MARINE BIOLOGICAL LABORATORY

Woods Hole, Massachusetts 02543

617 — 548-3705

APPLICATION FOR RESEARCH OR LIBRARY ACCOMMODATION

If you had research space last summer it is essential for consideration of this application that the Research Progress Report shall have been submitted. Accounts must be cleared before acceptance of this application.

Applications for the summer which are received by February 1st will be considered together and notification will be sent soon after March 1st. Other applications will be considered as promptly as possible.

1. Name (with degrees) John Philip Trinkaus PhD Soc. Sec. No. [redacted]
2. Institution represented Department of Biology, Yale University
3. Official position Professor of Biology
4. Telephone number: Office 203-436-2576 Home 203-453-2048
5. Permanent mail address Department of Biology, Yale University, New Haven, Conn.
6. In case of emergency notify Madeleine Trinkaus, Moose Hill Rd, Guilford, Conn.
7. Status at Woods Hole: (a) Investigator ☒ (b) Course Instructor ☐ (c) Library Reader ☐

   (d) Other
8. Dates between which accommodations are desired 7 June - 18 July, 1975

   Because of long-term and continuing commitments these dates must be adhered to unless prior arrangements are made suitably in advance.
9. If Instructor or Investigator, who will share the laboratory room with you C.A. Tickle, Investigator

   (Include names of other Investigators, Graduate Students, Research Assistants and Technicians)

   C.A. Erickson, Graduate Student
10. Title of research problem Mechanism of Morphogenetic Cell Movements in Fundulus heteroclitus
11. For review by the Space Committee, please provide a brief description of the research and study you intend to carry out at MBL, and list with titles a few recent pertinent personal publications, *including all* research done at MBL within the last 2 years. Use reverse side of this and/or additional sheets if necessary.

C.A. Tickle and I plan to continue our studies of the deformability of Fundulus deep cells as related to their locomotion. We were able to show last summer, by marking the cell surface, that the whole cell surface is involved when a cell is deformed, suggesting that membrane flow takes place.

Name .....

Lab. # ..... (office use only)

12. (continuation space)

We would like to determine whether this is due in part to unfolding of a convoluted cell surface by fixing deformed and undeformed cells for viewing in the scanning electron microscope. It will also be of interest to compare the surfaces of deep cells from blastulae with those from gastrulae, in view of the greater deformability of the latter. Perhaps they are more convoluted. In addition, we will examine the surface of normal blebs in the SEM in an effort to relate normal bleb formation to artificial deformation of the cell surface. Since blebs may act as organs of locomotion in deep cells, the results of this study may yield insights relevant to the mechanism of cell locomotion. We also plan to complete some of our unfinished business from last summer - in particular studying the relative roles of the cell surface and the cortical cytoplasm in deformability : treatment of cells with enzymes that act at the cell surface, such as neuraminidase ; determine if normally formed blebs are more readily deformed than other regions of the cell surface (blebs appear to lack microfilaments in Fundulus) ; and observation of the cortical cytoplasm of blastula and gastrula cells in TEM. Do more deformable gastrula cells have fewer cortical microfilaments ? We also plan to observe the structure of the cortical cytoplasm before and after a bulge is pulled out. What is its structure in a bulge as compared to the normal cortex ?

C.A. Erickson and I plan to study the role of reserve surface membrane in cell surface expansion during Fundulus epiboly. In this study, material will be fixed and observed in the SEM. We will attempt to get answers to the following questions. 1) Is there a decrease in the size and number of microvilli on the surface of cells of the enveloping layer as they spread during epiboly ? We have shown this to occur as fibroblasts spread in culture (Trinkaus and Erickson, 1974). 2) As the yolk syncytial layer spreads after treatment with cytochalasin B (Betchaku and Trinkaus, 1974), do the microvilli shorten or disappear ? And, conversely, as the YSL contracts on treatment with Ca^{++}, do the microvilli increase in size and number ? These microvilli are filled with 50 Å diameter microfilaments (Betchaku and Trinkaus, 1974) and it is important to try to understand their possible role in controlling the utilization of reserve plasma membrane in spreading. 3) Is the surface of the marginal region of marginal cells of the enveloping layer more convoluted (ruffled) during the first (active) phase of epiboly than during the second (passive) phase ?

Finally, J.A. Hogan and I will continue our freeze fracture EM studies of the presence and distribution of intramembranous particles in various plasma membranes of the Fundulus egg during epiboly. (Dr. Hogan will work in New Haven on material I prepare and fix in Woods Hole.) It appears from the work of Bennett and Gilula (1974) that, consistent with our predictions, the membrane at the outer surface of cells of the enveloping layer and of the yolk cytoplasmic layer (lowly permeable and lowly adhesive) lacks intramembranous particles. In contrast, particles are present in the plasma membranes of the inner surfaces of these cells. In addition, we have found them to be present in the plasma membranes of deep cells, consistent with the permeability and high adhesiveness of these cells. It remains to get some good fractures of the highly adhesive, highly permeable surface of the yolk syncytial layer. We will be interested to see 1) if there are particles and 2) if they are clustered. In addition, Dr. Hogan and I will continue our TEM studies of the microtubules and microfilaments of deep cells, as related to cell locomotion.

Recent publications

Trinkaus, J.P. 1973. Surface activity and locomotion of Fundulus deep cells during blastula and gastrula stages. Devel. Biol., 30 : 68-103.

Trinkaus, J.P. 1973. Modes of cell locomotion in vivo. Ciba Found. Sympos. on Locomotion of Tissue Cells, 14 (new series), pp. 223-249.

Tickle, C.A. and J.P. Trinkaus. 1973. Change in surface extensibility of

12. Recent publications (continued)

Fundulus deep cells during early development. J. Cell Sci., 13 : 721-726.

Betchaku, Teiichi and J.P. Trinkaus. 1974. An in situ study of surface expansion during Fundulus epiboly. J. Cell Biol., 63 : no. 2, pt. 2, p. 24a.

Trinkaus, J.P. and C.A. Erickson. 1974. Microvilli as a source of reserve surface membrane during cell spreading. J. Cell Biol., 63: no. 2, pt. 2, p. 351 a.

13. Please list, including grant number, *all* research grants you hold (irrespective of whether or not they support your MBL research). NSF Grant no. GB 21240, NIH grant no. HD 07137-01

This information is requested solely for statistical purposes in connection with applications to granting agencies for general laboratory support.

14. Fee to be paid by, and billing instructions Yale University, send bill to Mrs Roberta Clouet, Department of Biology, Yale University, New Haven, Connecticut

Basic seasonal laboratory fees range from $1,390 to $3,000 which includes space and services for one or two people. Additional persons at the postdoctoral level accommodated in a laboratory will be charged $550 for the summer with a $275 minimum charge up to 4 weeks; for all others including predoctoral students, technicians, dishwashers, undergraduate students, etc., there will be a $275 minimum charge for any period up to the entire summer. For the library, the fee is $400 for the season or $200 per month or any part thereof, not to exceed $400 for the season of 3 months; reserved desks $250 per month or any part thereof, not to exceed $500 for the season of 3 months.

15. Type of laboratory; equipment and facilities desired:
   a. ☒ Small laboratory (approx. 150 sq. ft.) ☐ Large (approx 320 sq. ft.)
   b. ☐ Exclusive use for Investigators and Associates
      Please list by name Associates who will occupy the lab (from pg. 1, line 9)
      C.A. Tickle
      C.A. Erickson
      ☒ Wish to share with another investigator if necessary
      (name, if selected)
   c. If research space becomes very limited (and you have requested exclusive use of a laboratory) would it be possible for you to share the space with another (compatible) investigator working independently? (Yes) No
      (No such assignments will be made without prior consultation with all concerned).
   d. Running salt water Yes ☒ No ☐
   e. Dark room Yes ☒ No ☐ Experimental ☐ Photographic ☒
   f. Chemical Hood (exclusive use) Yes ☐ No ☒ (occasional use) Yes ☐ No ☐
   g. Refrigerator space Yes ☒ No ☐ exclusive Yes ☒ No ☐
   h. Room air conditioner ($1.00 day plus installation) Yes ☐ No ☒

16. Special apparatus required: Some large specialized instruments are available for part-time shared use (see Annual Announcement). Please list your specific needs none

17. Will radioisotopes be used in your research? Yes ☐ No ☒
   a. What isotopes do you anticipate using?
      Approximately what quantities?
      Will a sea table be needed for use with isotopes? Yes ☐ No ☐

What biological material will be used in your research? Indicate approximate quantities and frequency of collections Eggs of Fundulus heteroclitus - will need ripe adults twice a week.

Remarks: