lightly, and collecting the dry exudate thus dislodged. One lot so collected was dissolved in water so as to float and settle off the particles of grass and part of the solution treated for two hours at 100° C. at pH 6.5 in accordance with the methods of Vickery, *et al.* (*Biochem. J.*, 1935, 29, 2710–2720). A marked increase in ammonia following the treatment indicated the presence of glutamine. A total of 12 flats fertilized at three different times while the grass was making rapid growth of dark green color following earlier applications of NH_4Cl produced relatively little or no white exudate.

G. J. RALEIGH

Cornell University

Captain Jenkins' Views

The objections of Captain John G. Jenkins, USNR, to the universal application of statistical methods to research in psychology probably are well taken. Indeed, these objections may well be extended to many fields of scientific endeavor and to many methods of research. Any circumscribed test assumes that certain ideal conditions shall be fulfilled, but in reality the ideal is seldom present or even achievable. Therefore, any single test reveals only one aspect of the situation. Usually the situation is far more complex than we imagine.

The chief injury of the standardized test arises not from its limited nature, but from the mental attitude of investigators that all research must be fitted to some particular test. However, all tests are only tools and like machine tools they are useful in some, but not in all, situations. Years ago Fabre pointed out this discrepancy between the ideal tool and the actual situation. Although the inimitable observer failed to appreciate the marvelous adaptability of Darwin's theory, his words from "A dig at the evolutionists," translated by Alexander Theixeira De Mattos, are applicable to the present situation:

"But to this calculus, all-powerful so long as it does not leave the domain of the ideal, let us submit a very modest reality: the fall of a grain of sand, the pendular movement of a hanging body. The machine no longer works, or does so only by suppressing almost everything that is real. It must have an ideal material point, an ideal rigid thread, an ideal point of suspension; and then the pendular movement is translated by a formula. But the problem defies all the artifices of analysis if the oscillating body is a real body, endowed with volume and friction, if the suspensory thread is a real thread, endowed with weight and flexibility; if the point of support is a real point, endowed with resistance and capable of deflection. So with other problems, however simple. The exact reality escapes the formula."

PAUL D. HARWOOD

Ashland, Ohio

. . . I think *Science* is to be complimented on Captain John G. Jenkins' article (*Science*, 1946, **103**, 33–38). The general indictment against the technical man, and it is not without some basis, is that his scientific approaches and thought patterns are devoted to obscure fields without any realization of practical value. While the scientific purity of thought is highly commendable it would appear that some of the effort in that direction would have greater significance if interpreted in the light of some of Captain Jenkins' remarks.

E. C. KOERPER, *In Charge of Special Engineering A. O. Smith Corporation, Milwaukee, Wisconsin*

Pancreatic Enzymes and Liver Fat

The late Dr. A. H. Palmer was well known for his work on the proteins of milk whey. He joined this department in September 1944 and undertook at my suggestion the separation and identification of enzymes present in the antifatty liver fraction of pancreas, prepared by the method of Entenman and Chaikoff (*J. biol. Chem.*, 1941, 138, 477). Palmer's work was hampered by ill health and terminated by his death on 10 April 1945. During his short period of application to his new problem, however, he obtained in crystalline form and in fair yield trypsinogen and chymotrypsin from the pancreas extract. He identified these two enzymes to his own complete satisfaction and believed that at least one more proteolytic ferment was present in the extract.

Chaikoff, Entenman, and Montgomery (*J. biol. Chem.*, 1945, 160, 489) state that their findings are consistent with the concept that the antifatty liver factor (of pancreas) is enzymatic in nature. The results of Palmer's work provided evidence in support of this view, and it is most regrettable that his notes are not sufficiently complete to enable us to make a detailed report of his findings. Some of his preparations are still available, however, and it may be possible to complete certain aspects of his work.

The probability that the enzymes contained in the pancreas which is fed to depancreatized dogs contribute very significantly to the total lipotropic effect by releasing lipotropic factors from the various constituents of the diet has been emphasized in previous reports from Chaikoff's and this laboratory. The possibility that these enzymes played a role in the prevention of fatty livers in insulin-treated depancreatized dogs was, of course, mentioned and seriously considered by Prof. J. J. R. Macleod and his collaborators in the original work in this field.

C. H. BEST

Banting and Best Department of Medical Research University of Toronto

Absorption of Phenol Vapors by Plants

An interesting phenomenon concerned with the absorption of phenol-like vapors by plants was observed during the Summer of 1945 in and about Ambler, Pennsylvania. A factory located on the outskirts of Ambler started the commercial production of 2,4-dichlorophenoxy acetic acid (2,4-D). This product has been used as a plant growth regulator and has been developed by the Bureau of Plant Industry, Soils and Agricultural Engineering, as a weed killer.

In the production or purification of the product at

Ambler, phenolic vapors escaped into the atmosphere and were distributed over several square miles of the area surrounding the factory. The concentration of the vapors varied with the atmospheric conditions: on clear days the concentration was slight or not noticeable; on cloudy days with low atmospheric ceilings the vapors were quite noticeable at distances of one to two miles from the factory. The summer in this vicinity was a wet one, the number of cloudy days and nights being above average.

One determination of the concentration of the vapor taken by the Pennsylvania Department of Health at the source is reported equivalent to parts of dichlorophenol at 4 p.p.m. However, at this concentration near the source, the odor is quite noticeable. While the vapors may be objectionable, they have not yet been regarded as a human health hazard, the factory workers having been exposed to these concentrations without any reported ill effects.

On the other hand, the flavors of certain garden vegetable crops grown within the area were affected by the vapors. Tomatoes were especially affected, with string beans, Swiss chard, and lettuce responding in lesser degree. Carrots, beets, potatoes, peppers, and cabbages were apparently not affected.

Samples of vegetables were secured by the writer from gardens located approximately 200, 400, and 600 yards and one mile and one and one-half miles from the factory.

The tomato fruits acquired a pronounced "medicine" flavor of phenolic type, yet not unlike that of iodoform, although iodine is not involved in the compound. The concentration of the unusual flavor in the various fruits was inversely proportional to the distance of location of the gardens from the factory. However, wind drift affected the concentration from time to time over the area.

The tomato deposited the flavor in the fruit at all stages of maturity and retained it permanently or until it decayed. Young, quite immature fruit possessed the flavor, which could easily be detected by odor when the fruit was cut or broken open. As the fruit matured on the vine the concentration apparently increased until the fruit was picked. Tomatoes grown at a distance of one or one and one-half miles from the factory, and, where it is believed the concentration of the vapors in the air was usually less than in gardens nearer to the factory, varied in the deposition of phenolic flavor in the several lobes or segments. Whereas one lobe was nearly free of the flavor, another one was quite strong. Fruit produced nearer to the source of the vapors acquired a more uniform deposition. The concentration of the phenolic flavor apparently did not decrease in storage. Contaminated fruits stored for 14 days five miles from Ambler in a normal atmosphere possessed as strong a flavor as when they were picked, as determined by taste tests. Fruits picked green and allowed to ripen in a normal atmosphere for 14 to 21 days seemingly had not lost any of the unusual flavor. Ripe fruits retained the flavor in normal air or refrigerator temperatures. Stewing the ripe fruit intensified the flavor. All fruits were carefully washed and peeled, and in no case was there any noticeable flavor in the skin.

No chemical determination as to character or amount was made of the deposited flavor. Three tolerance tests were made by the writer on three different days, samples being secured from gardens located about one mile from the factory. Twelve ounces of well-colored, ripe fruit that was carefully washed were eaten. Nausea followed within 15 minutes and continued for two to three hours. On alternate days the same experiment was made with an equal weight of ripe tomatoes grown in a normal atmosphere five miles from Ambler. No ill effects were noticed.

String beans grown in the same gardens as were some of the tomatoes also developed off-flavors which were not as strong of phenols as those of the tomatoes. The beans, however, were unpalatable, and several gardeners reported that they had to dispose of their canned crops, as persons eating them were nauseated.

Swiss chard developed a very strong, unpalatable taste. Eating a small quantity induced slight nausea. Lettuce grown within one-quarter of a mile of the source had developed a strong, unnatural off-flavor differing from that of "bitter" lettuce.

Samples of tomatoes were secured from several other localities within the Philadelphia metropolitan area where large chemical establishments have "zones of influence" and fields and gardens are subjected to vapors of various sorts. In none of the samples secured from these areas was there noticed any unnatural flavor. However, so far as is known, none of these latter factories evolve phenolic-like vapors.

It was not determined whether the vapors were absorbed directly through the leaves or by the roots from accumulations in the soil that may have been collected by the rains and dews.

The abnormal effects were noticed only on the flavor of the fruit or leaves as described above. In no case was there observed any structural deformation on any plants due to the vapors, although 2,4-D and other compounds of the hormone group have the ability to markedly affect plant structure when sprayed on certain plants in very weak concentrations.

It is believed important to call attention to the hazards involved in rendering important crop-producing areas useless by the dissemination of certain industrial vapors even in light concentrations. Following the experience around Ambler in 1945 the factory officials are reported to be active in altering their process so as to prevent any further escape of dangerous vapors.

E. G. BEINHART

Wyndmoor, Pennsylvania