Chapter IV - Advancing Our Understanding of the Ocean

- **Comprehensive and Coordinated Approach**
- **National Coastal and Ocean Observing and Prediction System**
- **Data Management**

DR. COLEMAN: Thank you, Mr. Chairman. I want to start off by first thanking our Science Advisory Panel that was with us. If we can, go to the next slide.

(A slide presentation in progress.)

DR. COLEMAN: The first one we had was rational investment strategy for U.S. ocean sciences. That first bullet says that we lack and established mechanism to manage the investment that we make in science today. We had really two recommendations, and you can read those.

Basically, we need a multi-sector or a multidisciplinary body to really develop a process, develop a process identifying funding and implementing and also even identifying those high priority national science needs.

At the present time, every agency is going on its own, universities are going on their own, so from a

practical standpoint there is no plan of what the high priority is that would be beneficial to our nature.

Then, the second one simply says that the National Oceanographic Partnership Act was really a good act with a good model. It set up a good model for us to follow and to continue in that, and so that is our first area.

John, do you want to--?

DR. EHRMANN: Yes. Let's take it one by one.

DR. COLEMAN: Okay. I will entertain questions or comments.

DR. EHRMANN: Comments on this first piece?

Dr. Rosenberg?

DR. ROSENBERG: Two comments. I guess the first bullet point raises the issue of our overall investment and whether we have got the information now that we are both required to have under the Act and we have been asking for on investment. I know there has been some sort of informal discussion of that, but I am still very concerned about whether we have numbers we can utilize to speak coherently about investment. My second question will be perhaps later on, but if we use

NOPA as a model, what is it that we need to add to it to make it work?

DR. COLEMAN: I think that is coming a little bit later on, but we will be discussing that last aspect. As to the numbers, no, we do not have them, just some loose numbers have been kicked around by the National Research Council.

DR. EHRMANN: Admiral Gaffney, do you have a

comment on that?

ADMIRAL GAFFNEY: Jim, I think you might cover this in a minute. When I think of the kinds of things that the Navy, for example, invests in oceanography, much of it is not characterized as science, but everybody wants it; it is data. I wonder if it might be useful to say, to use the term "oceanography" instead of "ocean science"? That way you don't just limit it to research, but some of the operational outcome from NOAA and Navy especially are valuable to the research community.

DR. COLEMAN: Good point.

DR. EHRMANN: Okay. Any other comments on the first one here?

(No verbal response.)

DR. EHRMANN: All right.

DR. COLEMAN: The second one is under "Research Partnership and Roles." Throughout the public testimony we have heard over and over the lack of research partnership, concise identification of roles and missions.

Basically, that first dot up there says really

our community has a wonderful capacity to conduct research, both basic and applied, but lacks clear vision of what are the appropriate roles of the various agencies. Often they are overlapping, often they are in conflict with one another.

Basically, the two recommendations are that the National Oceanographic Partnership Act is a good model, and we must use it as intended by the Act. Go back to the original Act, which we did, and utilize it in that objective.

The second is that we urge the NOPP, the "National Oceanographic Partnership Program," and all of those agencies that are a part of it to continue their investment. It is one of the few partnerships that

appear to be working today, and we urge them to continue that status of coordination.

DR. EHRMANN: Okay. Dr. Sandifer?

DR. SANDIFER: Thank you, John.

Jim, I obviously like this kind of recommendation. I firmly believe in the research partnering. I would only ask that the working group consider some other examples to bring to the whole body.

I am concerned that the National Ocean Partnership Act and NOPP at this point don't do as much on a broader regional basis, a local basis as I would like to see.

There are a number of examples of cooperative institutes around the country and other kinds of things. One in my backyard that I am very, very familiar with and very strong on where you bring together federal scientists, academic scientists and state agency scientists from a wide variety of disciplines and focus them in a general area and let them go and do good science.

There are a number of those models, and I would just like to see us look at some of those, particularly those that tend to bring together and

sustain relationships, people in the academic community and in the agency community. I think it builds synergism in both sides of the house, so to speak.

DR. COLEMAN: Thank you, Paul. If any of the commissioners have examples of that, we would be pleased to --

MR. TURGEON: I was going to ask if there were any specific examples you could give me that you think

sort of perk to the top of the list of things to look at.

DR. SANDIFER: Obviously, I think the Hollings Marine Lab with its partnership with two federal agencies, two academic institutions and a state agency is a real good way to go, but there are some others, a variety of cooperative institutes. The problem is that the federal structure has not been solidified to make it reasonable to get there. There is a lot of interest in it, but you go through all kinds of hooks to get a cooperative relationship built. I will give you some specific guidance, Ken.

MR. TURGEON: The reason we have got the NOPP in here is because it exists in the legislation. In the

Act it says federal, academic, states and industry, so we are trying to pull those together. If you look at the Act, it is a good model; if you look at the way it is being implemented, it is pretty shaky.

DR. SANDIFER: Yes. I think my point is that you have got that Act as a model. We need to give them some examples of how it ought to be better implemented or broadened.

DR. COLEMAN: Good point, very good point. Thank you.

DR. EHRMANN: Dr. Muller-Karger?

DR. MULLER-KARGER: Yes. To follow up on exactly that point. While I think NOPP has the right intention and the right vision, it has created programs that seem to be Band-Aid type of programs, where you have little bits put on top to try to integrate across some agencies. It is not an integration that goes deep, through the core, through all of the programs of all of these agencies. I think that is the strategy that I would like to see.

Thank you.

ADMIRAL GAFFNEY: That might be a symptom,

Frank, of the amount of money that has been put into the program.

DR. MULLER-KARGER: I agree. I agree 100 percent with that. But even if you go back to the original Act, even the amounts that are talked about in that program in that Act are Band-Aid level funding.

DR. EHRMANN: Dr. Rosenberg?

DR. ROSENBERG: Just in terms of examples,

NOAA has cooperative institutes of cooperative marine education and research fisheries institutes, as well as joint institutes with OAR in fisheries and academia involved including the one at Woodshole and other places.

In terms of the workings of NOPP, it might be worth looking at some of the sort of broad, integrated programs that involve a lot of people from a lot of places like GLOBEC, why they work as opposed to others that don't. Some of that I think is, as Admiral Gaffney just said, dollars but there may be some other features as well.

DR. COLEMAN: We will take those into consideration and expand those.

DR. EHRMANN: Okay. People okay to move on?

Admiral?

CHAIRMAN WATKINS: It is really a follow up to the comments that have already been made to a certain extent. When you talk about, you know, the very first bullet you have here is true. Although we can't address all sciences, it is not within our mandate, we could certainly say that studies such as those run by the

National Academy of Sciences, the one in 1995 chaired by the former president of the National Academy, who tried to encourage the Federal Government to glean out of R&D science, science and technology -- that was the whole effort.

How do you do that? They made a proposal how to do that. Nobody ever picked it up. It is a terrific proposal and it was done by some very thoughtful people, that particular study, but it has never been given the time of day. It deals with such things as stabilizing the research base for a five-year program for non-defense agencies. It does a lot of good things.

I think that we need to say without us trying to defend it is that, "The National Academy has said

this in 1995, and nobody has done anything, Mr. President." We believe it is very applicable in our ocean area, but we don't see this working in the ocean area.

We don't know how you set national priorities in science unless you convert R&D to science. We know what R&D is. We can add that up. We can say this is the research base for mission-oriented agencies,

vertical stovepipe-oriented, except for the National Science Foundation. We can say this is the money we are spending in all of that. Is that prudent foresight? I don't think so.

Somebody ought to be saying, "Wait a minute, maybe NIH isn't the place to double right now. Maybe we should go to the other agencies that are also involved in human health. Every agency that has a science and technology portfolio has a portfolio on health, human health, so enhancing the quality of life is also important to us.

I am just saying there isn't any mechanism and we are victims of that in the oceans area. We can quote a competent authority and say, "We think that is

applicable in our area. That gets back to Andy's, I think, position that we don't need to defend ourselves, but let's use somebody else and say we certainly think it is applicable here.

Now, NOPP, being one of the founding fathers of NOPP I can tell you that the intent was to really be an important institution. They were pounding on the table for new initiatives that would look ahead, would

suggest the research base where we might be heading for the future, what is technologically feasible, and all that -- it hasn't happened. We just heard that here.

It gets no funding. It does not have the support within the administration, even though it has support in concept on Capitol Hill. For example, we don't even have the mandated baseline on which we can even start our investment strategy for this Commission. They wanted to get all of the information on what is going on in the oceans science and technology, and I can't get it in operations.

My feeling is that we can't get that information. We can't get the support for NOPP. And, unless NOPP has teeth in it, along the lines we talked

about here, it isn't going to work. The model is okay, but the implementation of that model has to have support at the highest level of government that says, "That is my group. That may not be the only group, but it may be a group for research. That group is important, and you have got to listen to them." When they say, "This is our research priority for the ocean," somebody has got to listen.

However, now the agencies are so shy of coming forward with any new initiatives that they won't do it. In fact, we have just seen the study that says all of this ramp up of NSF for new science is wonderful. Do you know where it is coming from? Eight other agencies.

We have seen those declines in real and current dollars that is very significant. You take the decline in all of those other agencies, and, voila, it opens up to the new growth in NSF. It is a zero sum game. Unless we have new investment in what we are doing, it is not going to work. We have got to be bold enough to say so.

I don't know where the dollars come from. All

I know is we are so underinvested in the oceans area, that we have got to address this as a major issue. I am bringing up NOPP as the victim of that process. We are a victim that ocean sciences doesn't have the time of day in the national priority setting.

How do you set it, if you don't know what the science and technology is? It all ties kind of together here. I just bring this up because it is a burning

issue with me on our inability to get there from here, even though our policy may be wonderful.

So, we have got to be strong about this. I think this model is only as good as -- people look at it today. You will get the academic community alone saying it is not working and many others say it is not working. It only has a $25 million base. Well, what is that? I mean, that is trivial compared to what the agencies are doing in the oceans. Well, it is trivial, but it is not a trivial management concept. It is a beautiful management concept, if it is given teeth.

Somebody says, "We want to hear from them. We want to give them money and let them try to allocate it," and that kind of thing. Whatever we do for a

coordinating body at the highest level of government, we had better give them teeth so that people are worried about them and will listen to them and that they can come up with new initiatives and they can get additional funds that we desperately need. Anyway, that is my soliloquy.

DR. COLEMAN: You are not passionate about the subject, are you?

(Laughter.)

(Simultaneous discussion.)

DR. COLEMAN: Thank you, Admiral. That was well said, well stated (laughter).

DR. EHRMANN: Staff, is that clear.

THE STAFF: (Nodding heads.)

(Laughter.)

DR. COLEMAN: Ken, you know what to do now, right?

MR. TURGEON: I knew what to do five years ago.

DR. EHRMANN: Let's go on to the next one.

DR. COLEMAN: Okay. The next one is obviously a very important one, because everywhere we have been we have heard the need for an integrated and sustained

coastal and ocean observing and prediction system. The first bullet up there just says we need this.

The group got together and we sort of, from a consensus basis, developed seven recommendations. The first one you see up there is to task the National Ocean Research Leadership Council to simply develop an inventory of what exists out there.

They are scattered all around the country --

some are private, some are compilations of several academic institutions -- some are funded by the federal government, some by state governments, so simply what exists out there, and to make suggestions of how we can integrate them.

There is actually a very good plan that has been put out by the National Ocean Research Leadership Council. We recommend to adopt and support that and just request that that requested $138 million be new funds. It has to be new funds. It cannot come out of existing funds.

If you will, go to the next slide.

(A slide presentation in progress.)

DR. COLEMAN: We recommend that NOAA should be

the lead agency. I am sure this will raise some eyebrows among some of the commissioners. There is a whole series of other agencies that have the capabilities to input into NOAA. However, you need someone to lead it and someone to handle the program. At the present time, NOAA is our recommendation. Also, then, you want to be able to leverage off of the Navy's ocean data capabilities and infrastructures.

We went to Bay St. Louis and they have the ability to handle huge volumes of data, and that is a good model there. We recommend that the other NOPP agencies -- NSF, NASA, et cetera -- have to be integrated into this overall structure.

The next one. We support NSF's Ocean Observing Initiative. It should be implemented in tandem and not go off on its own, integration again.

The next slide. There was strong feeling in our group that it would really be great from a national perspective if this could be a whole earth system: the ocean, the atmosphere and the land coupled.

We have a Weather Service that is doing a wonderful job, but it is separated, no archiving of the

data so we can't get climate from the weather that is being gathered. We have tremendous observations within the water column, but in other agencies.

Therefore, it would really be ideal to have a total system of land, air and sea. We need to make sure that it addresses the needs of a large number of multi-sectored users: marine operations, research, education and monitoring. It cannot be just a research tool, and

it cannot just simply be an operational; there are a large number of needs. Those are our major conclusions at this time that we reached consensus on.

DR. EHRMANN: Very good.

Comments? Dr. Sandifer?

DR. SANDIFER: Jim, I think this is very good, very specific. If we could go back to the one of NOAA being the lead agency, I have got a couple of comments or questions in that regard. We obviously assume that there will be a NOAA of some sort.

How does you working group visualize that NOAA could be the lead and be able to take advantage of the huge capacity that we saw that the Navy had and really get the level of cooperation and support necessary from

the Navy without the Navy having some degree of control as well?

I personally like the idea of a civilian agency being in control of the data stream. I also like using the Navy's investment because they have got a huge investment, public investment, there in this infrastructure. How do you see making sure that the civilian side, then, in fact, does get the leverage off

of that infrastructure?

DR. COLEMAN: Yes, that is a very good point. We debated this considerably. I think when we say NOAA should be the lead agency, just an overview of the program and try to integrate that among some of the other agencies. That goes back to the partnership aspect of it. There is no doubt that the Navy has a capability to acquire and archive the data. But, can they manage it in a public sector that would feed both the private industry, academia, the states, et cetera? That was our concern there.

DR. SANDIFER: As you develop this, can we as commissioners get a little more information from you as to how we can make this work. Personally, I was hugely

impressed. I had been at Stennis years ago, and had never gotten to visit out in San Diego before to see those capacities was quite eye-opening, both the data accumulation and the modeling capacities. I am concerned that the civilian side not lose control of the data.

Secondly, I do believe that if you are going to have a successful program like this on a large scale

some agency has to not only be tasked with it, but has to accept it as, for want of a better term, a mission from God. It has got to be a reason for being. And, do you believe at this point that NOAA is the agency to do that?

DR. COLEMAN: In my discussions so far and from my science advisors, that has been their recommendation. Obviously, we will develop the text that goes along with this, and, hopefully, we can support that.

DR. SANDIFER: Right. Thank you.

DR. EHRMANN: Dr. Hershman?

DR. HERSHMAN: Yes. Jim, thank you very much for this. Now here is a good opportunity for us to

think about what we were talking about in the coastal management area and this particular area. Given that the Regional Science and Management Center that we articulated is really designed to provide sort of information to managers at, let's say, the state and local level, which is where we were coming from primarily but it certainly could be federal as well.

To what extent would this system, then, be

designed in a way that it would be useful to them, or is there a need for another in between level of translating or brokering function between the observing system activity itself and the management community? When we come in with our recommendation, would it be that this one device here encompasses it all and becomes sort of the service unit for the local management organization, or do we think in terms of a separate translating or information service function for the management unit?

DR. COLEMAN: That is what we meant by a muliti-sector use of it, because there are coastal managers that need that information. Their needs are obviously different from the researcher. There is a wide variety.

Again, as you go through a coordinated body and we put this program together, this is where the priorities will have to be set. OCEANS.US has done a good initial job of identifying the needs of the users. That obviously needs to be continued in that.

DR. HERSHMAN: Just a follow up, if I could. Thinking now spatially, all that I have heard about these observing systems is that they are sort of in the

ocean area from the shoreline seaward. A lot of coastal management is the bays and the estuaries and the river mouths and all that. To what extent does it encompass that sort of near-shore landside area as well?

DR. COLEMAN: If you look at the existing regional ones now, a large number of them are in the bays and estuaries. In our mind, that is just part of the observing system.

DR. EHRMANN: Okay. Dr. Muller-Karger?

DR. MULLER-KARGER: Yes, thanks.

I think Marc brought up a couple of really important points, and one is that integration of this system with the weather system would really have a comprehensive global as well as local observing system.

Now, I am part of the science community that is hooking this thing up. I think that one of the mistakes the science community has done is that it has not involved really and openly and completely engaged the potential users and the stakeholders in the development of the concept. I think that that is something that I think needs to change, and it has to change in the short-term so that the long-term benefits

are really more clear to everybody.

I think that there are a lot of potential users at the state level, even within the federal operational agencies that don't even know what this is. I think that is a big flaw. I would like to see that we are very strong in setting that direction.

DR. COLEMAN: Okay.

DR. MULLER-KARGER: Also, because this has been designed by academics and scientists, I don't think we necessarily have cooked up an effective governance system. A big question in the minds of the people that should be worried about this is how are you going to manage it? Who is going to do what? I don't know if there is going to be part -- I hope it is part of the

whole governance system that is planned for under our report.

DR. COLEMAN: We will obviously go into the governance capacity more in detail in the text. Again, this is one of the reasons for using NOAA as the lead agency. They already handle the Weather Service so they have that experience, and so forth. Again, we think that is a very good model to base the entire --

DR. MULLER-KARGER: Yes, but just saying NOAA is going to do this doesn't mean that it is going to be integrated within NOAA.

DR. COLEMAN: No, I recognize that.

DR. EHRMANN: Dr. Rosenberg?

DR. ROSENBERG: I strongly agree with Frank's point about the risks of not involving the users, and of course the importance of involving the potential audience. The risk is, first of all, that it won't provide the products that are intended. Secondly, it is hard to imagine that the Ocean Observing System will ever get the support that it needs unless people see clear products which are not necessarily just academic or research products. Most of the discussion has the

tag line of every proposal, you know, "This will be important for coastal management."

DR. COLEMAN: Right.

DR. ROSENBERG: "This will be really important for fishery management," or "This will be really important," whatever it is. I mean, that is just a fiction, because there is no real serious discussion of it. I think we need to go well beyond that to figure

out a mechanism for continuing to develop the system that incorporates the sort of broad community of end users that are going to be there in an ongoing governance mechanism.

I also think that Paul Sandifer's comments are important. I agree that we need to utilize the resources that the Navy has built. I also happen to agree with -- I probably wouldn't use the word "civilian control" -- strong civilian agency involvement.

However, I am concerned that if you just sort of give the data management or Ocean Observing System lead to an existing agency or an existing entity, that you won't make a fundamental change in the way that we do business.

I think we actually need to have a fundamental change in the way that we do business in managing these data resources. There is no reason to suppose that all of a sudden the entities that have been managing data in a rather fragmented form, you know, the big lightbulb is going to go on and they are going to completely change their mode of operation.

There is some virtue in thinking about, even

if it is within NOAA, that you have created a new entity to specifically do this that has as its setup goals handling the observing system and the data stream, or if it is in the Navy, the same kind of thing for a very broad range of users with the kinds of interactions that we talked about. I just don't see it happening by telling an existing agency, "Do things differently."

DR. COLEMAN: No, I agree with that last point. I think the discussions we have had, and if we assume that our recommendation stays NOAA, it would be to develop a unit specifically for that within NOAA and then put some type of coordinating body over that.

As far as the acquisition data, again that "OCEANS.US." document, the full document, really I

thought did an excellent job of looking at the needs of the various sectors. Obviously, they all need to be flushed out some more, but it was not oriented solely towards academic researches.

DR. EHRMANN: I think Ken had a comment.

MR. TURGEON: (No microphone.) The plan was laid out by the Ocean Leadership Council, and it was called the "Wash Plan." It is calling for not a single

system, but rather this is going to be a federation of regional systems, some of which already exist at various levels of sophistication and operations from the embryo level up to something higher. That is one that we were involved with, it is the GoMOOS, and there are a couple on the West Coast. This is going to be a federation of those systems which will then provide regional products.

The thing is we want to get standardization of protocols and data streams. If they want to do something else, that is fine, but there are going to be standards which would then feed into the national system. They will have the capability to do this with the Navy data and use this data with the operational

fleet. I think we are addressing many of those questions.

DR. ROSENBERG: Well, I may be misinformed with regard to that, but at least those systems, regional or national, are primarily focused on physical oceanographic data and some chemical oceanographic data, and that doesn't help for a lot of the communities that I work with. So, when you talk about implementing it,

it is not the issue of regionalization, it is the issue of what should be included in that. Right now, that is not a very open discussion.

DR. COLEMAN: I will say again that "OCEANS.US" did address this whole biological area. The main point they had is that at the present time the sense is that many of them just do not exist. One of their recommendations is to initially put a considerable sum of money into developing these.

DR. MULLER-KARGER: I am aware of what you are saying, Ken. I want to emphasize that even though there is a statement or some document that says this will be a federation that is a federation without a constitution. It has no governance mechanism. There is no act of

leadership agency involved in that process, and so, you know, it is still a "brownie in motion" type of process.

(Laughter.)

DR. EHRMANN: Let me go to Admiral Gaffney, who has been waiting.

ADMIRAL GAFFNEY: Well, I am speaking as a commissioner now, not as the only federal clerk on this Commission.

DR. MULLER-KARGER: All "brownie in movement."

ADMIRAL GAFFNEY: First, the way the Navy handles data, the part that Jim is referring to, is fundamentally different than others. We don't handle live biological data, but there is quite a bit of biological data handled. The way we handle it, requirements and response to a very hungry and angry customer is fundamentally different than everybody else. That is one point to make.

In response to Paul, it turns out that the Navy has most of the data already. It is not the civilian side that has most and the Navy would take control of it, but it would be giving the civilians control of most of the data which the Navy now owns, in

fact 80 percent of which has been released.

DR. COLEMAN: I always like to get something for nothing.

ADMIRAL GAFFNEY: Yes, sir, indeed.

(Laughter.)

ADMIRAL GAFFNEY: In fact, MEDEA who studied this issue for over a year at every classification level possible on this planet wrote to

the vice president and said the crown jewels of ocean data on this planet are at the Naval Oceanographic Office, because it is both modeled and actual data combined, which gives you a whole global look.

One way to operate, and this offer has been made and actually is commented about in the MEDEA Report, that people from other agencies many of them, lots, not just one or two, could actually co-locate, co-operate these centers. In fact, that happens now, has happened with the commercial remote sensing program of NASA for years, where they are inside and you get to see everything appropriately cleared, and you can still get to do your job.

There is a tremendous infrastructure that if

you do not leverage it in the interest of good governance it could never been replicated. We are talking about probably in excess of a billion dollars over ten years in infrastructure that has been created. Not to take advantage of that, and by taking advantage of it I don't mean free and forget the Defense Department's mission, but paying only those marginal costs that are for things that are not the Navy's that the Navy isn't doing

already. I think there is a great savings to the government. I think that is all I have to say.

DR. EHRMANN: Okay. Ms. Borrone?

MRS. BORRONE: Ken said something in response to one of the questions earlier that struck me that I really think we have to go back to. I think it is your first slide where you talked about the need for an integrated observing system to address the area of coastal and ocean challenges.

I hope that as we come our final thinking on this that because this is likely to be one of our major recommendations we do what Andy was describing, and that is, really lay out what we think the national objectives must be that embrace both the military and civilian

requirements, thinking about the idea that we have been talking about all day, ecosystem relationships.

In my mind, it means that we need to describe what our overall national goals are, even if they are not being met today or in the foreseeable future, and then describe in the way we can not only the governance structure, but the agenda for future action that is both the scientific-based research as well as the

programmatic or governance restructuring that may be necessary to allow for the integrated civilian and military requirements. I really think we have to, as part of this first definitional step talk about those national objectives, and if they are biologic as well as others, then we need to say them.

DR. EHRMANN: Okay.

Andy?

DR. ROSENBERG: Just very briefly. I was concerned because the comment was, "Well, we are trying to develop the biological sensors so that you can include them here." What that says to me is, "Well, when you can turn the biology into physics, then we will be interested in it, otherwise we don't care, frankly."

(Laughter.)

DR. ROSENBERG: It says when you can collect the data in the same format, then it is useful, otherwise we are not interested. That is exactly the problem. If the Ocean Observing System is meant to observe physical processes, then say that and then let's decide how much it should be supported on that basis. But if you are going to use it as a broad ocean

observing tool for multiple users, then you can't approach it in that way.

DR. COLEMAN: Good point.

DR. SANDIFER: Just to follow up. Admiral Watkins is probably been even more vociferous than either Andy or myself in raising the concern at every single meeting where ocean observing has come up that one of the research needs that should be identified at a high level is the need for better mechanisms for observing biological phenomena and integrating those data.

I have got a comment I will bring on something later when you are talking about information systems that relates to that. Well put, Andy. I think the

Admiral has done it every time that we have forgotten to do it. He has made sure that that didn't get put aside. We would like to see that as part of your suite of recommendations, a specific thing on research needs on biological observations.

CHAIRMAN WATKINS: Okay. That is a very good point, a good point.

DR. COLEMAN: Very helpful.

DR. EHRMANN: Any additional comments on integrated system?

(No verbal response.)

DR. EHRMANN: Those are very helpful comments, and I think it is going to be clear to the staff about some of the things they need to follow up on. Next, data management.

DR. COLEMAN: Yes. The last one in this is data management. It actually is closely tied with the one that we have already discussed. All of the agencies, the private sector and academic collect data. Access to it, standardization just doesn't exist.

A major recommendation is, simply, to request a thorough study. We indicate here that the probable

and possible and best method is to go to the National Research Council review why the Navy has been so successful in acquiring data, archiving it, processing it, and then try to take that and make recommendations of how to apply it to the civilian data needs.

We need a body such as this to make recommendations for a national data management governance framework. We don't even have that existing

today. Every agency archives its own data, some even throw it away.

We need to even know an inventory of what exists right now. Locally, every university has some little archive group and every investigator has their own little archive. Again, we don't even have an inventory of what exists. Then, we need to develop recommendations for what should be invested in terms of both resources as well as human resources. We think that if a study like this could be completed that it would at least point the direction that our entire data management needs to proceed in the future.

DR. EHRMANN: Okay. Dr. Sandifer?

DR. SANDIFER: This is a specific topic I

wanted to get to. Jim, I would very much appreciate the consideration of the working group and the Commission as a whole to add a specific bullet -- I think this is an NRC-requested study or suggested study -- to include specifically in that study the development of guidelines for a bio-informatic system for marine biology.

DR. COLEMAN: That is a good point.

DR. SANDIFER: I have got a one-pager that you

saw me scrambling and sorting through every piece of paper I had here, and it is always the last piece of paper. That was provided to me by my request by the leader of an informatics systems at the Medical University of South Carolina, who is also beginning to work a little in the marine biological field. It provide me with a good little bit of background. I will send it to you.

My interest is really getting a little bit broader, and his is as well. How do we define what it is we need so that we can, in fact, take advantage of NOAA's system and even more importantly the Navy system, not only be able to generate the data and archive it someplace, but integrate it with other data and use it

for modeling purposes. If we do not have predicted capability, we really have very little knowledge out of it; we simply have information.

DR. COLEMAN: A very good point. If you will get that to Ken, I would appreciate it.

DR. EHRMANN: Admiral Gaffney, did you have a point?

ADMIRAL GAFFNEY: No.

DR. EHRMANN: Okay. No problem.

Ms. Borrone?

MRS. BORRONE: For the past decade until last year, I chaired the Advisory Council to the Bureau of Transportation Statistics. If I would make one comment about this, it is that as part of the study there needs to be a look at quality, methodology as it is applied as part of the architecture framing.

We also need to look at the idea that whatever is eventually proposed needs to incorporate the staff capacity to be able to help guide, instruct or develop the same capability in other institutions, both governmental and civilian, so that there is an enhancement of the level of quality as you are looking

at short- or long-term time series data gathering efforts.

DR. COLEMAN: Data quality is very important, I agree with that, yet it is the hardest thing to really sometimes assess.

DR. EHRMANN: Dr. Muller-Karger?

DR. MULLER-KARGER: Yes, thank you.

Again, I come from the science academic

community that suffers a grave disease, that is, whatever data I collect is mine; okay. I don't share it with anybody, except maybe when I publish, and even then--.

My concern here is that I would like to see a very strong recommendation. This has taken me years to come around in my own mind, but I think it is the right thing to do, to recommend that any federally funded research very strongly consider that these data are public and that the information on the data generated by these public funds be in the public domain. I think that is a very fundamental change in the way that we do business right now.

DR. COLEMAN: That is a very good point,

Frank. In fact, there are some agencies today that do require you to put your data into a standard format and send it to the appropriate agency.

DR. MULLER-KARGER: Yes, but those are very soft requirements. If you get an NSF Grant, you are required softly. I mean, there is no hammer that is going to come down on you to share some of the data within a period of two years with the NODC, for example.

There is no requirement to do that in any way or shape. I mean, it is a very soft set of guidelines and has no teeth.

DR. COLEMAN: No. We will frame a recommendation around that. As I said, there are some agencies, for example, I know Mineral Management Service, they put an incentive in that if you don't do it, you don't get any more money.

(Laughter.)

DR. EHRMANN: That's right.

Ken, yes?

MR. TURGEON: (No microphone.) I have a question for Frank. Having come from MMS, what you have said is true, but they have some time period in which to

turn that data in. When I was at NOAA, researchers at the end of a project had two years to turn the data into NRC. Are you thinking of a shorter timeframe?

DR. MULLER-KARGER: Yes. I would say as soon as the data are qualified as being good. I would say release it right away. I agree that some people think, "Well, this is my time. I have done all of the effort to go out there and collect this data. It has taken a

year to plan it."

I think that once the scientists determines that the data has been cleaned up and is of good quality that the data should be shared with the public. A lot of people don't realize, and really it takes a complete paradigm shift, how useful this is.

In fact, they would be lucky if anybody uses their data. For the most part, most of the data are not used by a lot of people, and that is part of the problem. The whole strategy that we are trying to deal with is that a lot of the scientists are collecting their own data for their own curiosity, and then maybe later it gets to be part of something else. But if you can share data that can be part of this observing

system, especially data that falls under an observing system --

DR. COLEMAN: Yes, an observing system.

DR. MULLER-KARGER: -- I mean, that has to be released immediately. Even other programs that are funded by the Federal Government, they are funded by you and I, you know, and I don't know why that data should disappear into somebody's drawer.

DR. COLEMAN: They told us in this Act to be bold. That is really bold. The academic community really has always been against --

DR. MULLER-KARGER: I am not making too many friends with this.

(Laughter.)

DR. COLEMAN: I know, I figured that.

DR. SANDIFER: Very quickly, though, there are some other models in the molecular genetics arena, for example.

DR. COLEMAN: Yes, there are.

DR. SANDIFER: The publication of papers in genomics literature requires the information to be deposited.

DR. COLEMAN: Yes.

DR. SANDIFER: There are some protections that are relative to intellectual property, but the data do have to be placed into an overall data bank and there is a reference number that is published, so that if there is a reason to access it, somebody else can get some access to it. I think there are some models that would be well worth looking at, Jim, and we will try to find

some and provide the staff help with that.

DR. COLEMAN: I wish you would because I know some of the models, but they all have a time, a year or more. I don't know of a model right now that says as soon as you collect data you turn it over. This also involves a lot of the data from private industry, and there is very little chance that you will ever get private industry to turn data over immediately, because it is competitive.

DR. MULLER-KARGER: No, I meant specifically federally funded programs.

DR. COLEMAN: Federal, okay.

DR. EHRMANN: Any other comments on data? Yes, Mr. Chairman?

CHAIRMAN WATKINS: Just to close out the thing, when the Cold War ended, at the Department of Energy we initiated for the first time cooperative research development agreements. It had been at other agencies, but this was the first time the Department of Energy with all of the national laboratories with the secrecy of the nuclear weapons program, and so forth, were not engaged.

To get engaged, was one of the most difficult kind of a task because of the very things we are talking about here: intellectual property rights, royalty, who owns the research, et cetera, et cetera. To get a cooperative research development agreement would take two years on the important cases; today, it takes to weeks. Therefore, there are lessons learned.

It seems to me our staff could well go outside the staff and ask for pros in this area. Unfortunately, we will have to include lawyers. Nevertheless, go out to the pros in this area and find out what has been done to lay the groundwork on an umbrella kind of a strategy that allows more rapid access to that information, addresses these issues that are real issues, and don't

just let it sit there. If we let it sit there, nothing will happen.

This was the most contentious of all of the issues that NOPP had to face when they went into the groundwork for an integration of ocean observing systems. Who has access? What are the protocols? Who owns the data? How about the international connectivity? Those things need to be looked at on an

urgent basis up front, otherwise this gets into shallow waters very quickly.

I would also encourage us to think -- I have used the term "data" before and gotten pinged on as opposed to information. It came up earlier. So, all I say is data management, the Navy is extremely good at taking scientific data and taking all sorts of other information -- and let me tell you this case, socioeconomic conditions in Puerto Rico.

They have a beautiful program, the monitor from up above says you are threatening your reefs, and they say, "We are not going to turn our people more and make more unemployment here, I'm sorry." Well, that is an important decision for somebody to know about rather

than just the science base.

I am saying that the Navy has the ability not only to take scientific data, they could take other data and fuse it into useful information, depending on what the user wanted. The user is sitting there saying, "We need that kind of information, we need this kind, this is different over here is an important component of it."

I think that is data. If I am wrong that that, then we need to say so, but I think it is data and information. We said that earlier. I would like to see that in here as well.

DR. COLEMAN: That is a very good point.

DR. EHRMANN: Let me ask before we turn to the last section, which is part of Chapter V in the outline on education, Ken, you and your folks, are there any other questions or clarifications for this part?

MR. TURGEON: That's fine.

DR. EHRMANN: Okay, all right. Then, let's go to this last one.

CHAIRMAN WATKINS: Continue on with Dr. Coleman.