in the documentation.

The experience we had when we met in California in San Pedros, when we visited in Charleston, when we visited in Chicago, and when we visited in Boston all clearly showed to me the tremendous impact that the aquaria and many zoos that have aquatic components in their presentations can have in reaching an audience that we will otherwise completely miss.

If we could focus some national attention on providing some funding and coordination perhaps through the American Association of Zoos and Aquaria, or whatever it is called, "AZA," or other mechanism to really coordinate a message going out through that network, I think you would have a tremendous impact.

The statistics I saw, if I remember right, in the materials that were presented to us is more people

see those displays in aquaria and zoos than ever attend all of the major sporting events, for example, in the country, if I remember the statistics correctly.

It is a serious audience out there, and we get a lot of repeat business going through those institutions. I just would like to see a little bit more emphasis placed on that specifically in your report.

DR. TURGEON: It will be. We, for brevity in trying to save space and get this on a single slide, used the umbrella term "informal science centers." Ted Beattie, who is a commissioner on this Commission and head of the Shed Aquarium, wrote the white paper on which these recommendations were based. He is not going

to let me forget about aquaria, zoos or even museums.

One of the things we were trying to do in pulling this together is a consolidated message that can go across the country. It can have a regional tent to it, but we want to get across key consolidated messages.

As an example of one recommendation that is not up there specifically is the Federal Government working with these, again informal science centers, to

develop a traveling exhibition because there is, as Ted said, 25 percent of most zoo and aquaria space or aquaria leases are turning over, so they get the same people back. You could run something like that around the country and then come back with a new one. Again, you are right, the statistics on the people that are captured by the zoos and the aquaria and museums is phenomenal.

The other thing that was pointed out by Ted is quite often that is where you are also capturing what we call the traditionally underrepresented groups. There is a point to capture them and get them at least knowledgeable and, hopefully, stimulate some of them in this area.

DR. SANDIFER: I wanted this for the public comment. I actually haven't seen Ted's paper. However, with what Ted has shown us at the Shedd Aquarium, what we saw in Mystic with what Dr. Ballard is doing there and what I know is going on in some other aquaria and zoos from personal experience, I think it is very, very important that we put there message out there, again, explicitly so that the public knows exactly what we are

talking about. Also, the Congress will know exactly what we are talking about.

DR. TURGEON: Yes, and that will be in the verbiage that goes with these.

DR. SANDIFER: Thank you.

DR. EHRMANN: Comment on this? Okay, go ahead.

DR. HERSHMAN: Yes. It is not clear from the brief description here, but you probably have thought about the leadership or responsible point in either government or within the non-governmental world where we are going to carry this forward.

For example, the last bullet talks about evaluating and assessing these informal education

15 programs. Who would do that? Who will spark more of

16 this work? Is this something you envision, again, as

17 coming from regional councils as you are talking about

18 on the Governance, or is that a different kind of group?

19 DR. TURGEON: It would be a group made up of

20 those stakeholders. It would be the federal folks, it

21 would be representatives of the aquaria, representatives

22 of the zoos and museums working together as a team to

develop this. It wouldn't be the feds telling the others what to do.

Aside from being a partner in this, the main role we see for the feds would be providing the resources to allow this to happen. Some of it is already being done individually by those other entities. This would enhance their capabilities to get the message out, but we see it as a partnership. It would be like a committee or a task force approved by the respective groups.

DR. EHRMANN: Okay. Doctor?

DR. MULLER-KARGER: Ken, I was wondering if in your discussions on informal education you also touched on an international component? For example, is there a

way to heighten the consciousness of pollution issues related ships and shipping, outreach programs to nations that are harming coral reefs for capture of ornamental fish, for example. Is that part of the informal education process that you are talking about, or is it just internal, within the federal agencies?

DR. TURGEON: No. Actually, that would be part of the example I gave, the traveling exhibit where it

would focus on some major problem potentially or the benefits, but it would be looking at the oceans, not the U.S. federal waters. In terms of outreach to foreign nations, I don't think we got into that at all, but that is a good point, and we can certainly look into it.

DR. EHRMANN: Let me ask, any final comments on this one?

(No verbal response.)

DR. EHRMANN: I think everybody has had their chance on informal education. Again, I won't repeat the comments that were just made because there were just two or three of them, but I think very helpful input to the work group.

Let me ask a question about the next two. We

are just trying to calibrate our agenda, given the interruption we had. How many commissioners intend to make comments or input on the marine transportation issue?

(Commissioner Borrone raises hand.)

DR. EHRMANN: I see one hand. Maybe we can go ahead then and see if we can complete that one before we take our scheduled lunch break.

Commissioner?

DISCUSSION OF MARINE-RELATED COMMERCE AND TRANSPORTATION

MRS. BORRONE: I think that we might need to make clear where in this recommendation we are supporting the work that is already underway at the Department of Transportation on the maritime transportation system, and where these recommendations are reflective of those program efforts versus those that are new recommendations that we want to emphasize or add to that, so that we are not duplicating or replicating what they have already done in the MTS, the "marine transportation system" reports that exist. That

is the only suggestion I would make.

DR. TURGEON: Very good, we will do that, good point.

DR. EHRMANN: Okay.

CHAIRMAN WATKINS: I would like to find out what we have in the way of satellite remote sensing questions that I would hope both of you would field as answers to the commissioners. Who would like to talk

about that?

(A show of hands.)

CHAIRMAN WATKINS: I think we ought to go ahead with it. We have got, I think, at least seven or eight minutes here that we could donate to it right now because I don't want to interfere with the Stewardship presentations this afternoon. There is a lot on the plate there.

DR. EHRMANN: All right.

CHAIRMAN WATKINS: Go ahead.

DR. EHRMANN: Dr. Sandifer, did you have a comment on this?

DISCUSSION ON SATELLITE REMOTE SENSING

DR. SANDIFER: Very quickly. I am not quite

sure, Frank or Ken, what the second bullet on the first slide really means having, "A single agency -- responsible for coordinating research and science," and then all of the operational aspects. I am not quite sure what that means.

Secondly, I will get both of the issues on the table, I don't believe I see here something that specifically addresses biological observations and the

need for where the technology does not today exist to make those biological observations that there be an effort, a research effort, targeted to be able to do remotely-sensed biological observations in managing living marine resources. I would simply like to have that added to your list, if the working group is willing to do so.

DR. TURGEON: Frank, do you want to?

DR. MULLER-KARGER: Well, I think we can take turns at this. On the second one first, what we were addressing here were satellite remote sensing observations, not in situ remote sensing observations.

DR. SANDIFER: I understand.

DR. MULLER-KARGER: Part of this does imply

some biological observations through inferences on ocean color and things like that. I don't think that we can get down into specifics on science but to recommend, for example, an integrated coastal ocean observing system that includes high-resolution, high-frequency type of observation system. I mean, I don't know how specific you can be.

DR. SANDIFER: All I am asking, Frank, is that

consideration be given to emphasizing biologically relevant observations. There are some things, for example, some observations on marine mammals that might better be done from remotely sensed platforms than what we are currently doing now. Just at least that it is included in the suite of things that ought to have emphasis. Otherwise, frankly, I think physics takes over and biology gets forgotten. It is just a matter of saying, "Don't forget biology."

DR. MULLER-KARGER: Okay. That is a good point.

DR. TURGEON: Also, as a follow up, if you look at the ocean observation system write-up that we did and was presented at the November meeting, we consider

satellites as being a very important part of that system. Frank has pulled this out to demonstrate why we need to maybe treat our satellite systems a little better.

In that original paper, when looking at the ocean observing system, we talk about the need for biological sensors. We talk about where they need to be in terms of what it is they can do and what is the

practical place to put them. When we get into the information technology, which we are not ready to present yet but we are working on, we are already talking about the need for new sensors for ocean observations. Again, we will get into it. So, even though it is no mentioned here, it is covered in two other areas.

DR. EHRMANN: Do you want to comment on the first one, the "single agency" point?

DR. MULLER-KARGER: I will address the first question that you had, which is probably the same one Chris is going to bring up. That is where the fire alarm went off, if you remember, so that may be what ignited the strawman for governance.

(Laughter.)

DR. MULLER-KARGER: The whole point with remote sensing is that it provides you large scale coverage. It has a potential for having high-resolution, high-frequency coverage and integrating in situ observations in a way that just measuring in specific points, even by automated means, is not possible.

But if you try to see where the data are right now and how we collect the data and how we design these systems, I mean, there was a big discussion about this yesterday. If you look at the history of NASA, it is more of an engineering entity that develops one-of-a-kind missions, and if you are lucky maybe two of a kind that measure sort of the same thing, but they are focusing on the technology aspect of it.

They have stated explicitly that they will not provide long-term continuity for missions, so they don't see themselves as an operational mission, as an operational agency. At the same time, they have provided some of the best missions that could provide you the kind of measurements that you want from a

biological, physical point of view.

If you look at the other side of the house, the operational house, NOAA, we have a system that works very well for the weather system but very poorly for the oceans. NOAA has not managed to grow a set of customers that really pull the data out, and, therefore, they have been sort of unfocused in how they develop their data production system. They don't have the engineering

know-how and knowledge. They have a very, very weak research base, which is at NASA. NASA and NOAA have not managed to marry these two things together.

You have other agencies involved. You have the USGS, for example, that manages the Landsat Program, which really has flown by NASA. The USGS manages the data, but it doesn't have a funding mandate for that; it just operates the data center as a cost center without a mandate. That is high-resolution data that, in fact, most of the coastal managers use.

You have all of these pieces that are spread out. The research base is weakening. It doesn't feed into an operational system. We discussed this, and the best thing that we could come up with in 15- or

20-minute discussion, which was very lively, was this attempt to bring it together under one roof. It may not be the best way to do this, you know.

We have problems like this across everything we are talking about, and this is just one clear example that I am very familiar with. That is the history of that bullet, okay, and I am really interested in hearing your comments or your suggestions for governance systems

that would help integrate these functions.

DR. ROSENBERG: Can I ask a question for clarification? When you say a "single agency" here, do you mean a single civilian agency? Because I am a little confused. I am assuming that we are not talking about consolidating with regard to the military functions or DoD functions?

DR. MULLER-KARGER: Well, there is a model that DoD, NOAA and NASA came up with, which is an integrated program office that has converged, if you want to call it that, weather satellites from the military and the civilians. That seems to be a model that has a lot of positives. There is not a program that has developed a coastal observing system.

I mean, there may be things within the military system that may be convergent to this. I am not clear about that yet. I would like to see it. In this case, what we are talking about and everything that we have talked about is a civilian system, so to me that was basically a default position. I am not arguing or touching anything on the military side.

DR. ROSENBERG: I know you used shorthand on

the slide, but I think we need to be clear about, you know, the need to have a single, if you are recommending a single, civilian agency and then some kind of linkage mechanism, where appropriate, to the military agencies. It doesn't read that way, and maybe it does on another paper. That is the reason I wanted to stress that.

DR. EHRMANN: Okay. A good point.

DR. MULLER-KARGER: Thanks.

DR. EHRMANN: Mr. Koch?

MR. KOCH: Frank, I was wondering within your working group, one of the ideas that has been at least discussed informally has been moving USGS and NOAA into a coherent single agency. Is that level of specificity something that your subgroup has reached agreement on?

When you talk about a single agency --

DR. MULLER-KARGER: Which group are you talking about? REMO?

MR. KOCH: REMO.

DR. MULLER-KARGER: I am not part of REMO, so I have not been a part of those discussions. I was just part of this discussion; they pulled me in to talk about remote sensing.

MR. KOCH: Well, whoever put this together, I am just trying to figure out if there is consensus, if that is what you mean when you say "single agency" or it if it is more amorphous?

DR. MULLER-KARGER: Ken?

DR. TURGEON: Yes. It is probably more amorphous. Frank put this together. We made him an honorary member of the REMO Work Group, and so he is entitled to come to all of the meetings as he likes. I think here he meant by a "single agency," an existing agency regardless of any consolidation.

Am I correct on that, Frank?

DR. MULLER-KARGER: I think that that those details are to be worked out. I don't advocate creating

a new agency just for this purposes, no, but I do think that this needs to be integrated into whatever new structure we come up with.

DR. HERSHMAN: My point is Governance would appreciate knowing if there are going to be specific recommendations like this one of putting USGS and NOAA in a single agency. It would be helpful to know that.

DR. MULLER-KARGER: I agree. I think that we

need to go that way pretty quickly.

ADMIRAL GAFFNEY: It really was the opposite of amorphous; it was really very narrow. We were just looking at this one satellite function. In the discussion, we did talk about, "Gee, if there was the agency that Bob White mentioned, for example, if that was an earth systems, this would be a no-brainer because you would be looking at land, watershed, coast and ocean all together made perfect sense.

You would certainly take a little group out of NASA that does ocean sensing and put it in this thing. However, it was only a discussion around the table; it wasn't a consensus or even written down.

DR. HERSHMAN: Will you be looking at that

15 further?

16 ADMIRAL GAFFNEY: I suspect REMO will. If

17 Frank and I are invited, we will probably talk about

18 that a little bit.

19 DR. EHRMANN: Good. Commissioner Borrone?

20 MRS. BORRONE: Frank, in the slide that starts

21 with "Develop a coastal observing system that satisfies

22 the requirements of an integrated coastal zone

management program," the words "coastal zone management program" appear "integrated coastal zone management program."

You heard our discussion earlier. I am wondering, and you may not be able to speak for the REMO Group, in your thinking what you refer to as you are talking about "coastal zone management program," or if the REMO Group described it in some way it would be useful for you to feed it back to us so that we understand what your thoughts are about that versus what you have heard us describe, which are disparate and still not yet resolved between existing requirements of coastal zone management and future needs that are to be addressed?

DR. MULLER-KARGER: I would like to just very quickly illustrate the two thoughts I have on that, one is that we don't have a coastal observing system in space. We have nothing that provides us high-resolution, high spectral, high frequency observations that a coastal manager can use. We don't really have a complete understanding of the requirements of those coastal manager to define such a mission. I

think that is an important thing.

The other thing is as we develop these observing systems I think they need to plug into this coastal zone management program completely. As you develop a program from a governance point of view, it needs to include these type of observations. It was an attempt to try to integrate those from those two extremes.

DR. TURGEON: Just again in terms of where REMO was coming on this from the ocean observing system, I think we are looking at a national spine for an ocean observing system with regional components to it.

DR. EHRMANN: Okay. Dr. Hershman?

DR. HERSHMAN: Just again following up on what

Commissioner Borrone just mentioned, yesterday we were discussing regional science centers, which would be in support of the emerging new generation of coastal management activity. I think there is a separate paper on that, and I think it was presented yesterday afternoon to the Governance Working Group.

Is that going to be linked, will your work on the remote sensing be linked, to some of these regional

science centers that are being thought of as a support system for a new generation of coastal management?

DR. MULLER-KARGER: Well, the simple answer is I hope so. The more complex answer is I am not quite sure what these regional science centers are about. I have similar feelings for the federal coordinating, regional coordinating, unit.

I would like to see existing infrastructure, of which there is plenty, science and education infrastructure being used, the existing infrastructure, and so creating a new science center in a region that is imposed from the federal level.

I do think that there is a role for a central agency at the federal level, that cranks the machine,

generates these products, distributes data to the regions and the regions can use the data.

Now, do you have to have a similar structure in each region that produces products for each region? That will probably vary with each region and each need. What I don't want to see, and that is a specific comment on the science center, is I don't want to see a new federal science center created in a region just to

address those science needs.

DR. HERSHMAN: I think it wasn't intended to be a whole new center, but rather a coordinating mechanism. I was just pointing out that those two points ought to be brought together.

CHAIRMAN WATKINS: Well, I think you have opened another Pandora's box for us. In that discussion, I was in the Governance Working Group discussion when we brought this up, the paper, as you know, is not ready for discussion here today for the very reasons you raised, that we couldn't define exactly what it was, what was the coordination, was this a virtual center in the region of the country.

I think that we have a lot more work to do.

But the answer to your question is yes, it has got to be in there. If we are talking about coastal observations and they are going to feed in a national or even an international network on things like climate change projection models, human health and the ocean projection models, fisheries management issues, and so forth, obviously some of the same data that is those observations are going to be extremely useful to the

local users.

What we don't want to do is generate a piecemeal, stovepipe system in research. I think that we have a lot of work to do in this area that is very fundamental. I think it is one of the findings of the Commission that we have got to identify the inadequacy of the investment strategy of this nation and ocean policy. We haven't made that case yet.

That case has to be made, and I think it is being made. It is in there piecemeal, but we have to bring that up because it is a component of the justification for a virtual regional science center concept, to bring one aspect to the table at the national ocean council level, if you project it in the

strawman, but there is another one.

It is a subcommittee that devotes its attention to what is the research strategy to carry out the objectives and goals that we are recommending out of this Commission. It is a huge issue, and it is the driver of so much of the downstream operational systems that have to be developed.

It is my understanding that OCEAN.US within

the next two months will put out an RFP to industry to help build, if they can get the money for it, the architectural design for the coastal ocean observing system. We don't know what it is. Industry can try to pull that kind of thing together, and that is where locals should be very much involved in their component of this to make sure that the data coming out is converted to useful information for the decision-makers.

I think that we are on the verge of a major area of concern on what we recommend. We are on the tip of the iceberg in just talking about a regional science center. We have got a major research strategy problem that we have to deal with as a Commission, as a whole, when we add these things up.

I bring that up because I think it is important for everybody to recognize that this is going to be a major driver for the downstream execution of many of the things we are talking about, particularly when you get into ecosystem-based management issues.

DR. EHRMANN: Admiral Gaffney had a quick question just on the final slide, and then we will close this session.

ADMIRAL GAFFNEY: Well, the last two slides, Ken, you talked about things are still in work, and there is one called "ocean sciences infrastructure needs." I want to make sure that that either encompasses ships and other federal ocean facilities for science and for other ocean things, or is that a separate topic all together, ships and federal ocean facilities?

DR. TURGEON: No. That is going to capture things like the need for laboratories, the need for ships, the need for computers, the whole thing.

ADMIRAL GAFFNEY: Thank you. It includes ships?

DR. TURGEON: Yes.

ADMIRAL GAFFNEY: Great.

CHAIRMAN WATKINS: We are 15 minutes behind schedule, but that is workable because I know everybody is asking not to have a longer lunch period than 45 minutes, and that I hereby approve. We will be back here at 1:15 to commence the Stewardship presentations.

(Whereupon, at 12:30 p.m., a luncheon recess was taken, to reconvene this same date and place at 1:15 p.m.)