never been demonstrated in the muscles of invertebrates, and its presence in any of their tissues is generally denied. I intended to determine the creatine content, if any, of *Salpa, Balanoglossus* and one or more tunicates. The first two forms were not available at Mount Desert, but the large tunicate, *Boltenia* was suitable. Examination of Boltenia indicated that creatine, or a substance resembling it, is present in the gonads. This finding suggested examination of the gonads of other invertebrates, and a similar substance was found in the gonads of *Echiurus*, although the muscle contained traces. It is necessary to collect much larger amounts of material in order to make identification certain. If established, it will be the first time that creatine has been found in invertebrates.

2. An investigation of the nature of the slime of *Myxine*. This appears to consist of a true mucin and of another protein which is more like fibrin in its appearance. The slime seems to owe its peculiar tenacity to the combination of these two kinds of protein, one protecting the other.

3. An examination of the extractives (water-solube substances) of *Myxine* muscle.

4. An examination of the extractives of *Echiurus* muscle. Both seem to contain previusly unknown substances.

STUDY OF THE LICHENS ON MOUNT DESERT ISLAND 1931

By CHARLES C. PLITT, *University of Maryland*

During the summer of 1931 I continued my studies of the lichens of Mount Desert Island, being particularly interested in the marine and maritime species. I also paid attention to the Cladoniae, and was surprised to find 34 different species. Some of the species have two, three or even more varieties or forms, making a grand total of 84 different Cladonia forms.

THE DEVELOPMENT OF THE SUPERFICIAL VOLAR ARTERIAL ARCH IN MAN

By H. D. SENIOR, *New York University*

As part of a study of the development and anomalies of the arteries of the human upper extremity, the conditions in Harvard embryos 2051, 2095, 2246 and 1913, and Carnegie embryos 940, 423, 424 and 409 were collated. It became clear for the first time that the vessel which afterwards becomes the superficial volar arterial arch is originally a subsidiary channel of drainage between the deep volar arterial

plexus and the ulnar limb at the marginal vein. This channel receives blood directly from the (temporary) a. mediana and from the a. ulnaris from the time at which those arteries become recognizable. Having thus become incorporated in the arterial side of the vascular system, the arch is drained through its digital branches into the distal part of the marginal vein, and is thus drained in the adult.

THE ORIGIN OF THE PRIMITIVE DUCT

By H. V. NEAL, *Tufts College*

The origin of the primitive (pronephric) duct remains a persistent problem of Vertebrate Morphology. Early speculations as to its origin were biassed by the assumption that Vertebrates were derived from annelid-like ancestors and that their kidney tubules were comparable with nephrida. When, however, it was demonstrated that nephridia are ectodermal while kidney tubules are mesodermal, the assumption of their homology became untenable. Consequently, if annelids possess organs comparable with kidney tubules, the mesodermal structures which Goodrich has called coelomoducts appear to be the only ones.

Even after the mesodermal origin of the kidney tubules had been demonstrated the ectodermal origin of the primitive duct was assumed. The duct was supposed to have been formed by the closure of the edges of a longitudinal groove into which the segmental tubules (coelomoducts) poured their secretions through separate apertures. This description of the origin of the primitive duct remained as the orthodox hypothesis until agreement was reached that the primitive duct is a derivative of the pronephros and is therefore mesodermal. Consequently, morphologists assumed that the primitive duct had been formed by the union of successive pronephric tubules. Such an effect would follow from a backward shifting of the external orifices of anterior coelomoducts. In this way an increasing number of tubules would share a common duct to the origin of which each made a contribution and the external opening of which shifted posteriorly until it reached the cloaca. The intimate connection of the primitive duct with the ectoderm in ontogenesis thus receives a reasonable interpretation.

Doubt as to the adequacy of this hypothesis to explain the facts of ontogenesis has recently been expressed by Burlend ('31), who denies that the facts have been correctly stated by embryologists. According to Burlend, the pronephic duct is not ontogenetically formed by the coalescence of pronephric tubules. The supposition that tubules unite to form the primitive duct in Elasmobranchs is in his opinion an error due to misinterpretation of sections. Burlend correctly states that the pronephric anlage which in Elasmobranchs forms the primitive duct arises as an elongated cellular mass proliferated from the lateral wall of the splanchnocoelic mesoderm and not as a series of outgrowths, from the nephrotomes. Burlend believes that the clue to the origin of the primitive duct in Vertebrates is found in the observations of