Monique Dillon  
Resident Representative  
Office of Naval Research  
Charles S. Draper Laboratory, Inc.  
555 Technology Square, MS54  
Cambridge, MA 02139-3539

Dear Ms. Dillon,

Please find enclosed the Final Technical Report and Report of Inventions (Form 882) for our ONR contract N00014-87-K-0536, "Upper Ocean Mixing: The Use of Algal Pigments as Biological Tracers for Turbulent Diffusion", Principal Investigator: Nicholas A. Welschmeyer. Thank you, in advance, for your patience in awaiting the arrival of this report.

Some notes are probably warranted to recount the history of this contract, to clear any confusion. The contract originated as an ONR Young Investigator Program award while I was at Harvard University (N00014-87-K-0536). In 1990 I took a new position at San Jose State University (Moss Landing Marine Laboratories). The existing contract was transferred to San Jose State University Foundation and issued a new contract number, N00014-89-J-1615. However, there was no change in scope for the project. The Final Technical Report, enclosed herein, covers work accomplished throughout the whole project, referenced by the two contract numbers above; I hope this is satisfactory.

If there are any questions, please do not hesitate to call. Thank you again for your attention to these matters.

Sincerely,

Nicholas Welschmeyer  
Professor, Oceanography

cc:  
Paul Biddle, ONR Resident Representative, Stanford Univ.  
Diane Kruse, San Jose State University Foundation  
Merrily Sterns, Office for Sponsored Research, Harvard Univ.  
Bernard Zahuranec, ONR, Code 1122B, Arlington VA  
Defense Technical Information Center  
Director, Naval Research Laboratory
The goal of the proposed research was to develop an in situ method for determining upper-ocean mixing rates using algal pigments as natural biological tracers. The work focused specifically on xanthophyll-cycling, a well-known series of reversible, light-sensitive pigment transformations that occur in all higher land plants and many marine phytoplankton species. Laboratory work was initiated to define the rate constants for xanthophyll-cycling in microalgal cultures, and to develop a quantitative understanding of the influence of light intensity on the xanthophyll-cycling process. Field work was completed which verified that xanthophyll-cycling processes measured in natural phytoplankton populations indeed reproduced our laboratory observations.

A Monte-Carlo computer model was developed in order to study the influence of xanthophyll-cycling on algal pigmentation under known conditions of simulated mixing. The collective results from physiological experimentation and simulation modeling were used to develop a field method for calculating ocean mixing rates (Welschmeyer and Hoepffner, 1991; Welschmeyer 1991). The work has now identified previously unrecognized relationships between xanthophyll-cycling and cellular fluorescence, which are of potential importance in exploiting single-cell characteristics as novel tracers of ocean mixing. This new work is continuing in our laboratory.
PUBLICATIONS AND MANUSCRIPTS RESULTING FROM CONTRACT N00014-87-K-0536

PUBLICATIONS:


MANUSCRIPTS


PH.D. DEGREE:

REPORT OF INVENTIONS AND SUBCONTRACTS
(Pursuant to "Patent Rights" Contract Clause) (See Instructions on Reverse Side.)

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1a. NAME OF CONTRACTOR/SUBCONTRACTOR
SJSU University Foundation
1c. CONTRACT NUMBER
N00014-87-K-0536
2a. NAME OF GOVERNMENT PRIME CONTRACTOR
ONR
2c. CONTRACT NUMBER
N00014-87-K-0536
3c. CERTIFICATION OF REPORT BY CONTRACTOR/SUBCONTRACTOR
4. CERTIFICATION OF REPORT BY CONTRACTOR/SUBCONTRACTOR

SECTION I - SUBJECT INVENTIONS

5a. "SUBJECT INVENTIONS" REQUIRED TO BE REPORTED BY CONTRACTOR/SUBCONTRACTOR (IF "NONE," NO STATE)

5b. NAME(S) OF INVENTOR(S)
Welschmeyer, N.A.

5c. TITLE OF INVENTION(S)
None to report

5d. ELECTED FOREIGN COUNTRIES IN WHICH A PATENT APPLICATION WILL BE FILED

SECTION II - SUBCONTRACTS (Containing a "Patent Rights" clause)

6a. SUBCONTRACTS AWARDED BY CONTRACTOR/SUBCONTRACTOR (IF "NONE," NO STATE)

6b. NAME OF SUBCONTRACTOR(S)
None

SECTION III - CERTIFICATION

7. CERTIFICATION OF REPORT BY CONTRACTOR/SUBCONTRACTOR

Nicholas A. Welschmeyer

Signed

Date Signed: 9/23/91