

The Underwater Mining Institute:  
Two Decades of Partnership

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## ABSTRACT

The Underwater Mining Institute, supported by the University of Wisconsin Sea Grant Program since 1970, has provided the bridge between academic, industrial and governmental workers in marine mining and exploration and in doing so has built a unique partnership of participants for two decades. The UMI has reported the evolution of this infant industry from the ideas of some 20 years ago, to the realities of marine mining, today. The Institute is more than an annual forum; it has, through the years, fostered cooperation, assistance and understanding amongst those who compose the marine mining and exploration community, both in this country and abroad. It has been the catalyst for forming the International Marine Minerals Society and the *Marine Mining Journal*, and for many joint ventures, business deals, research grants, service contracts and student stipends. Such rewards, coupled with the enthusiasm of its participants, have ensured the continuing success of this annual Institute and its recognition as a Sea Grant institution.

## INTRODUCTION

On 1-4 October 1989, in Madison, Wisconsin, the Underwater Mining Institute (UMI) celebrates twenty years of annual meetings that, through papers and discussions, has reported and reviewed the progress, plans, policies, problems, profits and pain in the growth of marine mining, both in this country and abroad. In approaching this milestone -- indeed, it is an anniversary celebration -- and considering that the UMI was born and nourished of the Sea Grant Program, our friend, David Duane, suggested that a brief essay on the UMI would be of particular interest to the readers of this issue of the *Marine Technology Society Journal*. Save the short note authored by Gregory Redden (1980), there is no published record of the, shall we say, catalytic effects of the Institute on its participants, through the two decades of its existence. While one might consider the many technical and scientific presentations as the principal contributions of the UMI, this is not the case. Through the years, the professional contacts and personal friendships, established through attendance and participation at the annual meetings, have led to many other substantive contributions. Indeed, the spin-off rewards have been largely unnoticed by the community, and, yet, these products of personal contacts at the UMI -- jobs, research grants, joint ventures, gifts of equipment, shiptime, sales of services and material, consulting retainers, scholarships, business deals, and not least, the exchange of data and expertise -- have been the lasting, tangible rewards of participation, and, as such, real contributions in themselves. It has been my pleasure to have been continuously associated with the UMI since it began, in 1970.

### THE EARLY YEARS: 1970-1975

The UMI began as an experiment in support of free enterprise. In the first institutional Sea Grant award to the University of Wisconsin, in 1968, one proposed research project, modestly funded, was focused on a geological and geophysical survey of Green Bay, Wisconsin, with Robert P. Meyer and the author as co-investigators. With our eyes open for potential resources, it became apparent to us, early in the survey, that the floor of Green Bay was covered with small manganese nodules. During this same period, several major mining consortia were exploring for (and finding) nodules on the floor of the Atlantic and the Pacific oceans. For university researchers 1500 miles from the closest ocean to find nodules in local waters of the Great Lakes --albeit, small nodules -- was a timely boost to the pragmatic side of the national and Wisconsin Sea Grant Programs. This initial discovery, coupled with our discovery of lode copper beneath Lake Superior, the following year (1969), soon came to the attention of mining equipment manufacturers in Milwaukee. No less important was the fact that the famous consultant, Dr. John Mero, was concurrently addressing the mining industry (and any others who would listen) on the vast seafloor mineral wealth of the oceans, notably the Pacific nodules. His observations *and* his multi-million dollar estimates caught the attention of the Milwaukee equipment makers, and by the winter of 1969-70, the stage was set for the first UMI, in 1970. With an annual business of \$200,000,000 in upland mining equipment, the potential for ocean mining equipment looked promising, indeed, to Milwaukee manufactures. Thus, when John Gammell, an engineer with the University of Wisconsin Extension in Milwaukee, Gregory Hedden, University of Wisconsin Sea Grant and the author were exchanging ideas on how we might bring ocean miners to Milwaukee, in order to rub shoulders with equipment

manufacturers, the concept of holding a conference -- in Milwaukee, naturally -- occurred to all of us, and the Underwater Mining Institute was born. At the time, we decided, a bit self-serving as it were, to emphasize *underwater* rather than *marine*, mainly to allow our Great Lakes' research to be included in the conference program. As an aside, I should also mention that, for some of us, the selection of Milwaukee was the prudent decision as a place to meet. Madison, Wisconsin, was a hot-bed of riots and building take-overs by students protesting the Vietnam war and the military-industrial complex. We felt safer in the beer and sausage town of Milwaukee. Even so, for the first three years of the UMI, 1970-71-72, the author made it a point to notify the Campus Police of each meeting, and always to have one or two graduate students stationed out in the hallway, so that we would not be surprised by a horde of angry protesters determined to take over the UMI and spray red paint on the captains of industry.

In planning the 1970 UMI, we established several ground rules that, in retrospect, were novel for the time, namely: (1) Speakers did not have to provide abstracts in advance. This allowed for the latest results to be given at the meeting; on the other hand, we didn't know what they would say. (2) Speakers' talks were not to be tape recorded and speakers could refuse to answer questions if such questions related to privileged data. This protected proprietary information; yet, it promoted candor in the informal coffee sessions later. (3) Participants were *encouraged* to conduct business deals, seek support, look for jobs, and, for academics, to pursue research grants, ship time, loans of equipment and student support, and (4) All attendees were invited to speak, candidly, as individuals, not as representatives of their organizations. In retrospect, these rules have stood the test of time, and they still obtain.

The first UMI, in 1970, had such stalwarts on the program as Vince McKelvey (Director of the U.S. Geological Survey), John Mero (international consultant), Charles Park (Stanford University's famous geologist), Carl Austin (U.S. Navy), as well as mavericks, John Steinhart, Ralph Harker and the author (University of Wisconsin). It was a spirited meeting, and the coffee and cocktail discussions turned out to be as informative as the formal presentations. Maybe more so. It was at the first UMI that Vince McKelvey cautioned the audience to view the deep ocean mineral resources as "potential mining targets for twenty years from now," but to consider coastal placers, sand and gravel as targets worthy of serious industrial attention within the next ten years. For the most part, his admonition was overshadowed by the massive research and development efforts being conducted by the international consortia seeking new riches from the deep ocean nodules.

At the end of the first UMI, several participants gathered in the back of the meeting room and urged us to hold a second such meetings in 1971. (The Milwaukee industry representatives were less enthusiastic. They had come to sell equipment, and, to my knowledge, not one order was placed.) We agreed that such appeared to be a good idea, and that we could probably schedule a second meeting in 1971, but only if we could find enough new topics and the speakers to present them. We did (FIG.1), and the 1971 meeting brought together, amongst others, two of the shining lights from the industrial sector: Jack Flipse (Deep Sea Ventures) and Raymond Thompson (Inlet Corporation). Flipse wowed the audience with a stirring presentation on mining nodules from the deep ocean. Here was not just a speaker; here was a *real* ocean miner. He and his team had done it.

On the same program, Raymond Thompson caught the attention of every person in the room with his plans, released for the first time at a national meeting, for a major exploration and mining program in Alaskan waters, seeking platinum and gold in marine placers. Thompson, moreover, provided prudent balance to the program by providing the substantive details, not just the words, for the several key issues related to management, financing and personnel. Here was the type of realist we needed at the UMI. In terms of spin-off, Jack Flipse became one of the most ardent boosters of the UMI through the years. He has supported the UMI in the highest circles of government, industry and academe. His genuine concern for young scholars pursuing research in marine minerals and mining has been manifested in letters, counsel, employment and financial aid. One of the practical results of the catalytic action of the UMI was the handsome research support given to Prof. John Noakes for seafloor nuclear surveys, by Deep Sea Ventures Incorporated, Flipse's company. Likewise, Raymond Thompson and his company, within a few weeks after the 1971 UMI, initiated grants for our marine placer research. When Thompson learned that the administrative wheels turn at a glacial pace in a university, he mailed us an Air Travel Card, and suggested that we buy the necessary tickets for students headed for placer projects in Alaska, and that his company would pay the bills. I soon learned that the Air Travel Card was also good for paying air cargo bills, and by the end of the field season, thousands of dollars had been paid with the card to cover shipments of mud samples, coring equipment, rocks and cores. Additionally, Thompson arranged for my students and myself to obtain weeks of free ship time on vessels chartered by his company, and to cover expendable supplies not covered by the university. Such support continued through the following 16 years, until Ray Thompson passed away in 1987. Clearly, the contact that we made at the UMI was a rewarding one for us *and* the marine research community. Beyond the tangible, the warm friendships between Thompson and all of us on the early Alaska research projects were rewards in themselves.

There was one other speaker at the 1971 meeting who, by the nature of his presentation, established a sense of freedom of constraint in UMI presentations. Willard Bascom, when invited to speak on the exploration projects of his company, Ocean Science and Engineering, replied quite directly that, if he spoke, he would tell the audience, in no uncertain terms, that OS & E had not found the riches in seafloor minerals that were *supposed* to be out there. We considered his comment, and then invited him to come along and speak, and to tell it like it was. His presentation was listened to with much attention by the entire audience, and in presenting the negative results of his labors ("All the Ore We Did Not Find"), Bascom injected an atmosphere of caution and prudence in the UMI program that has remained with us. Considering that the popular press of

the time carried reports of "billions of dollars of seafloor wealth", Bascom's words were sobering, but the balance between fiscal reality and promotional spirit was achieved. Realizing the importance of being objective, the UMI named the well-known and highly-respected Canadian mining geologist, Lorne Wrigglesworth as its program commentator, with the singular charge of reminding speakers and attendees alike, at the end of each meeting, that reality must obtain. The tradition has continued through the years, and has fostered the credibility that is vital to Institute meetings.

The early years of the UMI, 1970-1975, saw the introduction of several firsts, i.e., first times for truly new developments and discoveries to be reported publicly. With the UMI policy of not requiring written contributions in advance, speakers were, and still are, more prone to speak candidly. Some highlights from the early years are of historical interest. James Harding, in 1971, reported on the first results of the Oceanonics Inc. exploration program in Central America. Michael Cruickshank presented the first program for industry-government collaboration in solving marine mining problems, at the old Tiburon Research Center. At the 1972 UMI, Frederick Beck released the first, full description of Callahan Mining's successful seafloor lode mine in Maine coastal waters, and David Carnes gave the first report *with production data* on the very successful underwater barite mine in Alaskan waters. Here were two ongoing, profit-making marine mines, and the details of each were heard for the first time by the UMI audience. As a rare treat, Paul Cardwell of Deep Sea Ventures revealed, for the first time, the details of his firm's nodule processing systems, including some critical data on processes not yet patented. The highlight of the 1974 meeting was William Siapno's presentation of data, again a first, on the metal values in nodules, and first details of the potential mine site at 10 N., in the Pacific (FIG.2). In only four years, UMI presentations had gone from planned projects to actual mining in the shallow waters and pilot mining in the deep ocean. The shadow of Howard Hughes' mystery marine mining venture was present at the 1974 meeting, and while the general public only knew what was in the press, James Comstock spoke on the "actual" engineering. By the time of the Sixth UMI, 1975, marine mining was on its way. The 1975 UMI saw the first foreign presentation -- the Canadians had been represented every year; hence no one considered them foreign -- when Harry Van Den Kroonenberg spoke on new marine mining systems. Harry's talk gave the UMI visibility abroad, and for each year since, there have been several foreign participants. In short, the 1970-1975 period was one of growth, enthusiasm, early projects in the industrial sector *and* a sense that any problem faced by marine miners could, and would, be solved, and discussed at the UMI. The early years also saw the affiliation of our long-time colleague, Gregory Hedden, as Institute Coordinator. Until he retired in the early eighties, Greg Hedden shouldered all the administrative burdens, balanced the accounts and, yet, found time to personally meet and greet each and every attendee by name.

## **THE MIDDLE YEARS: 1976-1984**

The first alert to problems on the horizon, for the marine mining community, was sounded at the 1976 UMI. Richard Bilder (University of Wisconsin) addressed the participants on "Law of the Sea-Aspects Related to Ocean Mining", and in the discussions after his talk, it became clear to all, notably the deep ocean group, that there were serious problems ahead. The new intentions of the United Nations would, for sure, present constraints to open-ocean mining. Likewise, the first

serious recognition of environmental concerns over marine mining was expressed by two speakers: Professor Robert Owen and Dr. Oswald Roels, both academicians. Nonetheless, successful marine mining ventures continued to be reported, e.g., John Murgas' presentation on the profitable heavy media separation system used by Chromalloy at its profitable seafloor mine in Alaskan waters, and the encouraging remarks made by Prof. Eugene Cameron (University of Wisconsin) in support of marine mining. Coming from the dean of American economic geologists, and an uplands mining specialist, Cameron's support was noted far beyond the UMI meeting hall. In 1977, continuing concern was expressed for the environmental and international legal problems facing marine miners. Leigh Ratiner, the famous international legal specialist, spoke on the 1977 Law of the Sea Conference, and alerted the UMI audience to further problems, most of which, unfortunately, materialized. The environmental scene, cloudy at best, was very candidly discussed by Paul Swatek, an officer of the Sierra Club. Swatek's admonition that marine mining must be conducted in such a way so as to protect the environment was a far softer appeal than the hysterical cries for *no marine mining* being heard in those years from the environmental awareness community in general. In that most companies were equally concerned with the environment -- clean mining is profitable -- a bridge of understanding between industry and environmental groups was easily built at the UMI.

In 1977, in light of expanded national interest, the UMI began to hold meetings outside Wisconsin, with meetings in Seattle (1977), San Diego (1978), Galveston (1979), and Savannah (1980). Taking the UMI "on the road" provided new opportunities for the attendees, mainly to visit local laboratories where marine minerals research was in progress, and to meet the researchers. Since 1977, the policy of moving the annual meeting to different cities has been followed, with a return to Madison from time to time.

Some highlights from the middle years include the 10th anniversary meeting -- a sure sign of continuity -- as well as several milestone papers on advances in the science and technology of exploration, research and mining. Andre Rossfelder (1979) released, for the first time publicly, his South Pacific exploration results. James Kosalos, in 1979, presented an entirely new concept in integrated exploration systems, and David Cronan (Imperial College), in 1980, presented early, unpublished, data on the Red Sea deposits. By far the most important of first public presentations in this period were those by Alexander Malahoff (then at NOAA), William Normark (USGS) and Peter Rona (NOAA) on their frontier discoveries in sulfide mineralization. At the 1982 meeting sulfides replaced nodules as the prime topic for discussion. It was a notable turnabout, the end of an era.

We have spoken of the catalytic effect of the UMI, and the middle years of the Institute witnessed two significant developments. There was, through the middle seventies, the problem of finding a suitable outlet for publications on topics germane to marine mineral resources, as well as a means for communicating news items, technical notes and similar information amongst members of the community. In our discussions with UMI attendees, namely Jack Flipse, Michael Cruickshank, William Siapno and John Mero, in the mid-seventies, it was the consensus that a new journal was both

desirable and needed. Thus, when in subsequent discussions with the New York publisher, Ben Russak, we were invited to help organize and edit a new journal, it was a logical move to do so, and to announce it at the UMI. Mr. Russak attended the Spokane meeting in 1977, announced the new journal, *Marine Mining*, and made the first call for papers. The UMI audience responded with enthusiasm, and the new journal was born. Likewise, discussion at the 1978 UMI led to the initial announcement of a new professional society. With its roots in the UMI, the fledgling society grew, and by early 1988 the International Marine Minerals Society had been fully organized, had elected officers, was legally registered as a non-profit organization, and has a roster of members in the United States and seventeen foreign countries. Without doubt, the UMI was the catalyst for the formation of *Marine Mining* and the IMMS.

At the 15th UMI, in 1984, sulfide topics dominated the program, with presentations by John Delaney (University of Washington), William Normark (USGS), Michael Knuckey (Falconbridge Mines) and Dallas Peck (USGS). Although there was a spirited enthusiasm for the new sulfide discoveries, there was a sense of serious concern over the economic indicators that were suggesting a downturn in the minerals industry. The signals, alas, were real.

## **THE RECENT YEARS: 1985-1989**

From the early days of the UMI, our friends north of the border had been regular attendees, challenging speakers and loyal boosters of the Institute. They still are. Thus, when David Pasho, Gordon Gross and Lorne Wrigglesworth invited us to hold the 1985 meeting in Canada, we accepted and, in doing so, the UMI went international in more than topical coverage. The 16th UMI, in Halifax, focused on Canadian activities and developments, but it also included a session on international developments. It was, in all respects, the most lavish gathering of the Institute to date. Attended by high-ranking government Ministers, who, after their addresses, drank beer with miners, graduate students and mud guessers, all boundaries were crossed, not just the border. The 1985 meeting, again a catalyst, brought about new contacts for cooperation between researchers, joint venture partners, and agencies on both sides of the border. With 31 presentations, it stands as having the largest program for any UMI, to date. The Halifax meeting also saw the first large contingent of European attendees at the UMI. In reviewing the highlights of the 1986, 1987, and 1988 meetings, the following are noteworthy. Robert Woolsey, at the Biloxi meeting, discussed, informally -- at the bar, as I recall -- plans for a new marine minerals research center at the University of Mississippi. Having long championed this ideal with our colleagues at the UMI, it is a genuine pleasure to report that, as of late 1988, the idea discussed in 1986 is now a reality: the new Marine Minerals Technology Center is in business. The new Center has a continental shelf component at the University of Mississippi and a deep ocean component at the University of Hawaii. Further, Prof. Woolsey and other officers of the International Marine Minerals Society, at the 1987 UMI, in Newport, Oregon, agreed to make the UMI their annual meeting site for conducting Society business. Then, as spin-off opportunities, the UMI, in 1988, served as a meeting place not only for the MMTC and IMMS; but, also for the Placer Research Group, the Editorial Board of *Marine Mining*, graduate student job interviews, two joint-venture business meetings and, not least, the UMI Program Committee.



From a small gathering of 36 attendees and eight speakers in 1970, the UMI has come a long way. It has done so because of the key people: the participants. With broad-based support from the National Sea Grant Program, from the industrial sector, from academe, and continued sponsorship by the Wisconsin Sea Grant Institute, success and continuity are assured.

Highlights of the two most recent meetings include James Kosalos' report on the new swath mapping system developed by Jim and his associates in Seattle, presented at the 1987 UMI in Newport, Oregon. Kosalos, as a student attendee at the early Institute meetings, met John Shaw (International Nickel Co.) and was invited to join INCO's nodule program. Thus, the cycle of an early student attendee becoming a speaker years later illustrates the value of student attendees at the UMI. Also at the 1987 UMI, Charles Morgan, a former student attendee at early UMI meetings, spoke on manganese crusts. His career has been another student-to-professional history, with his first employment coming from contacts made at the UMI, in the early seventies. For many former students engaged in marine minerals research and development, attendance at the UMI has led to career employment. The 1987 meeting had one other highlight of particular importance to the marine placer community. Richard Garnett and John Ellis (West Gold Co.) presented a special report, for the first time publicly, on the very successful placer gold mining operation in waters off Nome, Alaska. Here, almost 20 years later, was the evidence that marine mining was real and profitable. For the UMI attendees who had followed the history of placer studies reported through the years, this report received much applause from the audience. Another idea-to-production program had been accomplished *and* the results *first* shared with the community, at the UMI.

One particular presentation at the 1988 meeting brought home the fact that marine mining is now taken for granted. Whereas in the early seventies marine mining ventures were usually reported as *potential*, when Mark Bronston (West Gold Co.) spoke on developing marine placer mines in the Arctic, he spoke on real mines. We look forward, increasingly so, to more real-world reports on active mining developments, as the UMI, year by year, follows the evolution of the industry. With the presentations by Bronston and others of recent years, the partnership of industry, academe and government -- long fostered by the UMI -- has proven to be a lasting one.

## **THE FUTURE: 1989 AND BEYOND**

As I prepare this brief report, plans are already underway for the 20th anniversary celebration meeting of the UMI, 1-4 October 1989, in Madison, Wisconsin. With continued support by the Sea Grant Program of the University of Wisconsin, the Marine Minerals Technology Center and the International Marine Minerals Society, a program of outstanding speakers is being assembled. The technical sessions will include timely reports on new developments globally in nodules, placers, sulfides, phosphates, exploration techniques, mining methods and policy concerns. As appropriate for a 20th anniversary celebration, we will ask three or four of the early UMI participants to review our progress and to give us a heading for charting our course ahead to the year 2000. Not least, we will welcome back those early pioneers in marine mining who, so

long ago at the early UMI meetings, shared their expertise, their dreams and their concerns will all of us. A bit of nostalgia, yes; a sharing of wisdom, absolutely. But, most importantly, we will welcome aboard those younger UMI participants, from industry, academe and government, who will carry the UMI partnership ahead for another twenty years.

## CONCLUSIONS

In assessing the first two decades of the Sea Grant-sponsored Underwater Mining Institute, we make the following conclusions. The Institute has become the only continuing annual forum specifically focused on new discoveries, research, development, technological advances and problems directly related to marine mining and exploration. Through contacts developed at the Institute, members of the community have benefited from opportunities for new jobs, business, research support, exchange of data and new knowledge. For the modest funding provided by Wisconsin Sea Grant '80-82 the UMI has many positive achievements as a matter of record. The wise development of marine mineral resources, both at home and abroad, has been, and continues to be furthered by the Institute and the people who participate in it. Lastly, the partnership forged between industry, academe and government is, we judge, ready for another two decades. So is the UMI.

## REFERENCE

Hedden, Gregory J. (1980) The Underwater Mining Institute -- A Decade of Partnership; *Marine Mining*, vol. 2, No. 3, pp. 251-256.

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