

mer's work is necessary to get the data into a comprehensive form.

The work was supported by Grant RG-7458, National Advisory Council.

1962 #8

#### CLEAVAGE DELAY IN ULTRAVIOLET-IRRADIATED SAND DOLLAR ZYGOTES

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1. Ultraviolet (UV) irradiation after fertilization of sand dollar eggs delays first cleavage of the zygote. The delay can be partially reduced by treatment with visible light (photoreactivation).
2. Late in the fertilization-to-first-cleavage (F-I) interval there is a so-called "refractory period," during which time UV treatment does not delay first cleavage, but does prolong the first-to-second (I-II) cleavage interval. Treatment with UV plus visible light at this time results in virtually complete photoreactivation, i.e., the cleavage intervals of treated zygotes are indistinguishable from those of unirradiated controls.
3. If zygotes are allowed to incorporate 5-bromodeoxyuridine (BUDR) into their DNA, partially replacing thymidine during the DNA-synthesis prior to first cleavage, the I-II interval shows hypersensitivity to UV irradiation in the "refractory period." Zygotes which have incorporated BUDR cannot be photoreactivated.
4. Zygotes which have been irradiated while incorporating BUDR prior to first cleavage show no apparent hypersensitivity or loss of photoreactivability of the F-I interval, but do show both hypersensitivity and loss of photoreactivability of the I-II interval.
5. A working hypothesis consistent with the data is that UV-induced cleavage delay results from interference with the primer-activity of DNA in subsequent DNA synthesis.

Supported by a grant from the National Science Foundation.

1962 #9

#### FINE STRUCTURE OF SALT-REGULATING TISSUES\*

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- 1) Holothuria. Preparations of the respiratory tree of the sea cucumber, Cucumaria, were made and shipped by air to Chicago for completion and preliminary examination in the electron microscope. On the basis of preliminary results, new evidence has been obtained relating to the function of certain amoebocytes in the formation of the extra cellular substances of the connective tissue.
- 2) The so-called chloride cell of Fundulus. Experiments were designed to clarify certain controversial aspects of the fine structure of the gill of Fundulus in relation to the state of adaptation of the organism to fresh and salt water respectively. Specimens were slowly adapted to fresh water under controlled conditions of temperature and salinity. Specimens

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\* Supported by NSF G-21016.

fully adapted to salinities below blood levels showed changes characteristic of the fresh water condition (loss of the apical pits in the chloride cells). The dye binding capacity of the mucoid substances of the gills was not affected by changes in environmental salinity.

- 3) Maternal and extra-embryonic blood vessels in *Squalus* were prepared for electron microscopic examination in view of their special uterine environment.

1962 #10

#### HYPOXIA ON DEVELOPING SAND DOLLAR EGGS

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In the course of studies designed to test the permeability of sand dollar eggs to dyes, it became necessary to view simultaneously the successive stages in the development of the fertilized egg. This was accomplished by transferring a large quantity of fertilized eggs to a deep flask of sea water (250 ml), and allowing them to remain at the bottom, undisturbed, for 24-36 hours at the temperature of ambient sea water. At that time, all stages of development could be seen, including the first divisions into two and four cells. That this retarding effect on cell development was attributable to hypoxia was shown in several different ways: 1) The same effect could be produced by bubbling a mixture of 5 per cent oxygen in nitrogen through the sea water surrounding the eggs, 2) it could be prevented either by agitating the flask, by bubbling oxygen through the sea water, or by placing the fertilized eggs in a flat dish instead of at the bottom of a deep flask and, 3) retardation of development did not occur when 5 per cent carbon dioxide was bubbled through the sea water. These results suggest that the metabolic activity of the developing eggs depletes the stagnant water in their vicinity of oxygen, thereby retarding their normal development.

1962 #11

#### FURTHER STUDIES ON THE SOURCE OF AMMONIA EXCRETED BY THE GILLS OF MARINE FISHES

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Previously we showed that the combined 'activities' of glutaminase I and glutamic acid dehydrogenase in gill tissue could more than account for all the measured ammonia excreted branchially by the shorthorn sculpin, Myoxocephalus scorpius. Current investigations, which were undertaken to identify possible precursors of ammonia and to develop techniques for the determination of branchial blood flow rates by application of the "Fick Principle," suggest a modification, however, of a second argument which favored peripheral formation at the gills rather than diffusion of preformed ammonia. This presumed evidence was based on experiments in which the ammonia concentration of afferent gill blood drawn from the heart was compared with what was thought to be efferent gill blood drawn from the tail, and it appeared that the gills extracted only 10 per cent of the blood ammonia. In the current series of experiments, blood