held out of uniform against their own wishes. Obviously, once in the war, our chief business is to win. But surely, if a war is really worth winning, some consideration may well be given to the future of the men who win the war or for whom it is won.

There is, too, a wholly different angle that might be studied. That is the question as to whether those active in science are the best judges of the need for their activities and the desirability of the exemption of their potential assistants. Long and intimate association with my scientific colleagues leaves me with the conviction that they measure up well in patriotism with any other group of citizens. That certainly does not mean, however, that they are unprejudiced or that they are good judges of the importance of their own work.

In his farewell address to the Medical School of Harvard University on November 28, 1882, Oliver Wendell Holmes repeated this story:

> When the city was besieged each artisan who was called upon in council to suggest the best means of defence recommended the articles he dealt in: the carpenter, wood; the blacksmith, iron; the mason, brick; until it became a puzzle to know which to adopt. Then the shoemaker said, "Hang your walls with new boots" and gave good reasons why these should be the best of all possible defences.

It could hardly be otherwise. Does it surprise anyone that during war many a man finds in his own specialty great national importance and great need of Federal support? To him it *is* the most important thing that can be done. No doubt it is the most important thing *he* can do. But that is not the question here asked. That question is quite different. Is the contribution these young men may make of such probable value to the Nation that we are justified in compelling or even urging them to separate themselves from the great mass of their fellows and to form a special class? There is another less pleasant possibility. If a mere gesture toward science, mere registration for advanced work in science, means draft exemption, the results may be injurious to science itself. We offer the blatant temptation for men of weak character and morale to select science as safety first. Weak departments will fill their laboratories with weaker students and produce the Ph.D.s who will be the professors of the next generation. All this at a time when science is already too far from humanity for the national good!

In botany at least, the only field with which I can claim familiarity, we need to begin to think of our science not as an end in itself, but as a part of human living. We need more botanists with the courage to say with Kenneth V. Thimann, of Harvard University, "The consequences of major progress in this area are very great, not only to pure science but for agriculture. In these days when so much of the world is near to starvation no worker can fail to carry this thought in the back of his mind, in spite of the frequent statement that research is its own reward and that no further incentive is necessary" (from the Foreword of *Vernalization and photoperiodism:* a symposium, by A. E. Murneek, *et al.* Waltham, Mass.: Chronica Botanica, 1948).

We need to read something other than what is printed in our own memoranda and in *Science*. It might not do any harm to read even the statements of S. L. A. Marshall, one of the editors of the *Detroit News*, who was formerly on Gen. Eisenhower's staff in the European Theater of Operations, where he directed the Historical Branch of the Army. Speaking at Washington and Jefferson College on April 16, 1948, he said:

> Sitting at the central seat as I did, in the position uniquely suited to give one the main chance for clear evaluation of the forces, material and moral, which made possible our victory, and determined the balance for defeat or for triumph on each of our battlefields, I came through that experience seeing clearly for the first time that the epitome of national greatness, and the strength which makes for the survival of a society, are not to be found in the wealth and productive genius of its industry, or the brilliance of its scientific achievement. No indeed! Real national strength and the power to endure and to be made strong again through adversity, do not come of the material triumphs of civilization, but of what the total of surrounding influences puts into the hearts and souls of men.

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Quantitative Estimation of Amino Acids on Paper Chromatograms

The excellent technique for the separation of amino acids and other substances by one- and two-dimensional paper chromatography was introduced by Consden, *et al.* (*Biochem. J.*, 1944, **36**, 224). It has the drawback that, as originally described, it is only a qualitative method or, at most, an approximately quantitative method. A. S. Keston, *et al.* (*J. Amer. chem. Soc.*, 1947, **69**, 3151), A. J. Woiwood (*Nature, Lond.*, 1948, **161**, 169), L. Naftalin (*Nature, Lond.*, 1948, **161**, 763), and others have been able to determine the amino acids or radioactive amino acid derivatives separated by paper chromatography. They cut strips or areas from the paper, extracted the amino acid or its derivative, and determined its concentration in the extract by standard methods. These procedures suffer from the disadvantage that they either require specialized equipment or are relatively tedious to carry out. R. B. Fisher, D. S. Parsons, and G. A. Morrison (*Nature, Lond.*, 1948, **161**, 764) have described several methods based on the observation that the area on the paper occupied by the amino acid or other substance is a function of its concentration. This method has been only moderately successful in our hands and could be applied only when there was no overlapping of the amino acids.

The following procedure has, however, given good results. The amino acids in a protein hydrolysate are divided into three groups: dicarboxylic amino acids by adsorption on an anion exchange resin, basic amino acids by adsorption on a "carboxylic" cation exchange resin, and neutral amino acids. After elution from the resins (where necessary) and concentration, 0.01-ml aliquots containing less than 0.1 mg of amino acids are chromatographed. The amino acids are then revealed by spraying with ninhydrin or other suitable reagents. The color density of consecutive 5-mm strips is determined with an electronic transmission densitometer (Photovolt) using the appropriate filter. The color densities are plotted against the distance from the starting line, and distribution curves are drawn. The areas under the curves give the approximate content of each amino acid. Standard amino acids, both individually and in mixtures, are run side-by-side with the unknown.

In the case of the two-dimensional chromatograms, the area of greatest color density, multiplied by the area of the spot, gives the concentration of the amino acid when read from a curve prepared in the same way.

This method has been applied successfully for the quantitative estimation of all amino acids in an acid hydrolysate of proteins except for leucine and isoleucine, which, as yet, have not been sufficiently separated.

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Parasites to Aid in the Control of the Sweet Clover Weevil[1]

The idea of importing parasites to help in the control of injurious insects is by no means new. One of the early and outstanding achievements along this line was the introduction of the Vedalia beetle from Australia to California by the U. S. Department of Agriculture in 1888–89. This became established and has been an important natural aid in the control of the cottony cushion scale on citrus fruits. Many other examples of successfully established parasites might be cited. In general, the parasites must be obtained from the land where the destructive species originated, because it is there that they have had the opportunity to develop.

One of the destructive species about which American agriculture has become increasingly concerned is the sweet clover weevil, *Sitona cylindricollis.* This species was first recorded on the American continent near Montreal, Canada, in 1924, having come over from its native Europe in some unknown way, and has since spread over much of the sweet-clover-growing area in the United States and Canada. It is especially destructive to the sweet clover seedlings, often destroying them before they can become established. The damage is largely the result of the feeding on the leaves. This gives the leaves a scalloped effect, but, when severe, the plants may be completely defoliated. The larvae appear throughout the summer as small, white, fat grubs in the soil at the base of the plants, where they feed on the rootlets to stunt the plant's growth.

Measures against the weevil have included the application of insecticides and the use of shallow tillage. Of various insecticides a 3% DDT dust applied to the infested fields early in the spring, at the rate of about 20 lbs/acre, has been most effective. Shallow tillage of sweet clover during early summer destroys many of the larvae and pupae at the base of the plants by exposing them to the sun and heat of the surface soil. Delaying the seedling beyond June 15, when weevil activity temporarily subsides, has been observed to give new seedlings a chance to become sufficiently established to survive subsequent weevil damage.

Through the cooperation of the Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture, the North Dakota Agricultural Experiment Station has recently obtained from France two species of insects which are parasitic on the sweet clover weevil. One is a small, hymenopterous species, *Microctonus aethiops,* and the other is a small, dark-colored fly, *Campogaster exigua.* A few small shipments of both species received during the spring and summer of 1948 were released in cages supplied with large numbers of weevils to be parasitized. The cages were constructed of a 36-mesh plastic screen, a type of material which allows the passage of considerably more light than metal screen of similar mesh and probably contributes to more normal conditions for the caged occupants.

The reaction of the weevils to the parasites was interesting. Even though the weevils on this continent had apparently been separated from their parasites since at least 1924 (24 annual generations of the weevil), they immediately indicated fear when exposed to *M. aethiops.* On one occasion *M. aethiops* was observed to stalk a "frantically retreating" weevil for a distance of 30″ in a cage before overtaking it and thrusting an egg into its body. The presence of *C. exigua* in the cages did not cause any observable disturbance of the caged weevils.

H. L. Parker, who supervised the collecting of the parasites, observed that from 20% to 50% of the weevils in the collections were destroyed by *C. exigua* as contrasted with about 4% by *M. aethiops.* If present efforts result in establishing these parasites in this country to the extent that they can shift for themselves, a permanent check on the weevil and an important agency in natural control will have been achieved. The lack of these natural checks on the sweet clover weevil is evidenced by its extensive and rapid spread since its introduction to North America. Where sweet clover formerly thrived the weevil has, in many instances, reduced the acreage of this pasture- and soil-building crop to less than 25% of its former status. To what extent the recently imported parasites are able to become established and effective in checking the weevils awaits to be seen.

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[1] Assisting in this investigation are Marvin A. Leraas and Kenneth S. Engle, students at the North Dakota, Agricultural College.