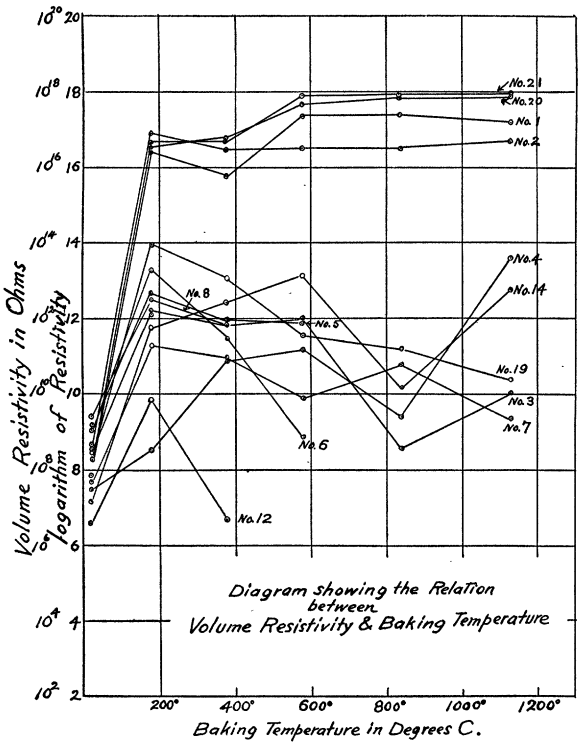

FIG. 1.

Samples Nos. 1, 2, 20 and 21 were again baked up to as high as 1870° C. and their corresponding volume resistivities computed and listed in Table 1.

TABLE 1

Sample	Sample baked up to 1130° C.	Sample baked up to 1350° C.	Sample baked up to 1700° C.	Sample baked up to 1870° C.
No. 1	1.30×10^{17}	1.15×10^{17}	9.6×10^{16}	1.0×10^{17}
" 2	4.37×10^{16}	5.56×10^{16}	3.25×10^{16}	1.25×10^{16}
" 20	6.85×10^{17}	2.30×10^{17}	2.10×10^{17}	1.68×10^{17}
" 21	7.50×10^{17}	6.78×10^{16}	5.81×10^{16}	5.40×10^{16}

It is evident that on further baking beyond 1130° C. the volume resistivity of these four samples decreases gradually.

II. *The compressive strength of soapstones.* The four samples mentioned above were tested by a laboratory oil press and showed the result given in Table 2.

TABLE 2

Sample	Compressive strength in pounds per square inch	
	Raw state	After baking up to 1130° C.
No. 1	2,500–3,300 lbs.	14,000 lbs.
" 2	2,000–2,500 "	10,000 lbs.
" 20	4,500–6,500 "	over 16,000 lbs.
" 21	2,000–2,800 "	over 16,000 lbs.

III. *Action of acids and alkalies on soapstones.* Raw and baked soapstones of these four samples have shown no noticeable sign of slight chemical change after being dipped for five minutes into concentrated hydrochloric, nitric and sulfuric acids and sodium hydroxide.

IV. *Hardness of raw and baked soapstones.* These four samples are approximately of the same order of hardness as that of quartz, which is about 6. In consequence of this great change in its hardness, from 1 to 6, baked soapstone can not be machined by ordinary shop tools.

V. *Change of colors at different baking temperatures.* See Table 3.

TABLE 3

Sample	At 22° C.	180° C.	380° C.	580° C.	840° C.	1130° C.
No.1	grayish white	gray	dark gray	dark gray	white	white
" 2	light pink	gray	dark gray	dark gray	white	white
" 20	grayish white	gray	dark gray	dark gray	white	white
" 21	grayish white	gray	dark gray	dark gray	white	white

VI. *Linear shrinkage and loss of weight after being baked.* After being baked to a temperature of 850° C.: (a) The average linear shrinkage of these samples is about 1 per cent.; (b) the loss of weight is about 5 per cent.

These results, together with others, will be published in detail in the forthcoming issues of the *Journal of the Chinese Chemical Society.*

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE DEMONSTRATION OF INTACT NERVOUS SYSTEMS OF INVERTEBRATES BY MACERATION OF WHOLE ANIMALS

CORNWELL[1] has demonstrated the nervous systems of vertebrates by the maceration of whole animals with 30 per cent. nitric acid. We were curious to know whether this maceration method would work satisfactorily upon invertebrates and whether or not the logic used for the explanation of this phenomenon could be verified. The present report records the results obtained when using the nitric acid maceration method upon invertebrates having nervous systems

[1] W. S. Cornwell, SCIENCE, 79: 162–163, 1934.

that are difficult to demonstrate by the conventional dissecting methods. Representatives from three phyla were used: (1) a mollusk, *Loligo pealei*; (2) two arthropods, *Libinia emarginata* and *Limulus polyphemus*; and (3) an echinoderm, *Asterias forbesi*. After killing the animal, it was placed in a 30 per cent. solution of nitric acid.

For the arthropods an immersion of 24 hours was sufficient to remove the inorganic salts of the exoskeleton completely and macerate the underlying tissues except the nervous tissue. The animal was removed from the acid bath and placed in a dish containing water. By cutting with a fine pair of scissors along the lateral, anterior and posterior margins of the carapace, this much softened structure was easily removed. The underlying tissues were then removed to expose the entire ventral nervous system. A fine camel's hair brush was found to be very useful in removing bits of tissue lying around the ganglia and nerve fibers extending into the appendages. Placing the dish containing the specimen under a gentle stream of water was effective in removing the remaining debris and washing out the acid.

With *Loligo* and *Asterias* a period of 12 hours in the macerating fluid was sufficient to soften the tissues adequately. With *Asterias* one needed only to pick away the tube feet and surrounding tissues with a pair of forceps in order to demonstrate the superficial nervous system. The method is a simple and efficient way of making class demonstrations. Moreover, a permanent preparation may be made by mounting the exposed systems in a suitable glycerine-jelly mass.

Cornwell[2] has suggested the presence of the myelin sheath, with its fatty properties, in the vertebrates as the explanation for the resistance to maceration, as shown by the central and peripheral nervous systems. The disappearance of a greater share of the sympathetic system he attributes to the fact that it is not entirely myelinated. This reasoning can not be used to account for the effects upon the invertebrates, for it is generally agreed that in the invertebrates and even in the cyclostomes a myelin sheath is not typically developed and is only characteristic of the adults of higher vertebrates. However, in addition to the nucleated sheath known as the neurilemma investing the nerve fibers of the invertebrates, there is present after treatment with osmic acid a deep staining layer between the outer sheath and the axis cylinder in some forms, *e.g., Palaemon*. Although this does not necessarily indicate the presence of fat, Friedländer[3] suggested that this sheath is similar to the myelin sheath in the vertebrates. On the other hand, the electrical stimulation of molluscan nerve fibers reveals a breakdown in conduction much more rapidly than when using the same stimulation on vertebrate nerve fibers. This perhaps indicates the absence of a myelin sheath.

By applying acetone or 95 per cent. alcohol to isolated nerve fibers of the forms we studied, we did not observe a clear space between the axis cylinder and the neurilemma which, if present, would indicate myelination. Furthermore, when a 2 per cent. solution of acetic acid, of which a few drops are placed at the edge of the cover slip and drawn through by filter paper, the preparation does not show the persistence of fat droplets, although albumin granules disappear optically. In *Loligo, Limulus* and *Libinia* the staining of isolated nerve fibers with Sudan III did not reveal the presence of any region of fat-like substance between the neurilemma and axis cylinder. However, in *Asterias* the fibrils have a more or less central position, with a rather densely staining region surrounding them. This region is composed of epithelial cells of mesodermal origin which may possibly serve as a protective covering. Apparently, in the invertebrates there must be some inherent property of the nervous tissue which resists the action of the macerating fluid, since the fibers are generally without a heavy protective sheath.

We are continuing our investigations on a variety of forms, along the following lines: a determination of the time necessary for the maceration process; a cytological study of the nervous elements of these representatives, using some of the more recent techniques; a chemical determination of the nervous tissue components.

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[2] *Ibid.*

[3] B. Friedländer, *Mitth. zool. Sta. Neapel*, Bd. 9, Heft 2, S. 205–265, 1889.

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