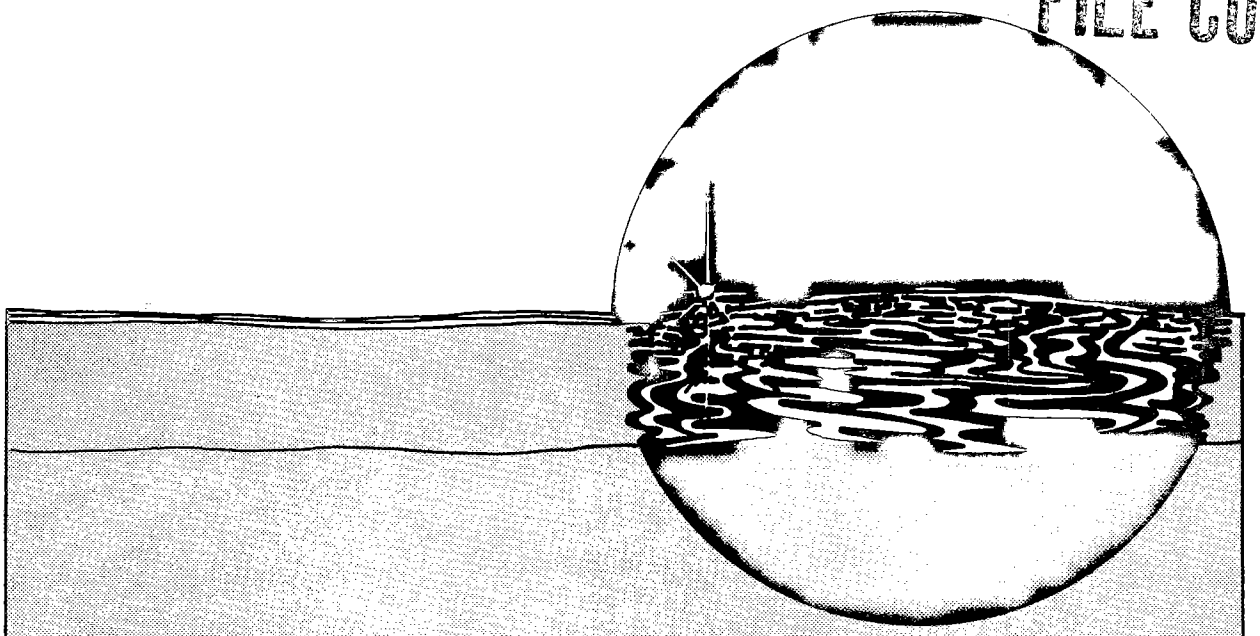

proceedings of the

Pacific Region Marine Education Workshop: April 22-27, 1979

June 1979

sponsored by
PASGAP - A Consortium of Pacific Region Sea Grant Colleges and
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PROCEEDINGS OF THE PACIFIC REGION MARINE EDUCATION WORKSHOP:

APRIL 22-27, 1979

JUNE 1979

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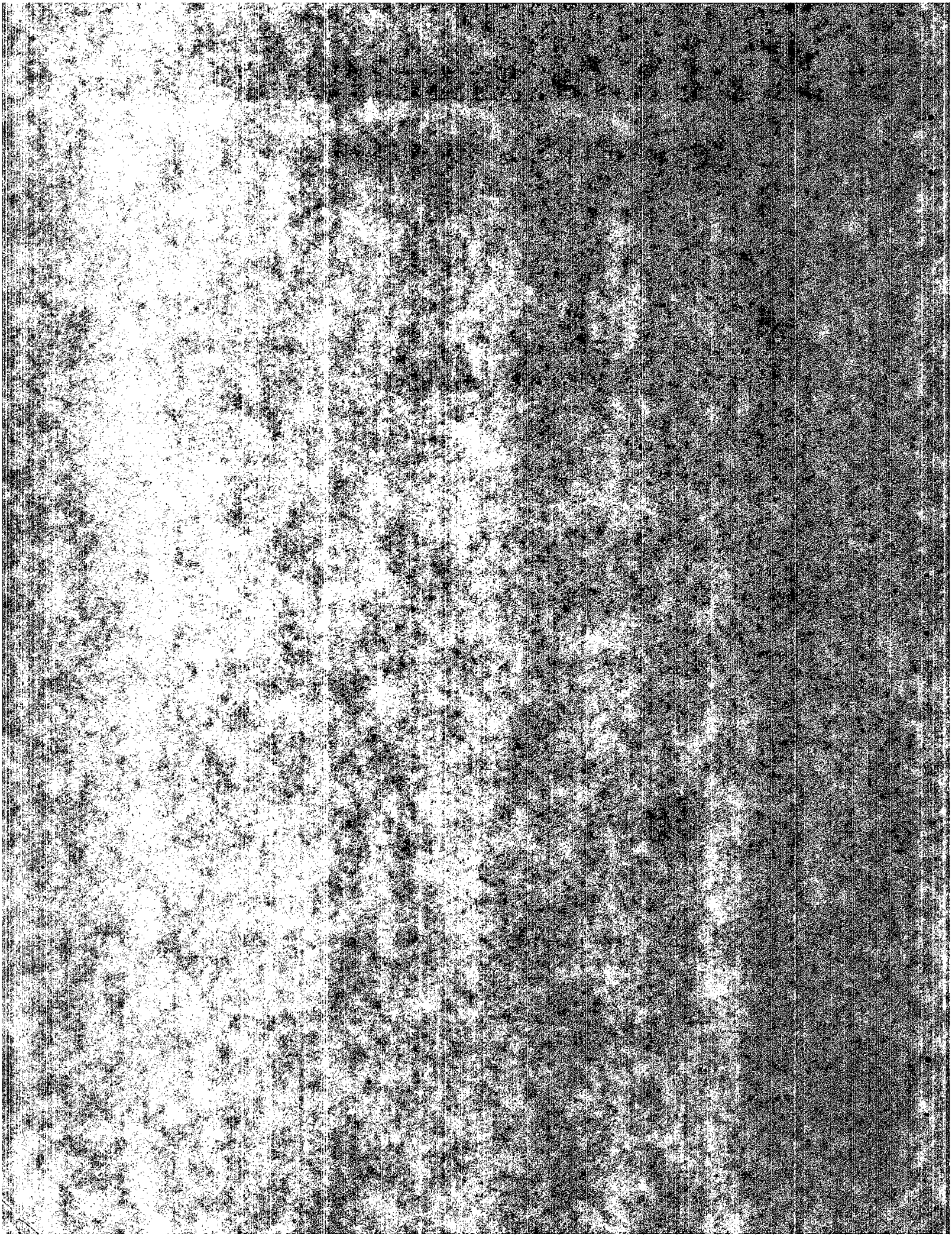

PREFACE

The result of the PASGAP Marine Education Workshop appears in this **Proceedings of the Pacific Region Marine Education Workshop: April 22-27, 1979,** *produced by the Publications Office of the University of Hawaii Sea Grant College Program, as the framework of each state's thrust in marine education. Also included are the texts of the two luncheon speeches by John Craven and Harold Goodwin. The 4-1/2-day workshop, held on April 22-27, 1979 at the Kuilima Hotel in Kahuku, Oahu, was designed to provide some relevant insights which paralleled a planning process which was the central focus of the total effort. It also brought together, or attempted to bring together as a team, individuals representing the three areas which must cooperate if innovation is to move into the existing educational system. This concept was not adhered to in the composition of all the six state teams, however.*

In attendance were also administrators, university faculty, teachers, Sea Grant people, consultants, federal agency representatives, and others in education, such as aquarium education directors. The mix of individuals, the skills they brought with them, and their native energy all interacted to create the plans for change which is contained in this Proceedings as the framework for the implementation of marine education for the six PASGAP states which participated. Through the sponsorship of the University of California Sea Grant College Program, it was possible for a team of educators to participate from the Palau Department of Education.

A related publication is the collection of the needs assessment of each PASGAP which was done by the team prior to their coming to Hawaii.

I wish to acknowledge with deep thanks, the time and talent shared by John Fry of Leeward Community College. Much mahalo to the members of the Planning Team, John McMahon, John Fry, Miles Muraoka, Judith Pool and Francis Pottenger for attending so many meetings so cheerfully. Special thanks to Brenda Melteff of the University of Alaska Sea Grant College Program for handling the fiscal matters so ably. The support of Senator Daniel Inouye in facilitating the communication with USOE is gratefully acknowledged.

Mahalo nui to Caroline Fazio and William Freyd who came from so far and gave so much and to all the staff and faculty of the University of Hawaii who shared so willingly.

Rose Pfund
Site Coordinator and
Chairperson, Planning Committee

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MARINE AND AQUATIC EDUCATION: NEW NATIONAL PERSPECTIVE

Harold L. Goodwin

To examine marine and aquatic education in terms of new national perspectives at first seemed a reasonable and manageable assignment. But, as I started to collect my thoughts, I began to wonder; what's a national perspective?

First, if it's the perspective of the nation as a whole, even a cursory reading of the daily press shows clearly that there is no national consensus on anything whatsoever. We are now a nation of confrontation among highly vocal minorities. If we're seeking perspective from Washington, that center of all wisdom and logic, we're in trouble. In the current energy jargon, Washington is suffering from a severe shortfall of perspective.

I finally concluded that I should try to give you my own perspectives, a sort of the-nation-in-perspective-of-marine-and-aquatic-education-from-a-busted-soapbox. So I've put together some notions that remind me of the old rhyme about what a bride wears: something old, something new, something borrowed, something blue. I'll leave it to you to decide which is which.

The task of marine educators, as I understand it, is to devise and put into operation the steps that will lead toward a marine-literate society. To advance toward our marine goals, we necessarily work within the framework of the society we are trying to influence. Our underlying assumption, or at least one assumption, is that, while we have turned away from the sea that nurtured our nation and made us great, we are still the same kind of people, and with proper understanding we will turn again to the sea. The assumption may still be true, but I wonder if our basic motivations have changed. Our primary motivations in becoming a sea people were first of all survival, then, as conditions improved, economic return--and both of these through self-reliance. Our forebears didn't create the great merchant, fishing, or whaling fleets and open the China trade because they sought adventure; it was because they wanted to make a living and they were a venturesome kind of people. This was a reasonable attitude. As Hendrick Van Loon said, "The history of the world is the record of a man in quest of his daily bread and butter."

The nature of the quest in our country seems to have undergone change, and the major change is in our essential attitudes. Without going into political and economic philosophy, consider the unarguable goal of eradicating poverty. To achieve this goal, the method which has evolved in recent years is economic redistribution, not economic growth. Yet, as Adam Smith preached, and our Founding Fathers understood very well, abolishing poverty by redistributing the world's goods or the nation's can never work because there is never enough to redistribute. Taking it away from the producers to give to the non or lesser producers destroys incentive and reduces the quantity to be redistributed.

If you wonder what this has to do with marine and aquatic education, consider this: a national ideology of economic redistribution can only be carried out by big government. Government, of course, is not capable of producing wealth. Government is a consumer of wealth, and the bigger it gets the more it consumes. When there isn't enough wealth for its redistribution policies, it makes the supply go farther by watering it down--inflating it. Government and redistribution can't expand indefinitely without more real wealth, and wealth can only come from business and industry. Keep in mind that there never has been a government-operated business that didn't operate at a loss.

The concept of economic growth has become unpopular in some quarters in the past couple of decades because it is equated with environmental problems or technology run wild. Yet, as our population expands--and it will expand for several decades more--if there is not economic growth there will be economic disaster.

So far this year, the government has proposed adding a new cabinet-level agency, the Department of Education. Coming up repeatedly is a plan for a Department of Natural Resources, so far unsuccessfully. Government wants to get bigger. Meanwhile, Senator Edward Kennedy, who is in a position to do something about his personal convictions, has announced that he is considering revision of the anti-trust laws to limit bigness in industry. Not to prevent monopolies, which is the anti-trust laws' purpose, but simply to limit bigness. This is at a time when economists, who seldom agree on anything, appear to agree that economic development now requires big business and big capital.

The sad thing about government reorganization is that it nearly always fails to achieve its purpose. The new Department of Education would not bring together all government education programs any more than the creation of NOAA brought together all ocean programs. There were 27 Federal agencies involved in the oceans when NOAA was created, and the last time I counted there were 32.

I think the new departments would simply follow the NOAA pattern. A new, high-level bureaucracy is created above the working levels--a very expensive level of non-producers, most of whom have the right to say "no," but few of whom have the authority to say "yes." This new level slows things down even more than before, creating monstrous new inefficiencies while not improving program operations at all. The new hierarchy has to justify its existence and it does so by creating busy-work which has no program purpose whatsoever.

But, to get on with it: one ray of hope is that a new agency may develop new enthusiasms. A new Department of Education would mean that, little by little, the real power in education will be eroded at the state and local level and will gradually accrue to an even greater extent to the new Federal department. What we should hope and strive for is the creation within the proposed new department of a distinct marine and aquatic education group, so positioned that it can bore from within like wood gribbles or shipworms.

A new Department of Natural Resources would absorb NOAA and we can only hope there would emerge at the new hierarchal level a senior executive who realizes that the nation has salt water on three coasts and that those oceans offer a great chance of economic development.

We're all ambivalent about government. We need it, or think we do, and on the other hand we don't trust it or believe its pronouncements. A little while ago we were told that the energy situation is the moral equivalent of war and we were called on to reduce our consumption. What happened? So far this year our gasoline consumption is up 5.4 percent over the same period last year. With gasoline lines already burdensome, we find the public blaming the oil companies and the government jointly and refusing to believe there's a crisis. Yet, there is no doubt whatsoever that it's a real continuing and worsening crisis that will take radical adjustment in our life styles. This is enevitable, because, no matter how the government tinkers, the law of supply and demand always takes control in the end. The days of cheap and plentiful petroleum are over. Period.

We could help ourselves and buy more time by exploiting more rapidly and efficiently our own offshore oil and natural gas resources, but there are two factors in the way. One is big government. The Office of Technology Assessment of the Congress made a study in 1976 that called for streamlining government decision processes. It now takes 20 years to develop an oil field and most of the delay is caused by government waffling or confused regulations. It is so difficult to get reasonable decisions on harvesting minerals, like the alluvial deposits off Oregon and Alaska, for instance, that American companies have given up and gone abroad.

The second obstacle is environmental groups that make both industry and government fight every inch of the way through the courts, holding up operations for years. I've watched the so-called Environmental Movement turn from a stark necessity to stop dangerous environmental degradation, to protest that is too often for the sake of protest, obstructing more from emotion than fact. The distrust of big business, big industry, and big government is such that the emotional arguments often carry the day; the assumption is that the protest must be right because government and industry are automatically wrong.

Let me cite the case of offshore petroleum production, fought tooth and nail by environmental groups, and under their pressures, by some local governments. Certainly oil pollution is bad. Very bad. This is not arguable. But where does oil pollution originate? The Environmental Research Laboratories and the NOAA MESA Program, with Sea Grant universities assisting, did a study on petroleum hydrocarbons in the oceans and coastal zone. Here's a summary of results:

The major source of petroleum hydrocarbons is petroleum transportation. If we combine all tanker operations including accidents, bilges bunkering and cleaning, and all other aspects of transport, we find that movement of petroleum and its products accounts for nearly 35 percent of marine petroleum hydrocarbons. Next, there are three sources of equal magnitude: natural oil seeps, like the one at Coal Oil Point off California; coastal industrial and municipal wastes; and hydrocarbons falling out

of the atmosphere. Each of these contributes 9.8 percent. The total for all three is nearly 30 percent. River runoff, which carries to sea the upstream discharges of petroleum wastes, is another major source accounting for 26 percent.

How about the terrible offshore production platforms against which the fight has been so long and hard? Offshore production contributes 1.3 percent of the total.

Overall, how contaminated are the oceans with petroleum hydrocarbons? To listen to some alarmists, the oceans are on the verge of dying from oil pollution. But the report says that most surface and near-surface oceanic waters have from one to ten parts per billion of hydrocarbons. Shipping lanes and some coastal regions have a bit more, but not alarmingly so; the magnitude is about the same. Ten parts per billion. That's the equivalent of ten drops of Vermouth in 500 barrels of gin--a very dry martini. Or, how about ten bad apples in two million barrels of apples. For junk food addicts, it's ten pinches of salt in ten tons of potato chips.

There are more than 10,000 offshore oil wells around the continental shelves, but so far as I can recall, there have been only five major polluting incidents, the most prominent in the Santa Barbara Channel where the wells are in a geologically unstable area that has produced natural seepage since long before the coming of the white man. The local Indians used to gather beach tar and make things out of it. Another incident was in the North Sea where Red Adair and his crew had to be called into action.

Sure accidents can and do happen, but risk must be measured against risk. If we continue to depend excessively on foreign oil, we'll be in much greater danger than from the relatively minor hazard of offshore production. By next year the exporting Arab nations will hold the greatest hoard of money every accumulated, more than 175 billion dollars. This amount is greater than the combined reserves of the United States, Japan, and West Germany. If that doesn't scare environmentalists into what Athelstan Spilhaus calls "ecolibrium," a sensible balance between environment and economics, then nothing can.

Don't misunderstand. I'm not opposed to the environmental groups. We need them as badly as we need economic development. It's just that we need both in a rational, sensible mix.

In *"The Need for Marine and Aquatic Education"* we produced at the University of Delaware, we pointed to the dangers of over-dependence on others for materials and oceanic transportation, but Athelstan Spilhaus went farther. He said bluntly that the United States is in a Second War for Independence.

We import 100 percent of our tin, 30 percent of our copper--and copper imports are growing and will soon exceed 50 percent--we import 50 percent of our lead, 40 percent of our zinc, and 70 percent of our aluminum ore. These are metals our industry must have to operate. Our exports are lead overwhelmingly by agricultural products, the nation's chief source of foreign income and the keystone of the plus side of our balance of payments. Keep in mind that all of our ocean freight, whether imported

or exported, must go by ship, and less than five percent moves in American ships. Spilhaus has summed it up better than I can, so let me quote:

> *I count about 13 basic materials without which manufacturing industries can't operate in our country. And if we define "dependence" arbitrarily as importing 50 percent of any of these, then we were dependent on four in 1950 and on six in 1970. By 1985 we will be dependent on nine. And by the year 2000 we will be totally dependent for almost all, except those things made of rock, sand, and vegetation.*
>
> *With these resources now coming in on foreign bottoms, do we not indeed return to the status of a colony? Others can turn off the spigot of our vital needs at the source, or they can cut off the transportation of these resources to our shores. Finally, they may impose blackmail prices constituting, if you will, taxation without representation--the thing we fought against 200 years ago.*
>
> *Should we not recognize the seriousness of this and admit that we are in a peaceful (hopefully) second war of Independence--a war for our economic independence?*

A question as a codicil on the Spilhaus statement: Do you know which nation has moved into ocean shipping most aggressively and successfully during the past few years? The Soviet Union, if you haven't heard. More and more of our goods are moving in Soviet ships. In one year movement of our goods in Soviet bottoms increased from zero to 1.8 percent, and the percentage is climbing because their rates are lower.

And if you haven't examined the sources of many of our critical metals, they include such stalwart, politically stable and reliable friends as Chile, Zaire, Rhodesia, Nigeria, and Jamaica.

We're not arguing for self-sufficiency; the real world requires trade, including imports of critical materials. But we can achieve a level of self-sufficiency that reduces or even eliminates the possibilities for strangulation or blackmail. Don't think we can't be strangled or blackmailed. There is already consultation among bauxite producers to form a cartel and control world aluminum prices. And when you next line up at a gas pump and see prices past a dollar a gallon, keep in mind that one religious fanatic triggered the latest blow and that other Islamic states are not immune to the same fever.

As you see Soviet merchantmen carrying more and more of the world goods, keep in mind, also, that the US government has helped the Soviets to take business away from our own and friendly fleets.

Incredible? You see, the Soviets have been most active in the North Atlantic, richest area for cargoes. There are price-fixing conferences regionally to prevent the kind of cutthroat competition posed by the Soviets and to keep subsidized fleets from undercutting those that must operate at a profit. Our Maritime Administration and State Departments pressured the Soviets to join the North Atlantic Conference, to persuade them to compete fairly. American firms participate in the conferences, and since the

purpose is price fixing, legislation in 1916 made them immune from anti-trust action. But just as the Soviets agreed to join the conference, the Justice Department announced that the US members might now be liable to anti-trust action in accordance with President Carter's deregulation policy. This, of course, could only result in a pullout of the American members--and the Soviets aren't interested in a conference without the US shippers. It's like government by the Marx Brothers or Laurel and Hardy.

If we could arrive at an equitable balance among government, industry, and environmentalists, think of the wonders we could perform to stimulate economic growth, protect and even improve the environment, and make the quality of life a little better for a lot people. I'm referring to the unthinkable--coastal engineering on a scale undreamed of by most of us.

By the year 2000, demographers tell us, more than three-fourths of our people will live in the coastal zone. Shorelines and facilities already are limited, but do they need to be? We can develop the knowledge and skills to re-engineer great sections of coastline, scalloping and building out for aesthetic and recreational purposes, adding hundreds, even thousands of miles of new beaches and recreational areas. We can build islands and great platforms for any purposes we choose.

Don't turn pale at the very idea. We've already done it on a small scale in many places, and done it well, improving the local environment through better tidal flushing, through plantings to stabilize dunes and banks, and through judicious placement of groins and moles to change local conditions. We've also done it very badly in a lot of places, either because we didn't have enough knowledge or we didn't care, but mostly because the activity had a political purpose.

Our many environmental problems in the past have resulted from lack of knowledge, lack of control or unwillingness to exercise control, and lack of an informed and activist public. We need a lot of new knowledge before we undertake to revise our shorelines, and we need wise and informed people in government at various levels who will exercise proper control for the public good. Of course I'm describing an ideal. Let's face it: control will be exercised for the public good only when the penalties for working against the public good become greater than the penalties for not taking care of the special interests. I use the term special interests to cover the spectrum, not only business and industry, but environmental extremists, government agencies, and all the other splinters that want to impose their prejudices on the rest of us.

If you think my attitude is that of an elder conservative, let me quote an extreme liberal who is also black, and a woman, that remarkable lady from Texas, Barbara Jordan:

> *This is the great danger that America faces, that we will cease to be one nation and instead become a collection of interest groups, each seeking to fulfill private dreams, each seeking to satisfy private wants. We must provide the people with a vision of the future that is attainable. We must strike a balance between the idea that the government can do everything and the belief that the government can do nothing.*

What we're really talking about under the guise of marine and aquatic education is simply education for citizenship. This used to be an education objective, and I think it needs to be again. If we have too much government, and I think we have several thousand times more than we need, there is also a void in our tangled code of laws: I think we need a law that severely penalizes qualified voters who do not vote. Other countries have such laws. Instead, our Congress passes ambiguous legislation that is interpreted to create overregulation by such agencies as HEW, which has demanded a stronger affirmative action program in Hawaii, ignoring the fact that the minority in Hawaii is composed of white males. Or, there is OSHA, which issued 43 pages of safety regulations for ordinary step-ladders.

Idiocy is not a realm inhabited only by Federal government. I have a report from Satellite Beach, Florida about an 11-year old boy who opened up a lemonade stand. I didn't think kids went into this kind of entrepreneurial activity anymore. But I was stunned to find out that the local government had closed him down. The reason? He had no restroom facilities.

Now, how does marine and aquatic education fit into the designs I've drawn on my soapbox? I think that marine education, if it truly takes its proper place in the educational process, can be the stimulus for a lot of positive things. If we revive our marine heritage we will also revive a sense of pride and accomplishment fringed with the romanticism needed by an essentially romantic people--because that's what we are. I think we can provide a new rallying point, a new national focus. Not soon, not right away, but as the youngsters exposed to a properly balanced marine education grow to adulthood and become leaders in industry, academia, and government at all levels, and in environmental and other important movements.

We might even hope for a revival, because of our sea heritage, of that old attitude that no limit existed for what was once termed "Yankee Ingenuity." Today we accept limits imposed by changes in the socio-economic system, but imposed even more by the attitude that technology is bad, that government is good, that wisdom and innovation reside in Washington. We are no longer the great innovators; we're the great cosmeticians. We're adept at making things look better for increased sales. The most frequent cry in commercials is "new, improved." Not different, not better, not longer-lasting, just changed by an insignificant percentage so the firm can yell, "new, improved."

In ocean energy, for example, the English are far out in front of us in developing systems to use wave power. The French are a decade ahead of us in advanced technology for use of tidal power; if we ever revive Passamaquoddy as a tidal power project, it will be with French bulb turbines. The Germans are far in front of us in the design of modern windships, using our own computer chip technology for computerized sail control for maximum efficiency. Very few of us in this country, and no significant voices in government, appreciate that there are trade routes around the world where sailing cargo vessels would have a large economic edge on the present cargo fleet. And, so I'm told, the Dutch and Norwegians make better and cheaper fishing trawlers than we do.

I believe strongly that a revival of our sea heritage through the educational system can help to restore our values and outlook. To revive our sea heritage means catching 'em while they're young. We speak of K-12, but I think the major emphasis needs to be K-6, with 6-12 and undergraduate education as finishing processes before specialization in graduate school. The present adult generation is an obstacle we need to overcome to truly marinate the curriculum. A small percentage can be convinced to join forces with us, but, on the whole, I think we can write off present adults as activists in the marine and aquatic education cause.

As to how to engage the young: emphasis on the humanities is the key. We need more emphasis on the humanities, and especially on language, than we have given to marine science.

Cultural enterprise, and cultural imagination, are fostered by ideas, concepts, shared excitements, and attitudes transmitted through words. Individual imagination derives from words. We think and conceptualize through words. Language shapes our outlook, our approach to the world.

Although we no longer realize it, we speak the language of a sea people. Our imagery is, to an astonishing extent, that of a sea people. Language and imagery are a vital part of our heritage, one to which even we, advocates of marine and aquatic education, have paid insufficient attention.

Listen to the President of Yale, A. Bartlett Giamatti, on the importance of language: "My theme is a simple one, that a curriculum embody the regard for language--read, written, or spoken--in order to assert the civic, not the technical, purpose of an education. Only if a curriculum sustains a shared core of values held by educated people through language can a free and mutually supportive people continue to flourish."

Giamatti wasn't speaking specifically of marine education, but the shoe fits and we ought to wear it.

In summary, my perspective on marine education is that it can become our most valuable instrument of change, a way to recapture our basic national values, to provide the stimulus for new national growth, to restore excitement to the learning process, and to accelerate educational change.

We need to use all our ingenuity and influence to ensure that the new agencies: the Department of Education and the Department of Natural Resources, if they come into existence, both have programs that will support and encourage marine and aquatic education. We have to do this in the very early stages, through any influential pressure points that we have, whether it is a member of Congress, a Chief State School Officer, or a friend in a key place. It won't be easy, but it must be done.

National progress, whether material, ethical, or spiritual, comes only through continually making the right choices. Our fields of choice have become too limited. We've lost our sense of unity and we've also lost our traditional values, placing them with semantic mush. We need the broad horizons of the global sea. We need to be reminded that we're

a sea people. Our base may be the land, but the sea was and ought to be our domain. If we truly master it and use it with wisdom, strength, sensitivity, and understanding, the benefits will be not only to us and the ocean environment itself, but to peoples everywhere.

To conclude, I remind you that we have lost a valued colleague, Bob Stegner of the University of Delaware. Our numbers are still small, and to lose such a stalwart hurts us all. In tribute to Bob, I want to read you his words, a poem called *Epilogue?* with a question mark, written more than a quarter century ago and printed in *The Biologist,* December, 1962.

Epilogue?

The ocean fascinates me.
This unique soup compounded life, once.
Man's genes swim there still,
And every day (or night) things come ashore
To look around for opportunities to eat
And live.

Man's overteeming billions soon must turn
To salty soup for food,
Where now we fish and gather as in Java
Long ago.
The sea can outproduce our fields by nine to one,
And feed a hundred billion Homo saps.
Is that what it is for?

It seems we'll travel space while yet
We only know one-fourth of earth.
Or maybe we'll expunge ourselves complete . . .
Tomorrow
To take a place with dinosaurs and dodos.
Will the ocean start again along the shore?

Could be some other watery planet . . .
In this business, too . . .
Will send a strange Columbus . . . Santa Maria!
Look at all that water!
Then HE inherits Paradise.
Isn't it a shame we waste so rare a spot?

What we had better do . . . right now,
Is figure humane limits for humanity.
And then we've got to know the genes we have,
So we'll know what to save.
Else this short airing scarcely dries the ears
Of humankind,
And we'll return in drainage to the sea.

Robert W. Stegner
Biology Department
University of Colorado
Boulder

HOW TO WALK ON WATER, HOW TO SWIM ON LAND

John P. Craven

Marine Affairs Coordinator, State of Hawaii
Dean of Marine Programs, University of Hawaii

The history of man may be characterized by a sequence of crucial turning points, which by the narrowest of margins divert the stream of history from one branch to another. Novelists have made careers on the speculation of the course of history if, for example, the South had won the Civil War, if Herald had not gotten shot in the eye, if Constantine had not adopted Christianity, if Muhammed had not married the boss's wife, if Moses had been left in the bulrushes, if Gilgamesh had perished in infancy, etc. It is in this vein that I would like to speculate about the nature of our world if at an earlier and more crucial turning point, the "other alternative" had taken place.

Let us suppose that early on in the evolutionary sequence that produced our land-dwelling Homo sapiens, one of our amphibious forebears had returned to the ocean in such a manner and with such effect that our world and our civilization would have developed in the sea instead of on the land.

Surprisingly enough, this seemingly drastic change in the course of history would have required only a small adaptation in human physiology. Indeed the major change would simply be that our lungs would be filled with water extracting oxygen dissolved in sea water instead of extracting oxygen from the air. The ability of mammals (including man) to accomplish this seemingly impossible feat had been fully demonstrated in the flooded lung experiments at Duke University.* It is thus no surprise that our blood has the same salinity that sea water had when our ancestors left the deep, and this fact is a major element in the success of the fluid breathing technique. In addition to flooding the lung, we would have had to develop or redevelop the gill. We do see in the human fetus vestigal appendices which may or may not have gill-type functions, and for the purposes of our fantasy these appendages would have developed and adapted to the function of carbon dioxide removal.

All of the activities of our land society would certainly have had their counterpart in the undersea world, but due to the properties of the sea they would be dramatically different. Communication would be by cable and acoustics instead of electromagnetics. Vehicle propulsion would be by buoyancy or by propellor and never by wheel. Indeed the wheel would probably have not been invented. We would use fuel cell batteries and nuclear power instead of internal combustion engines. Aquaculture instead of agriculture would be the primary means of food production. We would farm fish and hunt land creatures. There would, of course, be ships which operate at the free surface; there would be people who would remain in their secure flooded bulges and the above-water spaces would be *kapu*. Suffocation in those spaces would be as dangerous as drowning is today.

---

*Duke University was located in North Carolina, a state well-known for our carcinogenic product called cigarettes.

Populations would concentrate in the coastal zones as they do today because of the biological productivity of upwelling, but the land portion of the coastal zone and the inland would be as unpopulated as our ocean is today.

We could elaborate in detail on this mythical society but we can best understand it if we analogize using the events of today. Let us suppose that in the year 1979 this undersea society had a PALGAP (Pacific Land Grant Advisory Program) symposium on the subject of earthy education or land education. By virtue of his (or her) title it would have been necessary to invite the Dean of Terrestrial Programs or the Land Affairs Coordinator to give the luncheon speech. Can we imagine what this individual would have said in his high-pitched, dolphin-like voice?

We know that the first thing he would have said is that many people equate land education with earthography and land biology. He would point out that these are only sciences and it is in fact wrong to speak of earthography as if it were an all-inclusive science. There are in fact individual disciplines of earth geochemistry, geophysics, and geology. There is meteorology, high-altitude physics, climatology, hydrology, geography, earth zoology, entomology, mammalian physiology, etc. It would be a mistake to refer to scientists in those disciplines as earthographers or land biologists.

The speaker would say that the emphasis on science itself neglects the fact that the land is a place just as the ocean is a place, and everything we can do in the ocean we can do on the land. He would point out, however, that the systems would be very different. It would be his view that earth engineering was more important than earth science.

In fact, many people in the society regarded this speaker as slightly mad and as an unrealistic dreamer. He had the notion that mass transportation systems and even land-based cities could be built on land in the coastal zone. Most of his colleagues took the position that we have all the land engineers that we need and that most of them should work for scientists. They would say, "Our earthography land ships are the envy of the world." These colleagues were referring to a UNELS (University National Earth Laboratory System) fleet of dirigibles which, using oceanic technology, employed buoyancy propulsion and propellors to permit scientists to sail across the land some 5,000 to 10,000 feet above the earth. The dirigibles' gondalas were of course filled with sea water but they were otherwise configured with conventional winches, cables, trawls, corers, and unmanned vehicles for exploring the earth's surface. Any suggestion that the nation develop a "man on the land" program was rejected as being unnecessary and expensive.

Despite these eminent critics, the mad Dean would have persisted in his delusion. He would point out that the Army Above-Water Systems Laboratory in Kaneohe Bay had developed a vehicle with devices called wheels which used a novel but effective air breathing engine. Now the skeptics point out (and quite correctly) that such vehicles could not work on normal terrain and that it would be necessary to make a smooth path with concrete (a well-known material) or a relatively unknown substance called asphalt. It was also pointed out (equally correctly) that these paths would be prohibitively expensive (millions of dollars per mile) and that there was no one in the society with the necessary technological expertise to design or build them.

It was regarded as an even more absurd notion that structures could be built on land. The art of foundations was of course unknown and no structure had ever been designed to withstand earthquake, hurricane, tsunami, or weathering. In addition, the temperature variations on land were considered intolerable. There are temperatures well below the minimum ocean temperature of a few degrees centigrade and well above the maximum of 25 degrees centigrade. Any attempt to build a structure that could survive in such a hostile environment was deemed hopeless.

There were a few university professors who supported the Dean in his delusions. Some saw the possibility of waving fields of golden grain to supplement the miles of ocean kelp farms. Some saw land mammal husbandry to substitute farming for hunting. These proposals ran counter to the Land Mammal Protection Act which protected the horse and the monkey. Most citizens thought the ape clearly the equal or the superior of man in intelligence and they decried the senseless slaughter of deer and wild cattle. The humane and civilized members of society knew that whale steak and roast flipper of dolphin were the only civilized meats to eat and there was universal recognition that the cow was sacred.

In the face of the public perception, the mad Dean and his disciples realized that their dreams were indeed imaginary unless there was a massive program of public education from *keiki* (the *keiki* being the second crop of pioneer hybrid kelp) to *pau hana*. They realized that 75 percent of the high school students could not walk. Of those who professed such an ability, half could walk less than 50 yards and most of them could only wade. Now there was in the schools a program devoted to suffocation proofing which was reasonably successful. But the Dean and his colleagues realized that it was of greater importance to develop skill in rough land walking. The major danger was falling. It was often fatally surprising to those underwater denizens to discover that you could kill yourself in a fall of as little as 50 feet and to discover that severe damage could occur in falls of as little as 10 to 20 feet. You could even hurt yourself on a ladder. Such hazards were unknown in the ocean, where citizens would drop in for a visit from any altitude.

There were other strange hazards on land. It was easy to get a lethal electric shock; there were the dangers of sunburn, sunstroke, frostbite, freezing, and other strange hazards such as fire and explosion.

When faced with this litany of hazards, the Dean was not deterred. He pointed out that most could be overcome with simple precautions and simple skills; he cited the invention of SCOLBA (Self-Contained On-Land Breathing Apparatus) and he even pointed out that scientists at Duke University had demonstrated the ability of man to breathe with dewatered lungs.*

In his summary, the speaker concluded that the land was an environment on which man could live and move and have being; that energy could

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*Duke University was located in the underwater state of North Carolina--a state well-known for the manufacture of a legal but carcinogenic seaweed stick that released a pleasant vapor as it was melted in water.

be extracted from black rocks; that food from the land could be obtained through domestication of animals and harvesting of crops; that minerals and metals could be mined from beneath its surface; that aircraft could land on landports; that lawyers could develop a legal regime for the land; and that artists, poets, and musicians could distill aesthetic values out of spacious skies, amber waves of grain, majestic purple mountains, and fruited plains.

The PALGAP luncheon audience listened with faint amusement to this forceful polemic. They then voted to endorse a program of classroom studies where students could learn safely and comfortably in the wet. There would of course be a few classroom terrariums for laboratory purposes, and a copious film library featuring Lloyd Tunnels and Jacques Cousterre.

As for the Dean and his ideas for land learning programs, he was appropriately dismissed by one who remarked, "Look at his initials, 'J.C.'--he thinks he can swim on land."

FRAMEWORK FOR THE IMPLEMENTATION OF MARINE EDUCATION

Alaska
British Columbia
California
Hawaii
Oregon
Washington

FRAMEWORK FOR MARINE EDUCATION FOR THE STATE OF ALASKA

When we submitted our travel requests for this trip, a lot of people were skeptical. Alaskans in the legislature, university and other offices looked upon this meeting as a paid suntan vacation. When we return with no suntan and a 15-page plan for the legislature and university to act upon, they will wish we had brought back a suntan instead.

In order to understand our plan, you need to know a little about Alaska. Alaska extends from the temperate climate to the polar climate. It is a peninsular land mass with extensive coastline measuring more than 20,000 miles which translates into more than the coastline of the contiguous 48 states plus Hawaii. It also has more continental shelf than the other 49 states combined. It is known that the early settlers entered the new world over the Bering Sea Land Bridge. Even 18,000 years ago the new arrivals sustained themselves through marine resources. Throughout Russian domination and succeeding American ownership, the majority of the residents of Seward's Folly have continued to live near and off the sea. Traditionally, fisheries has been the dominant industry and is currently second only to petroleum. Even the petroleum resources are from the shelf or near shelf areas. It is estimated that over 50 billion barrels of petroleum are trapped under the continental shelf. It is apparent that the sea is vital to not only Alaska's but the nation's future. In addition to rich marine resources, the pristine environment of Alaska is an esthetic national resource which becomes more important to preserve as the population increases. This resource includes a richness of diverse Native heritages which must be taken into consideration when a statewide plan is developed. The foregoing presents a challenge in wise resource management. A challenge which makes imperative an aggressive marine education program for adults as well as for children. Therefore, in our planning process we identified two priority goals--marine education for K-14, and marine awareness for the general public. Under each of these goals we have identified several objectives.

Because of Alaska's unique circumstances, our first objective has been to develop materials around the Alaskan environment. To date, we have been preoccupied with understanding the Alaskan marine phenomena. As our first priority we have chosen the conveyance of this scientific knowledge to the present and future decision-makers--the citizens and students of our state--to bring to their attention the importance of the oceans.

Our second priority is to train school teachers to use this information in such a way that students begin to have a comprehensive understanding of the marine environment and its importance in human affairs; that is in the humanities as well as science and politics. This comprehensive view includes the way our Native populations have lived in complete harmony with the marine environment for thousands of years. Alaska has been experiencing a steady growth in population which has stressed the environment. In addition, the tourism industry has also expanded bringing more and more people to Alaska for short periods of time to enjoy its esthetic beauty and recreational opportunities. Therefore, our public awareness thrust has two targets: those permanent residents who need to be informed about the long

term use of the environment and the visitors who need to be informed on the short term recreational use of the marine environment. Under each of these objectives we have laid out activities over a 3-year span; for example, development of teacher in-service workshops, creation of marine related vocational education programs, the utilization of a computerized resource bank, and the identification of available funding sources.

Because Alaska's team has people representing the State Department of Education, the University teacher training, and cross cultural curriculum development programs and the marine advisory program as well as Sea Grant we were able to determine that a great deal of activity identified in the plan has already begun. In addition, there is consensus about the major goals and objectives for marine involvement in Alaska's education process. Despite the size of the state and other unique barriers, it is the commitment of this state team which will assure that this plan becomes more than just another piece of paper, it will become a vitalizing force for marine education in Alaska.

I would like to thank the entire Alaska state team for sharing their experiences and especially Hal Olsen, our facilitator, for his diligence in keeping us hard at work. Our state plan is currently pasted to the glass doors of my room. We would have brought them if we could have carried them. Anyone wishing more details on our plan is welcome to come by. On behalf of the Alaska state team I would like to extend our thanks for sharing experiences and having an opportunity to meet all the participants in this workshop and in particular we would like to thank our hosts, the University of Hawaii Sea Grant Program for their hospitality. Aloha in Yudik Eskimo is CHAMAI. If there are any questions, a member of our team will be happy to answer them.

FRAMEWORK FOR MARINE EDUCATION FOR THE STATE OF ALASKA

GOALS

1. Have a program in marine awareness for the general public in place
2. Have a program in marine education K-14 in the schools

OBJECTIVES

1. For at least one teacher in each school to have the opportunity for training in marine education
2. Marine education materials to create awareness of the marine environment in each school
3. Materials promoting marine awareness will be developed and distributed to the general public.
4. Expand marine vocational education program

PRIORITY SETTING

A. Marine education

1. Marine educational materials in each school
2. Teacher education opportunities for at least one teacher in each school
3. Assistance to schools in developing comprehensive marine education curricula
4. Expanded vocational training at post secondary level

B. Marine awareness

1. Work with adjunct programs so they will disseminate marine awareness materials to both youth and adults
2. Distribute materials to general public

ASSESSMENT OF WHERE WE ARE NOW ON A SCALE OF 0-5

1. Marine education materials

Some identification and classification	1
Acquisition	1
Some production	2
Distribution	2

2. Teacher preparation

Workshop	1
Formal courses	2
Consultation	3

3. Curriculum development

Statewide application	0
Use curriculum developers and teachers	1
Cultural materials	2
Needs assessment	3
Center network	4

4. Vocational training

Community college courses	2
Secondary school courses	3
Needs assessment	4
Resource assessment	5

5. Adjunct programs

Needs assessment for leader training	0
Workshops for leaders	1
Develop marine advisory materials	1
Marine advisory program	4

6. Distribution of public awareness materials

Distribution of public awareness materials	1

PROCESS FOR IMPLEMENTATION

A. Barriers to priorities

1. Teacher inertia
2. Teacher turnover
3. Geographic location and accessibility
4. Environmental diversity
5. Cultural diversity
6. Communication
7. School district autonomy
8. Lack of funds
9. High developmental costs
10. Fragmentation of effort
11. Limited personnel
12. Competition for student time
13. Student inertia
14. Teacher work load
15. Program competition
16. Lack of Alaskan materials

B. Barriers that can be dealt with

1. Teacher inertia
2. Communication
3. Lack of funds
4. Fragmentation of effort

5. Limited personnel
6. Program competition
7. Lack of Alaskan materials
8. Student inertia

C. Activities to overcome barriers in chronological order

1. Teacher inertia
   a. Existing: Useful materials, workshops, formal courses, visitation and consultation, teacher exchange
   b. 1st year: Teacher recognition, awards
   c. 2nd year: Grants

2. Communication
   a. Existing: Computer system, visitation and consultation, newsletters
   b. 1st year: Mailing lists for target groups, talent bank, PBS, interagency group, fund sources handbook
   c. 2nd year: ETV, translation of research results

3. Lack of funds
   a. 1st year: Identify sources
   b. 2nd and 3rd years: Redistribute by priorities

4. Fragmentation of efforts
   a. 1st year: Joint planning, Governor's policy statement, State Board of Education endorsement, endorsement of professional education association

5. Limited personnel
   a. 1st year: Identify contributing personnel, reassign present personnel
   b. 2nd year: Retrain personnel

6. Program competition
   a. 1st year: Improve marine education materials, teacher participation, teacher awareness on regional basis

7. Lack of materials
   a. Existing: Distribute existing materials
   b. 1st year: Across the board development effort, identify other existing material
   c. 2nd year: Rework existing materials, develop new materials, translate research results for school use

8. Overcome student inertia
   a. Existing: Camps, scholarships, trips, quality courses
   b. 1st year: Jobs
   c. 2nd year: Fairs, contests and awards

DISSEMINATION PROCESS

A. Target group: Students

1. What needs to be disseminated:
   a. Alaska specific marine education material
2. How it will be disseminated:
   a. Through school system
3. Resources needed:
   a. Alaskan materials
   b. Program developer
   c. Funds
4. Timeline:
   a. Present to 3 years

B. Target group: Teachers

1. What needs to be disseminated:
   a. Curriculum material
   b. Marine courses
   c. Teaching technique
2. How it will be disseminated:
   a. Formal courses
   b. Workshops
   c. Visitation and consultation
3. Resources needed:
   a. Teacher educators
   b. Teacher training material
4. Timeline:
   a. Present to 3 years

C. Target group: General public

1. What needs to be disseminated:
   a. Material on Alaskan marine environment and its resource development
2. How it will be disseminated:
   a. Through media
   b. Selective distribution
   c. Community education
   d. Community service courses
3. Resources needed:
   a. Alaska material
4. Timeline:
   a. Present to 3 years

D. Target group: Adjunct groups

1. What needs to be disseminated:
   a. Regional and local Alaskan material and activity
2. How it will be disseminated:
   a. Through existing organized group

3. Resources needed:
    a. Leader training
    b. Personnel to develop material and activity
4. Timeline:
    a. Present to 3 years

FRAMEWORK FOR MARINE EDUCATION FOR THE PROVINCE OF BRITISH COLUMBIA

We ended our statement on "Needs Assessment and Priorities for Marine Education" with the conclusion that the state of the art (or science) in B.C. is embryonic. The preliminary assessment conducted by Phil Moir uncovered a number of locally developed courses and materials which have evolved through the independent efforts of enthusiastic teachers--Barbara Klemm's "risk-takers." Also, Diana Rowles' review of the Provincial curriculum guides revealed considerable potential for teaching Marine Studies. Those of you who were able to attend our exemplary program session caught a glimpse of the fine work being done by Gloria Snively, Rod MacVicar and Diana Rowles in the conduct of marine-related field trips and projects. And, Glenn Sinclair, in his presentation on the Salmonid Enhancement Project, demonstrated that a) Government Ministries will invest sizeable sums for Marine Science education; and b) teachers will rally to support of programs or projects which involve them in the planning and decision making.

In going through the process of forming a committee, the question arose: "Who are we to launch a Provincial Team?" Well, we are "risk-takers" that's who! At this point our group is comprised of six people (three university, two school, and one private consultant) who are actively interested in advancing the state of marine studies; but we are not a "State/Provincial Committee." For instance, we noted earlier that our group lacks the important vertical element.

Thanks to Rose Pfund's advice, our group's deliberations were significantly enhanced through our Facilitator Frank Pottenger's thoughtful supervision. As Frank put it, our group sessions here have served to generate models for subsequent planning and implementation--a focussing and pathfinding process.

At our group's first Kuilima meeting we decided to call ourselves the Marine Education Information Committee. Our first decisive measure was to unanimously persuade Rod MacVicar, Environmental Coordinator for the Coquitlam School District, to serve as pro tem chairman of this ad hoc committee. Under Frank's watchful eye we utilized John Fry's "Planning Intervention Strategy" as a general model for guiding our discussion and got the process started. Suffice it to say we addressed the three Phases John outlined: Assessment, Processes for Implementation, and the Time/Goal framework--as well as a number of his other planning and sequencing recommendations, such as communications and public relations.

Circumstances are such that at this initial stage we must work from "the bottom up;" however, one of our main goals must be to alert and win over people in senior and key positions, particularly the Ministry of Education, Science and Technology, in order to more expeditiously overcome the array of obstacles; some of which we cited in our contribution to the "Needs Assessment" booklet.

In this initial phase of our developmental sequence we have identified the need to pursue a two tract (interrelated) program: Planning and Action Strategies. With respect to planning, we have resolved to: a) form a Provincial Team or Committee of from 10 to 12 members, with both vertical and horizontal elements. We see this team as being, as our Facilitator put it, a "critical mass;" and as the innermost of three concentric circles or orbits. The membership of the inner circle should be educators with demonstrated interest and commitment to Marine Studies. It might be comprised of a representative of the B.C. Ministry of Education, of the university faculties of education, of school district environmental coordinators, of school administrators, and equally important, of classroom teachers from several disciplines and several regions of the Province; and liaison will be maintained with PASGAP. Once in place this Provincial Marine Education Committee would advance the developmental process by systematically addressing: policy, goals, objectives, priorities, finances, resource materials, unit, course and curriculum development and implementation, evaluation and in-service teacher education.

One key early task of this permanent committee (which will have periodically changing membership) will be to select members of the second circle--Marine Education Advisors. Membership might be drawn from provincial universities, colleges and institutes, Federal and provincial government agencies, business and industry, students, and such educational agencies as the B.C. School Trustees Association, the B.C. Teacher Federation and the Educational Research Institute of B.C. Their involvement will serve to strengthen the evolutionary process toward: a) widespread awareness of the need for Marine Education; b) programs of in-service training for teachers; and c) the design implementation and evaluation of modules, units and courses.

The third or outer concentric circle might be labelled "Friends of Marine Education" (to employ a phrase offered by Glenn Sinclair) and would be comprised of any interested teacher, trustee, parent or student who wish to lend their support and become involved in the Marine Education Movement.

The Action track has already started; for example, the conduct of a three-day Marine Studies Fieldtrip to Bamfield Marine Station on the west coast of Vancouver Island this past spring. Gloria Snively, Diana Rowles and a Marine Biologist, Bill Austin, conducted a field-lab course for 17 elementary teachers. Two more week-end programs are planned for October. Also, under the aegis of the Marine Education Information Committee, and/or its immediate successor, we at U.B.C. are undertaking the planning for a major Symposium for May, 1980. We have alerted Frank that we will be inviting Hawaii people to come to B.C. and Vancouver and share their K-12 experience with us. We will certainly keep PASGAP members posted.

As a means of gaining visibility and a broad base of support among teachers and throughout the wider community, we have agreed that one key task in our over-all strategy, will be to secure funding (from industry, hopefully) for a periodic newsletter after the style of Alaska's excellent and useful *Tidelines*. Another important task, related to the purpose of the newsletter, is to facilitate local curriculum developers and teachers

currently working in Marine Education in the formation of a communication network.

Finally, our B.C. group would like to express our sincere thanks to the conference organizers, to PASGAP, and to the members of the other State Teams. We have gained a wealth of information and made many valuable personal contacts at these sessions. Listening to you review your problems, issues, and solutions has provided us with much needed perspective. The Marine Education challenge that faces all of us is complex and difficult--but, as John Craven implied in his fascinating presentation--it is imperative that we work together to build the educational programs necessary to insure that our children and youth, the succeeding generation, come into harmony with the aquatic and ocean environments.

FRAMEWORK FOR MARINE EDUCATION FOR THE STATE OF CALIFORNIA

The California State Team of educators has concluded that marine education, in order to be effective within the state education system, must be molded with formal and informal educational processes throughout the state of California. Toward the maintenance of a sensible, foresighted exchange between oceanic resources and society, California citizens must come to realize what the seas hold in store for them and why such knowledge is significant to them and to future generations.

California, a state with more than 1,200 miles of coastline, is in a prime position to influence the socio-economic state of ocean affairs, national and international. California citizens, therefore, should be motivated to knowledgeably involve themselves in the decision-making processes which now affect, and will increasingly affect the exploitation of marine resources and management of this substantial coastal zone area.

The marine world--its impact, resources, and economic potential--is the most massive component of our biosphere. As an element of the natural environment, the oceans should play as inclusive a role in an individual's overall education as they play in the balance of the earth's life forms, with the vitality and consistency upon which mankind depends for survival.

MAJOR GOAL

The major goal for the introduction of marine education into the public education system in the state of California is as follows:

> Marine education shall be considered a part of the environmental education plan for the state of California. As such, constructive marine education concepts will be introduced to all 58 counties of California, with a concerted effort to affect 50 percent or more of all students enrolled in California public schools, grades K-12. This goal is to be attained within a three-year period, beginning in the fall of 1979.

GENERAL OBJECTIVES

Major objectives to be facilitated toward the accomplishment of the overall goal are:

1. Selected multidisciplinary marine education materials will be made available statewide.

2. Adequate teacher training methods will be developed and implemented.

3. Public and community support for the plan will be sought.

4. California State and U.S. Government support for the plan will be sought.

METHODS TO BE UTILIZED

OBJECTIVE I. Selected multidisciplinary marine education materials will be made available statewide.

A. Through a statewide endeavor involving 14 interagencies, the marine education materials will be integrated with the environmental education plan for California.

B. Using the available environmental education materials, including marine education, curriculum specialists hired by the state will compile the entire environmental education "package," which will then be distributed throughout California schools.

C. Where manifest needs are expressed, an effort will be made to assist individual schools and teachers in the effective incorporation of marine education materials into the specific school curriculum.

D. Marine education materials will be introduced to the 10 statewide teacher resource centers, with encouragement toward the use of the materials, and assistance in their use. The materials will also be made available to other specialized institutions of learning, i.e., museums, camp programs, special education programs for the handicapped, YMCA programs, university training programs for undergraduate students, etc.

E. Assistance will be provided to specialized schools, such as magnet schools, in order to develop pilot or experimental programs using marine education as the backbone for all disciplines.

OBJECTIVE II. Adequate teacher training methods will be developed and implemented.

A. Encouragement will be given toward the propagation of imaginative use of marine education concepts, through inservicing, training of trainers' programs, and workshops. Through these programs, educators will be encouraged, using marine concepts as a vehicle, to allow students to expand their knowledge through inquiry. With this freedom to explore academically, the ordinarily "structured" learning environment will reveal the interrelatedness and personal values of overall scholastic pursuit.

B. Newsletters and other forms of regularly distributed forms of communication to educators will maintain the enthusiasm and flow of new ideas and techniques.

C. An annual statewide marine education conference will bring educators together to exchange experiences, ideas, and insights.

OBJECTIVE III. Public and community support for the plan will be sought.

A. Community and statewide media sources, such as newspapers, television and radio stations, will be tapped for exposure of marine education concepts, events, and progress.

B. Environmental and marine-oriented civic groups will be contacted regularly for their input, along with parks and recreation facilities. An effort will be made to provide materials for and assistance to these groups and facilities.

C. As provided by State Assembly Bill #65, local school site councils, involving school administrators, teachers, students, and parents of students, will be encouraged to adopt marine education programs for their schools, and to communicate their progress, ideas, and requests.

OBJECTIVE IV. California State and U.S. Governmental support for the plan will be sought.

A. License plate monies are available from the California State Department of Education for environmental education grant projects. Attempts will be made to utilize this resource to further the expansion and distribution of marine education programs.

B. An effort will be made to work with school districts in order that they may develop marine education project using Title 4-C funds.

C. Applications will be submitted to state, federal, and professional funding agencies for project monies.

Within the three-year period stated in the major goal, a network of communication will be established between universities, the State Department of Education, public schools, and community interest groups. All of the above methods will be facilitated through the state marine education coordinator, as selected by the Superintendent of California State Schools, Wilson Riles.

FRAMEWORK FOR MARINE EDUCATION FOR THE STATE OF HAWAII

GOALS

One important goal in Hawaii's marine education program is the coordination of the many seemingly fragmented parts of various community efforts in marine education towards commonly set purposes. Although there are other important goals listed in the State needs assessment and priorities identified by the DOE, the Hawaii State team has elected to address the problem of coordination.

OBJECTIVES

The following are chronologically arranged:

1. Prepare a statement which mandates a statewide marine education program for Hawaii.
2. Identify the different agencies and groups needed to coordinate the total effort in marine education.
3. Obtain agreement between these agencies that coordination is an important goal.
4. Develop a sense of ownership for this effort.
5. Have each agency inventory its educational resources and identify its clients.
6. Have each agency assess what it has done best in the past and can contribute to this effort in the future.
7. Obtain agreement among agencies as to where the educational gaps lie and to reassess their potentials for filling identified gaps.
8. Reach agreement as to the priorities to be used in filling the gaps identified.
9. Develop the support of external agencies, groups and individuals for accomplishing tasks, e.g., legislature and other funding agencies.

METHODS

The methods listed relate by number to the objectives. Those followed by an asterisk (*) are currently in progress.

1. State assigns a neutral agency to produce a marine education planning document.*
2. The planning document identifies agencies with marine education missions and responsibilities.*

3-4. The above agencies meet to:
   a. Clarify and adopt the planning document;*
   b. Establish ties with each other and remain in contact, e.g., newsletter; and
   c. Establish self-governing policies for the group.

5-6. Each agency will assess its own operations and determine its appropriate role and function in marine education.*

7-8. The agencies shall negotiate among themselves whenever expansion of functions is considered.

9. Support for nurturing and sustaining each agency's efforts will be obtained by meeting the criteria and goals of funding, legislative and regulatory agencies and through public relations efforts.

RESOURCES NEEDED

Resources will be determined as an outgrowth of the deliberations.

1. Money for current and expanded services
2. Positions
3. Policy directives

DISSEMINATION PROCESS

This process will be resolved through the coordinated planning process.

This process assumes the following:

1. Identification of
   a. Target groups
   b. Tasks, and
   c. Materials needed to accomplish those tasks.
2. Determination of who has
   a. Best rapport with the target group;
   b. Resources;
   c. Time or appropriate mission.
3. Negotiation for assigning the dissemination tasks at the various levels.
4. Establishment of an ongoing evaluation process.

FRAMEWORK FOR MARINE EDUCATION FOR THE STATE OF OREGON

GOALS

1. To have identified, selected, modified, and field tested existing marine education materials to be implemented statewide in grades K-12.
2. To have developed an implementation system to infuse marine education into the existing educational programs K-12 in Oregon.
3. To have designed strategies or techniques that will develop an awareness of the need for marine education statewide.

OBJECTIVES

1. Conduct an inventory of existing marine education materials within the state of Oregon to be modified for use in K-12.
2. Conduct an inventory of existing marine education materials in location outside of Oregon to be modified for use in K-12.
3. Select potentially useful materials/labs and have marine education committee modify them for use in Oregon schools.
4. Package and pilot test modified materials.

PRIORITY SETTING

Conduct an inventory for existing marine education materials within the State of Oregon.

ASSESSMENT

(for priority objective #1)

1. Have already completed a marine science curriculum survey in 57 Oregon schools.
2. Currently have a collection of marine science materials at Oregon State University Marine Science Center.
3. Selected community colleges currently have collections of marine science materials/labs.
4. Individual teachers across the state have marine science materials/labs files.

PROCESS FOR IMPLEMENTATION

A. Barriers to priorities

(for priority objective #1)

1. Logistical problems/barriers in assembling all the materials available.
2. Existing materials probably not in an easily retrievable form.
3. Teachers have little time and money to put materials in a proper retrievable form.

4. Teachers have a suspicion(s) or misunderstanding of the need for such materials inventory and thus do not respond to materials, surveys and inventories.
5. Administration at the State, District, and school level lack a perception of the need for materials inventory in Oregon.

B. Barriers to priorities that can be dealt with

1. The lack of perception of need for such an inventory by State, District, and school administrators
2. Reducing the suspicions or misunderstanding of classroom teachers as to why an inventory of marine education materials is needed and how it will be used.
3. Providing time and/or money for teachers to produce their marine education materials/labs in a proper format.

C. Activities to overcome barriers in chronological order

(for barriers that can be dealt with #1)

1. Submit/publish articles in school administration journals to raise awareness of the need for materials inventories.
2. Maximize the use of commercial television for building marine education awareness.
3. Conduct the programs at key administrator conferences/conventions regarding the need for marine education materials inventories.

D. Resources needed to implement activities

(e.g.: to conduct programs at key administrator conferences)

1. Personnel
   a. District Curriculum Director - $60.00 travel/per diem
   b. Charismatic lay person - $60.00 travel/per diem
   c. State department representative - $60.00 travel/per diem
   d. Classroom teacher - $60.00 travel/per diem
2. Expendable supplies
   a. Printed handouts:
      1) Directions for materials collection
      2) Statement of administrator endorsment
      3) Model/samples of materials to be collected and how used
3. Equipment
   a. Appropriate audio-visual equipment
4. In-service training
   a. One day training session of team
5. Other
   a. Activities packages samples

FRAMEWORK FOR MARINE EDUCATION FOR THE STATE OF WASHINGTON

GOALS

To have an operational plan to initiate and manage a system and its program that will deliver marine education.

OBJECTIVES

1. To have identified the operational systems for governance, development, delivery, and the substantive component of the marine education planning framework.
2. To increase the delivery of marine education to an additional 5% of teachers in the state per year.

PRIORITY SETTING

The single priority is to have an operational plan to deliver marine education.

ASSESSMENT

Priorities are currently on target in terms of the stated goal, having already completed the Washington State Marine Education Needs and Priorities report, collected available marine education resources, and produced a model planning framework.

PROCESS FOR IMPLEMENTATION

A. Barriers to priorities

1. The large amount of participation that is necessary for acceptance and support for a plan
2. Lack of funding
3. Geographic location
4. Lack of curriculum materials
5. Lack of time
6. Lack of reference materials

B. Barriers to priorities that can be dealt with

1. The large amount of participation that is necessary for acceptance and support for a plan
2. Lack of funding
3. Lack of curriculum materials
4. Lack of reference materials

C. Activities to overcome barriers in chronological order

1. Obtain the types and amount of participation necessary for complete development and implementation of the plan.
2. Involve potential funding agencies in the planning process.

3. Apply the development system included in the completed planning framework.
4. Define specifically and provide reference materials (MEMS).

D. Resources needed to implement activities

1. Personnel
   a. Planning coordinator
2. Equipment
   a. Reader
   b. Printer
3. Other
   a. Printing and materials necessary to describe the planning process
   b. Authority/credibility, acceptance by the state education office
   c. MEMS materials
   d. Other resource needs will be defined as the plan is actualized.