status of the writers and on their military rank. The majority of the answers came from men in this country, but those from overseas did not differ significantly from the whole group. Personal acquaintance of the writers with the author of this survey (eight cases) did not seem to influence the opinions expressed as shown by the fact that the answers were representatively distributed.

In summary, thirty-five of these forty-one zoologists now in the Armed Forces believe that peacetime research should be carried on in wartime, "in spite of war" and even with "redoubled efforts." Of these, five are for continuation in spare time, three with restriction to important problems, and twenty-seven for more or less unqualified continuation. Six men are against continuation. It would be of interest to know what the majority of men in other fields of science, of the humanities and in general think about the problem raised.

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THE 24-INCH OBJECTIVE PRISM OF THE WARNER AND SWASEY OBSERVATORY

ONE month before "Pearl Harbor," the 24-inch Schmidt-type telescope and the building addition to the Warner and Swasey Observatory of the Case School of Applied Science were completed. Plans for an objective prism for this instrument were executed in conjunction with the design of the mounting, and the Bausch and Lomb Company agreed to furnish us with a suitable disc of optical glass for this purpose. On December 12, 1943, the completed prism was finally mounted on the telescope and during the succeeding two months extensive tests were made with it.

The one-lump mass of glass for the disc was chosen from one of the pots of optical glass. The 260-pound piece chosen was free from deep striations and air bubbles. This huge mass, one of the most perfect ever produced, was molded to shape in a deep furnace utilizing a pot design to produce a wedge shape. The flat surfaces were then polished and the disc examined with polarized light. No strains were detected. Later tests showed that the annealing of the glass was excellent. The diameter of the finished disc, before being reduced in the optical shop, was 26.75 inches; the thickness varied from 3.0 to 4.3 inches. The refractive index of this light flint glass is 1.617 with dispersion ratio of 36.6.

The grinding and polishing of the prism was executed in a most satisfactory manner by C. A. Robert Lundin, of the Warner and Swasey Company. This firm has also constructed and erected the Schmidt-type Burrell telescope of the observatory and the dome.

The diameter of the finished prism is 24.5 inches, with clear aperture of 24.0 inches and with graduated thickness from 0.75 to 2.5 inches, producing an angle of 4 degrees. The finished prism weighs 100 pounds.

The prism cell mounting is so constructed that when in place it may be easily rotated through any desired angle in a plane perpendicular to the optical axis of the telescope. The cell with the prism forms a symmetrically balanced mass of 150 pounds. A 26-inch ring-weight of 150 pounds situated in front of the correcting lens is first removed from the telescope when the prism is to be mounted, thus avoiding any re-balancing of the instrument.

The optical system of the Schmidt telescope is composed of a 36-inch mirror of pyrex glass with aluminized surface and a 24-inch correcting lens of Vitaglass, 0.34 inch thick. The effective focal length of the instrument is 84 inches. The plate holder is circular and adapted for plates 8 inches in diameter yielding a field of 5°.

The combination of the prism and telescope produces spectra of 3.2 mm in length from H_β to H_ϵ.

The quality of the spectra appears excellent. In the spectrum of the F_5 star α Persei 21 lines in the region from H_β to H_{16} have been identified. Both focal images and spectral images are of excellent definition to the very edge of the plate.

The main program of the prism telescope combination will be the study of the structure of the galaxy through spectral type distributions and related problems. Plates already secured indicate that absolute magnitude classification as well as spectral types may be readily studied with these small scale spectra.

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DIGESTIVE AVAILABILITY OF BEAN STARCH

IN view of the present emphasis on the use of dried beans a brief account of some additional observations on digestive factors in navy beans may be of interest. It was recently found that the ether-soluble fraction of these beans retards the *in vitro* digestion of soluble starch more than some of the other edible fats. In an earlier note[1] attention was called to the interference which is observed when the total ether-soluble fraction is added to soluble starch in the same concentration in which it occurs in the beans or about 1.5 per cent.

Employing 1 per cent. solutions of soluble starch adjusted to pH 7 with phosphate buffer, further study has shown that various preparations of starch and navy bean oil differ in the ease with which they are completely digested when sufficient pancreatic amylase is added to digest untreated control starch or starch containing 1.5 per cent. of olive oil, lard or butter

[1] D. E. Bowman, SCIENCE, 98: 308, 1943.

within 30 minutes. Estimation of the amount of reducing sugars formed indicates that in the great majority of these artificial bean-oil preparations the undigested residue which is responsible for the positive starch-iodine test and which resists digestion for some hours after the control preparations are digested does not exceed 5 per cent.; however, in some cases this fraction was observed to be much greater. Sodium chloride was added to obtain maximum activity of the enzyme.

The reason for this variation and the relation of the ether soluble factor in the intact bean to the delayed digestion of bean starch is being studied further. The relative inaccessibility of the bean starch to *in vitro* digestion by pancreatic amylase is apparent when soaked whole beans are heated and crushed under conditions which more than suffice to render the starch of potatoes quite available. When digested as described with equal starch concentrations the difference in the amount of reducing sugars formed in the two cases is very striking. The starch of beans which are finely ground before cooking appears to be more easily digested than that of the beans which are cooked whole and then mashed.

Procedures other than prolonged heating employed in compensating for the delayed digestion include the well-known action of acids upon insoluble starch as well as treatment with yeast and enzymes of barley malt. While the yeast has many obvious advantages in adding desirable nutritional factors simple preliminary treatment with acid with subsequent neutralization appears to be more practical and efficient than the latter in accelerating the digestion *in vitro*.

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DEMONSTRATION OF THE FORMATION OF A FILAMENT FROM TISSUE CONSTITUENTS IN VITRO

IT has been possible during the past four years to entertain visitors to this laboratory with an *in vitro* demonstration of what we have extravagantly termed a "nerve regeneration." A perfectly formed spiral filament can be precipitated from a phosphate extract of brain tissue when a direct current is passed through the material confined in a glass tube of small diameter. This demonstration has served to mystify the skeptics and impress the more gullible of my less scientific collaborators. The interest expressed justifies the recording of this phenomenon, which was first observed during the course of some experiments on the cataphoresis of a mixture of brain proteins.

The demonstration may be repeated as follows: 12 inches of glass tubing with an external diameter of approximately 3 mm (internal diameter may vary between 1 and 2 mm) is bent into a "U" tube approximately 5 inches tall. The tissue extract is prepared by taking one volume of brain cortex (freed of the more obvious blood vessels) and mixing with two volumes of .02 M phosphate buffer, pH 7.3, in a small mortar and pestle, where it is ground until it is quite homogenous. This mixture is centrifuged at 1,500 r.p.m. for approximately 15 minutes, or until the gross particles are separated from the supernatant extract. It is not necessary to centrifuge until the supernatant is perfectly clear. Some of this extract is transferred to the glass "U" tube with the aid of suction and 110 volts of direct current are applied to this mixture with the aid of platinum electrodes inserted in both ends of the "U" tube. The platinum electrodes are made from pieces of platinum wire, gauge No. 22. Contact between the solution and the platinum is made by inserting the wire a distance of 1/16 inch below the surface of the mixture. Shortly after the current is applied a small precipitate begins to form at the anode (acid-forming pole). This precipitate extends itself to form a thin filament which spirals down the tube to form what looks like a fine spring. The thickness of the filament will vary depending upon the strength of the current and the density of the tissue extract. Reversing the polarity of the current causes solution of the filament by the alkali formed at the cathode.

It has been possible to make these spiral filaments from the brains of rats, hogs, cattle, rabbits and man. Attempts to duplicate this phenomenon with tissue extracts from other organs have not been successful in the few trials attempted nor has it been possible to date to duplicate the experiment with solutions of purified proteins.

The filament formed has low tensile strength but with care can be removed from the glass tube. It is not pure protein but is a mixture of most of the components of the original extract.

The explanation of this phenomenon may depend in part upon the fact that the protein in solution in the brain extract is precipitated when the acid is formed at the end of the anode. The orientation of this precipitate into a spiral may be influenced by the shape of the vessel in which it is formed, the electrical field of force about the precipitate and the movement of the fluid in the container.

The biological significance of this demonstration can be almost anything the imaginative reader cares to imply. Additional work is indicated.

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