its ability to concentrate chlorephenol red within the capillaries. The specific resistance was 100-200 ohm cm², the short circuit current 1-3 μ amps. Addition of 10^{-3} or 10^{-4} molar ouabain or 10^{-4} molar KCN to both sides caused a steady decrease so that the p.d. was less than 0.5 mv after 30 min. In contrast, the <u>in vivo</u> p.d. between VF and general extracellular space of the fish was 5-15 mv, VF negative. This p.d. was stable even after the fish was decapitated. In 4 experiments the thin neural tissue of the floor of the fourth ventricle was mounted in the Ussing chamber and for the first 15 min the p.d. was 1-2 mv, VF negative. In 3 of these preparations the p.d. reversed with time. These preliminary experiments suggest the possibility that the <u>in vivo</u> p.d. between VF and blood or EDF may, in some circumstances, be the sum of the p.d. across the CP and that generated by neural tissue.

1963 #27

EXPERIMENTS CONCERNING THE CLEAVAGE STIMULUS AND FURROW IN INVERTE-BRATE EGGS

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The geometrical relations of the cleavage stimulus in the egg of the sand dollar (Echinorachnius parma) were determined by constricting uncleaved eggs and changing the normally spherical form to that of a modified dumbbell before the position of the furrow was determined.

When the mitotic apparatus of such cells lay with an aster on either side of the constriction, the distance from aster to cell surface was virtually uniform throughout the cell. Since subsequent cleavage of such cells is temporally and morphologically normal, the position of the furrow cannot be determined by absence of stimulus occasioned by a greater distance from aster to presumptive furrow than from aster to polar region. The furrow appeared adjacent to the zone between the asters in all cases. A portion of the surface in intimate contact with an aster could produce a furrow a few minutes after relocation of the mitotic apparatus.

In cleaving eggs of <u>Echinorachnius</u>, <u>Cerebratulus fuscus</u> and <u>Hydractinia echinata</u> paraxially oriented needles were placed in the path of the deepening furrow on diametrically opposed sides of the cell. The furrow progressed until it contacted the needles at which time progress ceased. In no case did a furrow sever itself upon a needle.

1963 #28

EFFECT OF CARBACHOL AND THIOCYANATE ON POTENTIAL, RESISTANCE AND H^+ SECRETION OF THE GASTRIC MUCOSA OF THE DOGFISH

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Experiments were performed at room temperature (17 to 24 C) with an <u>in vitro</u> method. The nutrient solution contained in mM: 252 Na⁺, 10 K⁺, 5 Ca⁺⁺, 2 Mg⁺⁺, 240 Cl⁻, 30 HCO₃, 2 SO₄⁻, 1 P, 10 glucose (secretory solution same cation content but Cl⁻ only anion). The H⁺ rate was determined by the pH stat method and the electrical resistance as the change in PD per unit of applied current. Carbachol (10⁻⁶ M) to the nutrient usually produced a marked increase in the H⁺

rate. The average PD before carbachol was -1.4 mv (minus means nutrient negative). Addition of carbachol to the nutrient resulted after a latent period of 3 to 7 min., in the PD becoming more negative. the PD peaked (average PD = -5.2 mv at peak) and then gradually became more positive and leveled off around -2.4 mv. Carbachol resulted in a decrease of the resistance from an average value of 232 ohm cm² to an average of 150 ohm cm². Addition of thiocyanate to nutrient (20 mM) caused a marked reduction of the H⁺ rate, an average increase of the positivity of the PD by 7.5 mv and an increase in the resistance. Preliminary experiments reveal that thiocyanate when added to the secretory side inhibited H⁺ secretion and resulted in a much smaller increase in the positivity of the PD. After the H⁺ rate was reduced to about zero further increases in thiocyanate on the secretory side resulted in an increase in the negativity of the PD. In a typical experiment with a thiocyanate nutrient and a Cl⁻ secretory solution the PD was +16 mv and with a thiocyanate secretory and a Cl⁻ nutrient the PD was -16 mv. These effects of thiocyanate on PD could be interpreted to mean that the gastric mucosa is more permeable to thiocyanate than to Cl⁻ in the net transport of charge sense.

1963 #29

THE STRUCTURE OF GILLS

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In order to obtain a thorough knowledge and understanding of gill structures, the following fishes were fixed and prepared for electron microscopy: A) Agnatha: hagfish. B) Condrichtyes: dogfish. C) Osteichthyes: 1) marine: pollock, fundulus, longhorn sculpin; 2) brackish: fundulus; 3) fresh water: catfish, eel, goldfish, fundulus. The gills of these fishes are being studied by means of both phase contrast and electron microscopy. In particular, the following structures are analyzed: a) surface epithelium, secretory and excretory cells; b) sinusoids of the gill lamellae; c) connective tissue components such as fibroblasts, cartilage, basement membranes; d) vascularization of the gill filament: afferent-efferent blood vessels, lymphatics, and lymphoid tissue.

1963 #30

CARDIAC OUTPUT DURING DIVING IN THE HARBOR SEAL, Phoca vitulina

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The adaptive mechanisms that permit prolonged diving in mammals have been of great interest. It is well known that these adaptations involve circulatory readjustments so that blood flow to critical areas such as brain are maintained. The occurrence of bradycardia in response to diving has been well documented in the seal. Indirect evidence has suggested a generalized arterial constriction in all areas except the brain during diving. Because of technical problems, successful measurements of cardiac output during diving have not been reported nor has there been reported direct evidence of generalized arterial constriction. In the present study the Ham-