

UNIVERSITY-NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

An association of Institutions
for the coordination and support
of university oceanographic facilities

3 August 1981

To: Advisory Council
From: Derek W. Spencer
Subject: Radioactivity on UNOLS vessels

Attached is some background material on the radioactivity issue. I am preparing a position paper for UNOLS which I will distribute to you on or before the Advisory Council Meeting.

The Conflict

Radioisotopes have become an essential tool in the investigations of many ocean processes. Studies of both natural and fallout radioactivity have revealed, and will continue to reveal, details of ocean circulation, biological and chemical interactions within the ocean and fluxes of materials through the ocean. At the same time, the use of artificial radioactivity as a tracer of biological and chemical processes has become an almost indispensable technique. A conflict arises, particularly with ^{14}C and ^3H , between artificial tracer studies, which require relatively large amounts of radioactive chemicals to be present on a vessel, and ocean studies in which exceedingly low levels of activity are to be determined on samples of sea water or sediment. Careless use or disposal of the tracer chemicals could cause a severe contamination problem for the ultra low level measurements.

The Facts

- 1.) Most tracer studies utilizing ^{14}C or ^3H require amounts of radioactive chemicals whose activity ranges from 10^7 to 10^{11} greater than the precision currently required of low level measurements. A very small amount of this activity could be a problem.
- 2.) There is no evidence that documents that any UNOLS vessel is contaminated with radioactivity beyond the level to be expected from normal use. (i.e. with no deliberate introduction of artificial radioactivity) But, with the exception of recent extensive swab testing of the R/V's MELVILLE and KNORR there is no evidence that they are clean.

Radioactivity on UNOLS Vessels

- 3.) Both artificial tracer studies and low level activity studies will continue to be important and necessary components of our service for the foreseeable future.

Best wishes,

Derek W. Spencer

Enclosures: ATTACHMENT I - Partial set of correspondence prior to Feb. 13, 1981 meeting at SIO
ATTACHMENT II - Feb. 13, 1981 meeting at SIO to discuss radio-isotope problem
Report of meeting and follow-up correspondence
ATTACHMENT III - A new development - Chemists' use of radio-isotopes on MELVILLE

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ATTACHMENT I

GEOLOGICAL RESEARCH DIVISION

November 11, 1980

TO: W. Nierenberg, Director

I was appalled to learn, completely by chance, today that use of artificial C¹⁴ has been authorized on the Melville during Vulcan Expedition. In fact, it has already been used, on Leg 1, and further usage is planned on Leg 7.

You should note that Michel is doing natural C¹⁴ studies on Leg 6, and he did not know it was being used on Leg 1 by Rosson. Nor did Rosson know about the ban on radioactivity on the Melville. Further, the Cruise Coordinator, John Lupton, has never been notified of this usage. In view of all our past efforts dedicated to keeping Melville the clean ship I am shocked that approval for C¹⁴ and H³ has now been obtained so casually.

We have had a long standing absolute ban on use of radioactivity on Melville since 1972. It is the last clean ship in the fleet (Knorr got contaminated in a manner similar to the work planned on Melville). I want to urge in the strongest way possible that Melville be preserved as a clean ship. Large-scale natural radioisotope studies are now being planned for the Antarctic and for the Transient Tracers Pacific study. We must preserve one clean ship for the future.

I enclose a copy of the approval for the Melville Antarctic use of C¹⁴ signed by G. Shor, May 16, 1980. (There is previous correspondence in the file in which you express unhappiness about this but finally let George make the decision!). None of this proposed usage was ever brought to the attention of any of us involved with studies of isotopes in the ocean!

I now learn that it is proposed also to use stable isotopes, C¹³ and N¹⁵, on the Melville at the same time. Use of C¹³ would imperil our program on the following legs, in which we are following up the Geosecs C¹³ work. There are continuing studies of N¹⁵ in the ocean by people not at SIO: I don't know of any immediate work planned here, but it could happen. I urge that a ban on use of stable isotopes also be initiated for the Melville.

I believe it may be possible to do the C¹⁴ Antarctic work on another ship which may be working with Melville (FIBEX program). This is what was done with the CUEA proposal, and should be investigated as a solution now.

It has been your firm policy, until the approvals in May and August of this year, that no radioisotopes be used on Melville. I suggest that any change in this policy should (a) be discussed at a general SIO meeting, (b) also be discussed with people at other institutions and at NSF who are planning future ship usage for natural isotope studies in the ocean. Until then, I urge you to keep the ban in force.

- Enc. (1) Melville C¹⁴ Clearances
- Enc. (2) 1976 CUEA Non-Clearance
- CC: G. Shor
- K. Smith
- R. Weiss

H. Craig
H. Craig

BCC: W. Broecker
G. Ostlund

NOV 18 1980



Sent 1980 November 12

DR. WILLIAM NIERENBERG
DIRECTOR, SCRIPPS INSTITUTION OF OCEANOGRAPHY
TWX 910 337 1271

HARMON CRAIG HAS ALERTED US TO A SITUATION WHICH RAISES THE CONCERN OF THE MEMBERS OF THE TTO AND GEOSECS EXECUTIVE COMMITTEES. APPARENTLY, A POLICY CHANGE HAS BEEN MADE WHEREBY THE MELVILLE WILL NOW BE USED FOR RADIOACTIVE TRACER WORK AT SEA. WE ARE PARTICULARLY WORRIED ABOUT RADIOCARBON AND TRITIUM BUT ALSO TO SOME EXTENT ANY OTHER ISOTOPE OF WHICH THE NATURAL DISTRIBUTION IN THE OCEAN WOULD BE A VALUABLE TOOL.

WE REALIZE THE DIFFICULTIES OF MAINTAINING AN OUTRIGHT BAN ON THIS WORK BUT WANT TO MAKE SURE THAT RIGID RULES ARE IN EFFECT AND ENFORCED FOR THE HANDLING OF SUCH MATERIAL ON THE SHIP. THIS SHOULD INCLUDE BOTH ROUTINE OPERATIONS AND EMERGENCIES IN FORM OF SPILLS, ETC. WE HOPE THAT THE OPERATORS ARE AWARE OF THOSE RULES AND DO FOLLOW THEM AND THAT WIPE TESTS, AT LEAST FOR C14, ARE MADE AT ALL SENSITIVE AREAS AFTER THE CRUISE.

WE WANT TO EMPHASIZE AGAIN THAT MELVILLE IS APPARENTLY THE ONLY REMAINING SHIP ON WHICH SYNTHETIC C14 HAS PRESUMABLY NOT BEEN USED, AND IT WOULD BE EXTREMELY UNFORTUNATE FOR OCEANOGRAPHY IF FUTURE WORK WITH NATURAL C14 AND TRITIUM WOULD BE JEOPARDIZED.

ON BEHALF OF TTO AND GEOSECS EXECUTIVE COMMITTEES

D. SPENCER, WHOI
W. BROECKER, LDGO
H. CRAIG, SIO
P. BREWER, WHOI
C. ROOTH, UM
T. TAKAHASHI, LDGO
G. OSTLUND, UM

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1 December 1980

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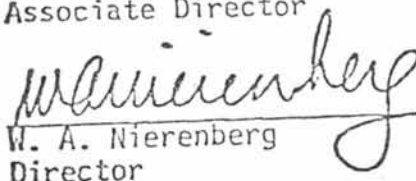
To: Distribution
Subj: Isotope use aboard R/V Melville

As a result of questions raised, at the Marine Operations Committee and elsewhere, about plans for use of radioisotopes and stable isotopes aboard the R/V Melville on VULCAN expedition, a meeting of concerned parties was held in the SIO Director's office Friday, 21 November. Detailed information was provided by Holm-Hansen and Azam about plans for isotope use (and confirmed in writing subsequently), and concerns explained by Craig, Lupton, and Weiss. A summary report and recommendations were given to Director Nierenberg, by the undersigned, after the meeting; the outcome is as follows:

1. There will be no change in the standing policy regarding use of radioisotope aboard the Melville. That policy is, and has been, as follows:
Use of radioisotopes aboard Melville (and on any new ship in the past) will be discouraged as much as possible, but not necessarily prohibited. Where a program requires the use of radioisotopes, every attempt will be made to schedule it on another ship. If the Melville is assigned, and if the use of radioisotopes is essential to the scientific program, the user must specify handling methods; use a isolation van rather than the ships laboratories, and obtain advance approval from the Director, SIO. We know that we cannot prevent contamination forever; we will do our best to delay it.
2. The use of ^{14}C and ^3H , as outlined by Holm-Hansen and Azam in the attached memo, is approved for Leg 7 of Vulcan Expedition on the R/V Melville, subject to proper precautions for handling. We note that they have dropped plans for use of ^{13}C on Leg 5, in deference to the plans by Craig to measure low levels of natural ^{13}C on a later cruise leg.
3. We note that there are loopholes in our present methods of scheduling shipboard work that may involve the use of radioisotopes and of handling requests for approval of radioisotope handling methods, and that we have had no rules on the use of stable isotopes. The SIO Marine Operations Committee will be asked to develop procedures that ensure proper review of such requests and that result in timely notification of those concerned of such plans; we also will try to improve our administrative handling of such requests to avoid last-minute flails like the present one.



George G. Shor Jr.
Associate Director



W. A. Nierenberg
Director

Approved

Distribution
Marine Operations Committee members
Harmon Craig, Ray Weiss, John Lupton, Osmund Holm-Hansen, Farooq Azam, Joe Reid
GeoSecs/TTO Committee
Neil Anderson

(14)

Lamont-Doherty Geological Observatory
of Columbia University

Palisades, N.Y. 10964

Cable: LAMONTGEO

Telephone: Code 914, Elmwood 9-2900

Palisades New York State

TWX-710-576-2633

December 15, 1980

Dr. Neil R. Anderson, Program Director
Marine Chemistry Program
National Science Foundation
Washington, D.C. 20550

Dear Neil:

As you know, the marine geochemistry community is facing a very serious problem in connection with further studies of the distributions of natural and bomb C-14 within the sea. There is ever-increasing pressure to "legalize" the use of tracer C-14 on the only two ships suitable for our major programs (i.e., the Knorr and the Melville). It is the consensus of opinion among those involved in natural C-14 studies that some remnant of the tracer C-14 used for these biological tracer studies will eventually find its way into some of our samplers or extraction systems. While we cannot quote the probability that this will happen, and while we can reduce this probability by improving our procedures, none of us feel comfortable about running million-dollar expeditions on C-14 contaminated ships. Something must be done.

The present ship operation system works much to our disadvantage. Any director who maintains a C-14 "clean" ship puts himself at a considerable disadvantage. Not only does he annoy many of the biologically oriented investigators at his institution, but he lowers his chances at least on the short term of balancing his ship budget.

I can see only one solution. Either the Knorr or the Melville must be designated as a C-14 clean ship in the sense that it will not be used for biological programs (since tracer C-14 is used so widely in biology, the restriction to programs not involving tracer C-14 would surely lead to violations). If this designated ship were to be set up to do CDT's, nutrients, alkalinity, pCO₂, radon...as well as large volume water sampling, the incentive to use it for a variety of programs would likely more than counterbalance the loss of biological business.

As both the Knorr and Melville have already been used for tracer C-14 work, were one to be designated as outlined above she should be thoroughly cleaned and then subjected to an elaborate swab test. The cleaning would be repeated until no tracer C-14 could be found.

I need not belabor the value of C-14 to studies of the patterns and rates of circulation in the sea and of its potential to studies relating to fossil fuel CO₂. It seems reasonable to ask that one of the 15 or so ships in the academic fleet be suitable for our work. Biologists wishing to do tracer C-14 work will still have more than ten ships among which to choose.

Dr. Neil R. Anderson

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December 15, 1980

As to which ship to choose, I have one comment. The logistics group which carries out most of the C-14 sample collections and extractions is housed at Scripps. Thus, use of the Melville would have definite advantages over use of the Knorr.

Future planning for the Transient Tracer program will be jeopardized if some decision in this matter is not reached in the next six months. We have tentative plans to conduct an expedition in the equatorial and south Atlantic in the period October 1982 to June 1983. We need to schedule either the Knorr or Melville for this forthcoming expedition.

Sincerely,

WSB/rc

W.S. Broecker

cc: W.A. Nierenberg
R. Steele
G. Ostlund
R. Williams
P. Brewer
✓ H. Craig
M. Stuiver
R. Weiss
C. Keeling
G. Gross

(20)

Lamont - Doherty Geological Observatory | Palisades, N.Y. 10964
of Columbia University

Code: LAMONTGEO
Palisades New York State
TWX-710-576-2653

Telephone: Code 914, Elmwood 6-2900

December 15, 1980

Dr. Osmund Holm-Hansen
Department of Biology
Scripps Institution of Oceanography
University of California, San Diego
La Jolla, California 92093

Dear Dr. Holm-Hansen:

I have been hearing of your debates with Harmon Craig with regard to use of the Melville for C-14 productivity experiments for some weeks now. You have unfortunately become the "test case" in the rather complicated question as to whether trace C-14 should be permitted on the Melville. This is, indeed, unfortunate and must have caused you considerable grief and inconvenience.

Those of us involved in natural and bomb C-14 studies in the ocean met in San Francisco last week. We all agreed that dual use of ships for high and low level C-14 work is unacceptable. Our long-term solution to this problem is outlined in the enclosed letter to Neil Anderson.

With regard to your proposed use of C-14 on the forthcoming Melville expedition, it was agreed that I should plead with you not to carry out these efforts on the Melville. We honestly feel that your program will jeopardize our future work.

If you do go through with your plans, we request that you go to extra care to avoid spills, and if spills occur to document where they occurred and what procedures were used to clean the contaminated area. It is the spills we don't know about that pose the greatest hazard. We call upon you as a scientific colleague to take every measure possible to prevent the contamination of the platform we feel is best suited for our geochemical work. We hope this will be the last such confrontation. There surely are ways to accommodate both types of research.

Sincerely,

WSB/rc

W.S. Broecker

P.S. To show you that I am far from a critic of the kind of work you do, I am sending under separate cover the thesis of Peter Bower, one of my graduate students. At the Experimental Lakes Area in Canada, he conducted a whole lake C-14 spike, four and sixteen hours in situ incubation and incubations in the Fee artificial light system. The agreement was excellent ($\pm 20\%$). This work should squelch some of the heard but rarely documented criticisms of the Steeman-Nielsen technique.

bc: Anderson Ostlund
✓ Craig Williams

December 17, 1980

DEC 18 1980

To: Harmon Craig

Subj: Melville time

I don't know who promised you that you could have time on the transit leg on the Melville from Puntarenas to Valparaiso, if anyone. I do know that in the ship support proposal to NSF we listed that time as Holm-Hansen's, in order to make sure that the Office of Polar Programs paid for it (the ship time), and didn't leave the ship stranded, un-funded, in Puntarenas. We couldn't very well list it as being for your program, since they (NSF) had told us to cut your ship time from 2 months to one month, and I had managed to get them to stretch that "one month" to 49 days in order to get the ship home to San Diego and not leave it stranded in Tahiti. Adding on another week (that you hadn't ever requested from NSF or from us) would have gone over like a lead balloon.

Holm-Hansen says that he is not planning to do any science on that cruise leg; he and some of his group will be aboard packing up and getting ready to offload at Valparaiso. If you want to do something on that leg (that doesn't lengthen the time significantly), I would suggest that you ask Holm-Hansen if you or people who work for you can come along. The time was paid by Polar Programs, not by Mary Johrde's office, so it is essentially Ozzie's.

I am curious about who told you that you could have that time; did I? Or did Haines? or Bob Fisher?

I keep hearing indirectly that you, Neil Anderson, and others are trying to have "NSF control scheduling of the Melville." I think that you should think rather hard about what you are trying to accomplish. Melville is on the Antarctic program this year rather than being on Transient Tracers (which would have put Knorr in the Antarctic) because your friend Peter Brewer pushed to have Knorr on that program. If one of the two ships had not gone to the Antarctic, that ship would still be laid up. There has been a strong push by some people in NSF, and by some of our friends who run small oceanography labs, to "lay up one or two of the big ships," permanently. If Melville had not gone onto the Antarctic program, it would by now be a very strong candidate for scrapping. Is that what you want?

NSF owns four ships: Oceanus, Endeavor, Wecoma, and Alpha Helix; presumably they have more say in the use of those ships than of the ONR-owned ones like Melville. To the best of my understanding, all of those ships are now contaminated with C-14. Do you really want to try to get the scheduling of the one ship that anyone has tried to keep clean shifted from SIO (which has tried) to NSF (which has not)?

George Shor

JAN 7 1980

December 31, 1980

To: Harmon Craig
Subj: Melville/Knorr, again

I don't really care whether Peter Brewer is a personal friend of yours; he acted as a representative of the floating crap game that is variously called GeoSecs/TTO/lowlevel geochemists. De facto, he made the decision that Knorr would have the geochemical program in 1981, which pushed Melville to take the Polar program. It does suggest to me that Knorr is not as undesirable for lowlevel work as you have suggested.

The Polar Program work (Holm-Hansen, Foster, Dick) represents not just "a month's support." It represents as a beginning 4 months, and was the basis for getting a couple more months of work (Scheidegger and Kulm) en route. If this work had not been scheduled, the Melville would have stayed in layup probably until next summer. At that same time, there was a very strong push being made by some senior officials at NSF (Frank Johnson and Mary Johrde), and by some of our distinguished colleagues who head small oceanographic institutions with small, expensive, relatively useless ships (i.e., John Knauss) to "solve the problem" of shortage of money by getting rid of big ships belonging to big institutions. Permanently. If Melville had stayed in layup for 24 months, I doubt if it would have ever come back into operation.

I didn't make the decision to put the Polar Program work on the Melville; Bob Fisher did. However, I think that it was the correct decision under the circumstances. He, and I, are primarily concerned with the long-term problems of keeping a seagoing capability at Scripps, by keeping a well-run, reliable, economical set of ships tailored to the work that our people do. You, on the other hand, seem to be concerned more with the relatively parochial (and in some respects short-term) problems of your own branch of ocean science. It seems to me that (despite the Mayan attitude) dead virgins aren't of much use to anyone.

Do you really want Mary Johrde to schedule our ships? That's what you and Neil Anderson are asking for, even if you don't realize it. The present set of solicited letters that you guys are sending to Neil are probably the silliest thing that you could have thought of, unless that is your goal.

I think that there may be a reasonable solution to the problem, given a potential 8 months of TTO use every three years. (Note: I only found out about the approximate amounts and times of potential use by phoning WALLY Broecker; during all of this flail, none of you ever bothered to put in a ship request or even a letter of intent to either SIO or WHOI). It might well be possible to designate one of the two ships as a totally "clean" ship, and the other one as "dirty," to accomodate the rather large number of marine biologists who, like yourselves, can use no ship other than Melville or Knorr. If we were to do this, it would require the agreement of Steele and Nierenberg, and some very close cooperative scheduling by Dinsmore and myself, to make it work. I am working on this--but at the same time you are doing your best to infuriate all of the people whose cooperation you need.

You have met the enemy--he is you. Happy New Year.

(24)

UNIVERSITY OF CALIFORNIA, SAN DIEGO

ISOTOPE LABORATORY A-020
SCRIPPS INSTITUTION OF OCEANOGRAPHY
LA JOLLA, CALIFORNIA 92093

TELEPHONE: (714) 452-3260
TWX NUMBER: 910-337-1271
CABLE ADDRESS: SIOCEAN, LA JOLLA

December 23, 1980

To: George Shor, SIO

On: Melville again

This concerns your points (Dec. 17) about NSF scheduling of Melville, Knorr on TT, and NSG ships.

1. "Your friend Peter Brewer." Peter Brewer is not an especially close friend, and I think Knorr was used on the TT test leg because it was in the Atlantic.

2. NSF ships--C-14 use on (Oceanus, etc.). I don't understand the point. C-14 was used on these ships, so what? It is precisely the significant point--that C-14 should be used on some ships, so that its use can be avoided on others.

3. "NSF scheduling of Melville." I have not until now been pushing for this--it has only become important since the decision at SIO to allow C-14 use on Melville. It is apparent that you, as Associate Director, must be primarily concerned about short-term funding of ships, rather than long-term scientific problems of a general nature, and that you thus are unable to make value judgements about the relative significance of programs on the ships. That is, programs now must be evaluated in terms of dollars brought in, rather than in terms of real value to science. I can understand that you feel that your primary responsibility is to keep the ships afloat, even while I disagree that these short-term solutions are valid for the long haul. (That is, you are killing the long term use of Melville for natural C-14 studies, to get a month's support this year!)

The point is that NSF is going to have to schedule the ships to make any sense out of the funding situation and the need to evaluate programs: good science vs. mediocre science. It's that simple. No institution dares to make such evaluations locally, and in fact probably should not because of lack of qualified people able and willing to make such decisions. Only someone like NSF who can call on a wider set of opinions, can do this.

Enclosed is a copy of a letter to NSF about this problem. Similar letters are being written by others. Sooner or later, NSF will have to designate ships, though not necessarily "scheduling" them in a detailed way.


H. Craig

Encl.
HC/jh

Geological Research Division
December 31, 1980

To: George Shor, SIO

With respect to your letter to Neil Andersen, I want to close the year with a couple of (probably) futile comments. I read your letter as implying that I am involved in some endeavor with TTO to subvert your ownership of the Melville. May I once again state that I am not involved in TTO in any way; nor have I ever attended a TTO meeting. I am certainly not part of any "private game" except my own.

My own is simple. I recognize that it is overwhelmingly important to keep Melville clean, and that I have earned the right to be listened to about this (except of course at my own institution). You have made a bad decision which is very probably going to affect future work in oceanography in a detrimental way. Further, this decision has been made against the advice of every single scientist who knows anything about the subject or the problem.

I fail to understand your interest in my not sending my letters to Dinsmore. I send my copies to Derek Spencer, as noted, since he occupies a position equivalent to yours at WHOI. He can give them to whomever he likes.

There is one very simple reason that you haven't had long-term advance requests for Melville time. That is, despite what you maintain to the contrary, there was a general understanding that Melville would be kept clean from C-14. You, of course, can continue to deny this, but you haven't been-- been involved in the problem until very recently. The previous incumbent took great care that someone who understood the problem got notified when it was proposed to use C-14 on Melville. Unfortunately this "open" information policy ceased with his incumbency.

One final point. It is necessary to use Melville or Knorr for this work, for two reasons. One: simply handling the Gerard bottles demands a large deck space, preferably with the Geosecs "trolley" to extend over the side for putting the bottles on and off the wire. It's difficult and dangerous on New Horizon class ships. Add the need for a "clean" ship and it comes down to Melville or Knorr.

Two: The amount of work involved means one should have a lot of other programs running and enough people around to keep costs going around the clock. This again makes Melville or Knorr the most cost effective.


It's still true that the sensible decision now, is to stop the C-14 use on Melville until a long-term plan can be worked out. Very little would be lost if Holm-Hansen put the C-14 work off until next year's Antarctic visit. Can you demonstrate otherwise? On the other hand a great deal may be gained for future research of great significance. What is the urgency that demands that C-14 be used this year?

George Shor
Page 2

December 31, 1980

These are questions which it is important to answer now in detail.
Does anyone want to hold his breath?

New Year's Cheers.



H. Craig

.....
.....

cc: N. Andersen, NSF
G. Gross, NSF
D. Spencer, WHOI
W. Broecker
P. Brewer
G. Ostlund
W. Nierenberg
R. Weiss
C. Keeling
R. Dinsmore!

HC/jh

P.S. You now ask for "honest information". I am curious to know what
dishonest information you have been given by the "clean ship" side.
(I already know about the dishonest stuff from the other side.)

1/15/87

DR. JOHN SLAUGHTER
DIRECTOR'S OFFICE
NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

I WISH TO ALERT YOU TO IMMINENT USE OF TRACER CARBON 14 IN FIVE MILLICURIE AMOUNT ON SCRIPPS SHIP MELVILLE BEGINNING FEBRUARY 21 IN THE ANTARCTIC. WORK IS ON LEG 7 VULCAN EXPEDITION BY HOLM-HANSEN OF SCRIPPS SUPPORTED BY POLAR PROGRAMS NSF. MELVILLE HAS BY TRADITION BEEN THE CLEAN SHIP AT SCRIPPS KEPT FREE OF RADIOACTIVITY FOR STUDIES OF NATURAL C14 IN OCEANS AS IN GEOSecs AND TRANSIENT TRACER PROGRAMS SUPPORTED BY NSF OCEANOGRAPHIC PROGRAMS. USING TRACER C14 ON MELVILLE AT CONCENTRATIONS ELEVEN ORDERS OF MAGNITUDE ABOVE NATURAL LEVELS POSES SERIOUS THREAT TO FUTURE STUDIES OF CARBON IN ATMOSPHERE AND OCEAN AND THE NATION'S CO2 PROGRAM.

DESPITE MANY LETTERS AND CABLES FROM OCEANOGRAPHERS ALL ATTEMPTS TO DELAY USE ON MELVILLE HAVE FAILED. PLANS ARE WELL UNDERWAY TO DECLARE MELVILLE OR KNORR A CLEAN SHIP AS NATIONAL FACILITY. KNORR AT WHOI MAY BE CONTAMINATED BY RECENT SPILLS. THUS IF MELVILLE BECOMES CONTAMINATED BY WORK IN FEBRUARY WE MAY WELL LOSE THE CAPABILITY TO STUDY CO2 IN THE OCEANS BECAUSE OF A SINGLE ACTION WHICH COULD HAVE BEEN PREVENTED. HOWEVER NSF OCEANOGRAPHY PROGRAM IS POWERLESS TO REQUEST TRANSFER OF C14 WORK TO OTHER SHIP IN AREA AT SAME TIME OR DELAY OF C14 USE UNTIL NEXT YEAR.

I URGE YOU TO CONSULT WITH NEIL ANDERSEN IN OCEANOGRAPHY ON DETRIMENTAL EFFECTS TO NATIONS CO2 PROGRAM AND BERNHARD LETTAU IN POLAR PROGRAMS ABOUT POSSIBILITY TO DELAY C14 USE UNTIL NEXT YEAR OR USE ON OTHER SHIP SUCH AS METEOR THIS YEAR. ONLY THROUGH YOUR OFFICE CAN OCEANOGRAPHIC AND POLAR PROGRAMS POSSIBLY REACH A RATIONAL AGREEMENT TO KEEP MELVILLE CLEAN UNTIL ARRANGEMENTS FOR A DEDICATED CLEAN SHIP CAN BE MADE. TRACER C14 USE WILL BEGIN FEBRUARY 21 UNLESS YOU CAN INTERVENE OR PERSUADE HOLM-HANSEN OR SHOR AT SCRIPPS TO CHANGE THEIR MINDS.

H. CRAIG
SCRIPPS INSTITUTION OF
OCEANOGRAPHY

January 12, 1981

Dr. Neil R. Andersen
Marine Chemistry Program
National Science Foundation
Washington, D.C. 20550

Dear Neil:

Concerning the "clean ship" problem, there is an ad hoc committee being set up here at SIO to evaluate all requests for use of isotopes on SIO ships. This committee is being formed by Dr. Kenneth L. Smith (Marine Biology, SIO, A-002), a member of the Marine Operations Committee. As of now, Ray Weiss and I are members, and Smith is trying to get an appropriate physical oceanographer and biologist to complete the committee. Presumably this committee will be formed by the 13th of February, and Smith thought that it would be a good plan if this committee attend the meeting you plan on 13 February. He also suggested that it might be appropriate if you contacted him about this possibility.

My general feeling is that one of the "Geosecs" ships (Knorr or Melville) be kept free of radioisotopes. During the past 15 years I have been collecting and processing water, biological and sediment samples for natural radiocarbon dating from "contaminated" ships (USN Eltanin, Thomas Washington, E. B. Scripps, Horizon, etc.). In some cases ^{14}C tracers were being used concurrently with the sample collection (and even spills of ^{14}C occurred). In only one instance were any of the samples contaminated with ^{14}C tracers. The moral of this is that natural radiocarbon work can be done on contaminated ships provided the investigator assumes that all areas and surfaces are contaminated, and that he (or an enlightened co-worker) collect and process the samples themselves using the appropriate precautions.

Concerning the "Vulcan" expedition, Holm-Hansen and the other isotope people will leave Punta Arenas January 16, return February 16, leave February 20 and arrive in Valpariso April 1.

Enclosed is a copy of the final report for the first two years of the surface film project (OCE77-26178) (minus the reprints, etc.). I completely forgot this report.

Sincerely,


P. M. Williams

PMW:dho
Enc.

DWS 5035 1981

Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Phone: (617) 548-1400
TWX: 710-346-6601



January 28, 1981

Dr. Neil R. Andersen
Ocean Sciences Division
National Science Foundation
1800 "G" Street, N.W.
Washington, D.C. 20550

Dear Neil:

I have followed the debate over ^{14}C use on the "Melville" with some concern. Concern initially for the technical problem of ^{14}C contamination, and concern more recently for the rather rapid polarization of views that seems to have taken place. I find myself firmly holding the view that the problem is very important, indeed vital for expeditions I am involved in, yet I am uneasy with blindly insisting on a ban on isotope use and demanding exclusivity for geochemists. It's not practical.

I have followed the equivalent events at Woods Hole for many years as a member of our Isotope Users Committee. We have recently compiled a history of isotope use on the "Knorr", which I enclose. The policy has basically been to carry out ^{14}C usage on the "Atlantis II" and to be highly restrictive with regard to the "Knorr". Some isotope use on the "Knorr" has been by geochemists. The experiment, and not the discipline, is the problem.

I don't believe that "geochemists should learn to work on a contaminated ship" as I have heard it said, but rather that isotope use should be highly restricted and that safe techniques be enforced. In large part, this is a supra-institutional problem, as you, and Derek Spencer, have well recognized. An individual doing a good job in this area receives little recognition; a significant reprisal rarely follows a botched job. With isotope use restricted to vans, and kept out of the interior spaces of the ship, and a small monitoring contract to a respected ^{14}C lab to back up this restriction, then co-existence may well be possible.

I'd like to see this problem reviewed annually by NSF or UNOLS or an equivalent group. We are putting multi-million dollar experiments on multi-million dollar ships, yet relying on crisis memos and innuendo on which to base major decisions. There has to be a better way.

Good luck with your efforts in this area.

Sincerely yours,

Peter G. Brewer

PGB:am

Enclosures

February 3, 1981

Dr. Neil Anderson, Program Director
Marine Chemistry Program
Division of Ocean Sciences
National Science Foundation
Washington, D. C. 20550

Dear Neil:

I have visited La Jolla since my encounter with you in Washington. Our replies to our critics on the Chow proposal are in the mail to you. Herein, I will voice my concerns about the carbon-14 problem, productivity measurements and the clean ship caper.

I do agree with the argument, presumably of Craig, that a clean ship or two is essential for marine science. I submit that the carbon dioxide problem is one of the outstanding issues in environmental work. Contamination free samples of seawater, air, algae and sediments may provide most important information for the resolution of outstanding issues. There is always the possibility that the high levels of activity, presently used in productivity measurements, can be converted into organic compounds or calcium carbonates, which stay on the ship and possibly contaminate future samples.

The great importance of the carbon dioxide problem simply is incompatible with any risk involved with using a potentially dirty ship.

But perhaps there is another facet of the problem that is worth considering. Most biologists doing productivity studies are unaware of the possibility of using much, much, much less activity for their pursuits. By the utilization of low level counters (either scintillation precisions can be attained compared to presently obtained ones. We can minimize contamination on some ships by making such efforts. I think it might be worthwhile to assemble a group of productivity measurers and competent radiochemists to see how lower levels of carbon-14 might be involved. This is not a substitute for a clean ship. It is improving measurement techniques and reducing cross-contamination problems.

Regards,


Edward D. Goldberg

P.S. I will see you in La Jolla on the 9th. (not 13th) of February.

P.P.S. I have been funded for a second Dahlem Conference. Probably for early 1982. It will involve marine and atmospheric chemistry. I hope you will be able to offer some guidance.

February 12, 1981

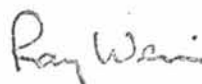
TO: Neil Andersen

SUBJECT: Comparison of amounts of ^{14}C used in primary productivity measurements to amounts of ^{14}C measured in natural ocean samples.

Natural radiocarbon in the oceans is typically measured by extracting the inorganic carbon from about 200 ℓ of seawater containing about 2.3×10^{-3} mol/ ℓ of total inorganic carbon. Thus, each sample contains about 0.46 mol of carbon, or about 2.8×10^{23} atoms of carbon. The natural $^{14}\text{C}/^{12}\text{C}$ ratio in such samples is about 1.0×10^{-12} , so that each sample contains about 2.8×10^{11} atoms of ^{14}C . The decay rate $-dN/dt$ is given by $N\lambda$, where N is the number of ^{14}C atoms, and the decay constant λ is $(1/8033) \text{ y}^{-1}$. Thus, the radiocarbon decay rate of a typical seawater sample is about 3.5×10^7 disintegrations per year, or about 66 disintegrations per minute (dpm).

This amount of radioactivity is typically measured to ~ 5 parts per thousand, or about 0.3 dpm: a level of precision which is essential to the interpretation of deep water radiocarbon distributions. Thus, a tolerable level of contamination which would have a negligible effect both on the measurements and on the interpretation of the observed distributions is an order of magnitude below this limit, or about 0.03 dpm.

By contrast, the amount of radiocarbon which is typically being taken aboard research vessels for primary productivity studies and other biological experiments is in the range of 5 millicuries. This corresponds to 1.1×10^{10} dpm, and is $\sim 4 \times 10^{11}$ times the acceptable level of contamination for a deep seawater sample.



Ray Weiss

RFW/st

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SCRIPPS INSTITUTION OF OCEANOGRAPHY

LA JOLLA, CALIFORNIA 92093

February 13, 1981

Dr. Neil Andersen, Program Director
Marine Chemistry Program
Division of Ocean Sciences
National Science Foundation
Washington, D. C. 20550

Dear Dr. Andersen:

I wish to add my support to that of my colleagues in the geochemical community who have urged that some formal structure be established to assure that at least one large research vessel be kept free of significant potential contamination by isotopes which are used as natural tracers of ocean circulation and air-sea exchange. While I am very much opposed to the direct intervention of NSF or other funding agencies in the scheduling and planning of research expeditions, the present situation in which any investigator can independently obtain support for research using artificial radioisotopes, and in effect approach the ship-operating institutions with cash in hand, is bound to limit the ability of the institutions to maintain a "clean ship" policy. In addition, the institutions have been justifiably reluctant in cases of conflict over ship usage to judge the relative scientific merit of different types of research, especially research which has received the blessings of a funding agency and the peer review system. The resolution of these conflicts must necessarily include the participation and coordination of the funding agencies, to assure that the integrity and availability of an uncontaminated vessel suitable for studies of natural isotope distributions is maintained without undue financial risk on the part of the ship-operating institutions, and to provide a mechanism of scientific review to resolve basic incompatibilities between different disciplines.

It is apparent from the volumes of correspondence which have recently accumulated over this matter that neither the biologists nor the geochemists have proposed a satisfactory method for evaluating the risks of coexistence when the level of radiocarbon used in artificial isotope experiments exceeds the acceptable level of contamination of natural samples by the staggering ratio of 10^{11} . In this context, it must be recognized that the process

Dr. Neil Andersen
February 13, 1981
Page 2

of contamination is essentially stochastic, that significant contamination may occur without massive spills and without the knowledge of the user, and that an apparent lack of contamination due to a small number of past uses of artificial radioactivity does not provide statistical support for future isotope use. It should also be recognized that the problem will be further exacerbated by recent developments in the measurement of radiocarbon and other isotopes by accelerator techniques, which extend the measurement of activities to still-lower natural levels.

While one may hope that these problems will eventually be resolved in a more scientific way, at present the contamination of a vessel by long-lived radioactivity must be regarded as an irreversible process. In a time when we are unlikely to have new vessels to replace those which are contaminated, any "clean ship" policy which attempts to restrict but not to prohibit the use of such isotopes, without enforceable protection against contamination, cannot be scientifically defended.

Sincerely,

Ray Weiss

R. F. Weiss

RFW/st

UNIVERSITY OF RHODE ISLAND

DWS JUL 28 1981

OFFICE MEMORANDUM

To: Derek Spencer, Chairman, UNOLS

Date: 15 July 81

From: E. Swift, GSO

Subj: UNOLS Regulations for use of Radio isotopes aboard UNOLS Vessels

John Marra's letter seems to cover most of the reasons that an additional level of authorization for the use of radio isotopes at the UNOLS committee level¹ would tend to be unproductive for oceanographic science as a whole.

