TABLE I
HYDROLYSIS OF SYNTHETIC SUBSTRATES BY PANCREATIC TRYPSINS

Substrate	Crystalline trypsin	Crystalline chymotrypsin	Hetero-trypsin
Benzoylarginine amide ...	+	±	
Carbobenzoxytyrosylglycine amide	−	+	
Benzoylglycyllysine amide.	−	±	+

ficity among crystalline trypsin (Northrop), crystalline chymotrypsin (Northrop) and heterotrypsin.

It may be mentioned that the substrates of trypsin and heterotrypsin both contain basic amino acid groups; nevertheless, this basicity is in itself not decisive for the specificity, since trypsin does not split the substrate of heterotrypsin. It has been reported[2] that chymotrypsin attacks the highly basic protamines which are extremely rich in arginine. This is of interest, since the artificial substrates of chymotrypsin do not contain a basic group and since chymotrypsin is unable to split either of the synthetic basic substrates of heterotrypsin and trypsin.

With the aid of the synthetic substrates exact estimations of each of the trypsins in the presence of each other become possible and their respective activities in various biological systems may be determined. Such an investigation of commercial pancreatin showed that this enzyme preparation splits benzoylglycyllysine amide much more rapidly than benzoylarginine amide. Therefore, pancreatin must contain a large amount of heterotrypsin and the activity of pancreatin toward genuine proteins must, to a large degree, be due to heterotrypsin.

The physiological rôle of the pancreatic trypsins is generally considered to be one of preparing the food proteins for a complete breakdown. If this be the only physiological function of the trypsins, it is difficult to understand why they exhibit such pronounced and narrowly limited specificities.

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[2] E. Waldschmidt-Leitz and S. Akabori, *Z. physiol. Chem.*, 228: 224, 1934.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

IGNEOUS ROCK TEXTURE DEMONSTRATION FOR STUDENTS OF ELEMENTARY GEOLOGY

THE study of igneous rocks by students of elementary geology is greatly facilitated by laboratory demonstration of the various types of texture, namely granitic, felsitic, porphyritic and glassy.

To demonstrate those textures in which either macroscopic or microscopic crystals are present to give a grained appearance to the rock, it is first necessary to prepare a supersaturate solution of sodium thiosulfate ($Na_2S_2O_3 \cdot 5\ H_2O$) by heating 100 cc tap water to boiling, then dissolving 200 grams sodium thiosulfate in the boiling water. The test-tube and its contents are cooled to or below room temperature by placing the test-tube and contents in cold running water. The cooled sodium thiosulfate solution is supersaturated.

For the formation of a granitic texture, place approximately 20 cc supersaturated sodium thiosulfate solution in a test-tube and inoculate the solution with a small particle of foreign material to start the crystallization. Crystals begun by the introduction of foreign material form aggregates which in arrangement of the individual crystals have the same arrangement as the crystals observed in igneous rocks of a granitoid texture.

The fine, almost microscopic, size crystals characteristic of felsitic textures may be obtained by violently shaking a test-tube containing 20 cc supersaturated sodium thiosulfate solution. The agitation of the supersaturated solution causes the formation of large numbers of minute crystals which accumulate on the bottom of the container. The crystalline character is distinctly seen when the accumulation at the bottom of the container is examined with a hand lens.

Two distinct sizes of crystals may be obtained in a single test-tube by first inoculating 20 cc supersaturated solution of sodium thiosulfate with a particle of foreign material and allowing the crystal aggregate to become well developed. The container with the developing crystal aggregate should be violently agitated by shaking so as to cause the formation of minute crystals, which in falling to the bottom of the container mix with the larger crystals of the aggregate to form porphyritic texture.

Glassy texture, such as is represented in obsidian, can be demonstrated by placing a 250 cc beaker half filled with granulated sugar over a Bunsen burner and heating slowly. The heating must be slow enough that the sugar melts without burning. If the melted sugar is poured into a beaker of cold water or on a cold surface, the resulting rapid cooling will form glassy textured masses.

The procedures mentioned above are not in themselves new but merely represent an application of elementary chemical and physical principles in experiments that can be conducted as classroom demonstrations to aid the student of elementary geology in

understanding the different textures found in igneous rocks and the relation of each to relative rates of cooling necessary to produce them.

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USE OF NILE BLUE SULFATE IN MARKING STARFISH[1]

THIS method was developed by the writer in the summer of 1935 and has been used very successfully for the past two years in his studies of the migration of starfish population of Long Island Sound and in connection with other problems where the marking of the individual starfish was desired.

The method consists in immersing living starfish in a solution of Nile Blue Sulfate for a short period of time. The solution is prepared in the following way: One gram of Nile Blue Sulfate is dissolved in a small volume of distilled water and then diluted with sea water to make up one liter of solution. If a large number of animals is to be stained at the same time, it is more convenient to prepare about 10 liters of solution at once. Dr. G. Gruebler and Co.'s Nile Blue Sulfate gives the best results.

When the solution is ready the starfish are placed in it. To avoid the suffocation of animals the solution should be aerated. The normal starfish (*A. forbesi* and *A. vulgaris*) are usually of orange-red color. After being placed in a freshly made solution of the dye, the animals acquire a very deep blue color in from 3 to 5 minutes, but as the solution weakens, longer immersion is necessary. According to my experience it is possible to stain several hundreds of medium-sized starfish, using one gram of the dye. The method can be used equally well for the marking of small or large starfish. Small, rapidly growing starfish, however, retain the color for considerably shorter periods than large ones. In the studies of the migration of starfish population of Long Island Sound, many large starfish were recovered 10 months after they had been stained and released in the Sound. At the end of the 10-month period the blue color was considerably faded but still quite deep.

In experimental work occasion often arises when each starfish has to be marked so as to be distinguishable from all other animals used in the same experiment. In such cases, the Nile Blue Sulfate method is indispensable because of the simplicity of its use. Any ray or any portion of the starfish's ray can be quickly stained by immersing it in the solution of Nile Blue Sulfate for several minutes. The stain is localized in the immersed part of the starfish and does not spread over the entire animal.

[1] Published with the permission of the U. S. Commissioner of Fisheries.

The simplicity and efficiency of this method is readily apparent if it is remembered that the self-mutilating tendencies of starfish prohibit the use of any other method of marking such as attachment of tags or cutting off portions of the rays.

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A PORTABLE HOOD FOR SMOKING KYMOGRAPH DRUMS

MODIFICATIONS of the apparatus described by Williams[1] in SCIENCE produced a portable hood which is fully effective at a cost of $7.00.

An end board of the proper dimensions was removed from a tight packing box, the dimensions of which were 27″ × 17″ × 16″. Over this aperture was placed an older model dismantled Hoover sweeper. A sheet of tinplate, 7½″ × 16″, was fastened across the top portion of the open side, and the box was entirely lined with tin. The original plan called for a hose through which the smoke could be expelled. Great was our satisfaction to find that the sweeper's sack would retain all carbon, even if benzene were used!

Increases of one or two inches in the above specifications should not adversely alter the effectiveness of the apparatus. Experience shows that decreases are not to be recommended.

The Hoover sweeper is peculiarly adapted to this work because of its wider suction opening. Sweeper companies resell used machines of the vintage in question, after reconditioning the motor, for $6.00.

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[1] G. W. Williams, SCIENCE, 81: 2106, 465–466, 1935.

BOOKS RECEIVED

American Philosophical Society. *Memoirs*, Vol. VI, 1937, *Snowshoes.* By DANIEL S. DAVIDSON. Pp. x + 207. 65 figures. $2.50. *Memoirs*, Vol. VII, 1937, *Oklahoma Delaware Ceremonies, Feasts and Dances.* By FRANK G. SPECK. Pp. viii + 161. 4 figures, 4 plates. $2.00. *Transactions*, New Series, Vol. XXX, February, 1937, *Paleocene Faunas of the San Juan Basin, New Mexico.* By WILLIAM D. MATTHEW. Pp. viii + 510. 85 figures. 65 plates. $5.00. The Society, Philadelphia.

BENTLEY, JOHN E. *Superior Children; Their Physiological, Psychological and Social Development.* Pp. xxiii + 331. Norton. $3.00.

CROWTHER, J. G. *Famous American Men of Science.* Pp. xvi + 414. 11 plates. Norton. $3.50.

SURE, BARNETT. *The Little Things in Life; The Vitamins, Hormones and Other Minute Essentials for Health.* Pp. xi + 340. Appleton-Century. $2.50.

WINCHELL, ALEXANDER N. *Elements of Optical Mineralogy; An Introduction to Microscopic Petrography.* Part I, *Principles and Methods.* Fifth edition. Pp. xii + 263. 267 figures. Wiley. $3.50.

WOODS, HENRY. *Paleontology, Invertebrate.* Seventh edition, revised. Pp. 475. Cambridge University Press, Macmillan. $3.25.