In our investigation the influence of various doses of pure crystalline thyroxin (as sodium salt) and cattle thyroglobulin (prepared by the method of Roche *et al.*, *3*) on the growth of rice moth larvae (*Corcyra cephalonica St.*) was studied. In each set of experiments, 15 petri dishes (14 cm in diameter) containing 10 g of white wheat flour and different concentrations of thyroxin or thyroglobulin, as detailed in Table 1, were seeded with 5 mg of fresh eggs of the moth collected during the previous 24 hours. At the end of 15 days, two batches of 10 larvae were picked up from each dish and weighed separately, and the average weight of the larvae in each dish was obtained. The average values of three such sets are given in Table 1.

It will be seen from these results that thyroxin up to a dose of 0.75 μg/g of diet has a definite growth-promoting effect on the larvae, while higher doses bring about inhibition of growth and even death at a concentration of 20 μg/g of diet. Thyroglobulin in all the concentrations used failed to show any influence on the growth of the larvae.

The results of oxygen-consumption studies with the larvae fed on different doses of thyroxin or thyroglobulin for a period of 15 days are given in Fig. 1. These results show that thyroxin feeding increases the oxygen requirement, whereas thyroglobulin was not quite effective. The slight increase in the oxygen consumption in the thyroglobulin-fed group over those of the control group can be attributed to the addition to the ration

Table 1. Influence of thyroxin and thyroglobulin on rice moth larvae at the end of 15 days' growth

Dish No.	Thyroxin content in diet (μg/g)	Thyroglobulin expressed as its thyroxin equivalent (μg thyroxin/g diet)	Avg. wt. of larvae (mg)
1			3.05
	Thyroxin-fed group		
2	0.10		3.03
3	0.20		5.36
4	0.30		6.91
5	0.40		7.39
6	0.50		9.29
7	0.75		9.59
8	1.00		6.91
9	2.00		5.96
10	20.00		2.45
	Thyroglobulin-fed group		
11		0.058	3.00
12		0.145	2.98
13		0.290	3.02
14		1.450	3.00
15		2.900	3.04

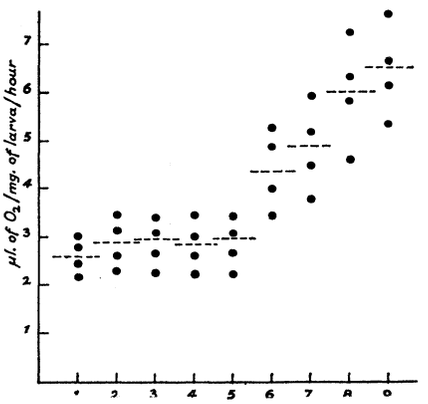

Fig. 1. Influence of thyroxin and thyroglobulin feeding on the oxygen consumption of rice moth larva. (1) Control group (10 g wheat flour); (2) wheat flour (9.5 g) + casein (500 mg); (3) wheat flour (9 g) + casein (1 g); (4) wheat flour (9.5 g) + thyroglobulin (equivalent to 0.29 μg of thyroxin per gram of diet); (5) wheat flour (9 g) + thyroglobulin (equivalent to 0.58 μg of thyroxin per gram of diet); (6) wheat flour (10 g) + 1 μg of thyroxin; (7) wheat flour (10 g) + 3 μg of thyroxin; (8) wheat flour (10 g) + 6 μg of thyroxin; (9) wheat flour (10 g) + 10 μg of thyroxin.

of the animal protein, because a similar slight increase was noticed with the casein-fed group also (Nos. 2 and 3 in Fig. 1). These results show that the larvae, although they do not normally require thyroxin for their growth and maintenance, are still able to utilize thyroxin for their metabolic activity and are unable to use thyroglobulin as a source of thyroxin. This is probably due to their inability to split the protein completely. The influence on the growth would have depended on the amount of free thyroxin present in the various thyroid preparations used by different workers, and this may account for the peculiar results obtained by earlier workers.

These studies show, in addition, that rice moth larva (*Corcyra cephalonica St.*) can serve as a suitable organism for the study of thyroxin metabolism. Studies of the influence of triiodothyronine and other related investigations on this organism are in progress.

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24 May 1955

University Chemistry Teachers

The following survey of the characteristics of university chemistry teachers was made from the data in the American Chemical Society publication *Faculties, Publications and Doctoral Theses in Chemistry and Chemical Engineering (1953)*, supplemented by information from the 1954 edition of *American Men of Science.*

According to the report, there are 89 departments of chemistry offering both bachelor's and doctor's degrees; the 89 departments employ 1465 professorial employees. Of this group 35 percent claim to be physical chemists (including chemical physicists and nuclear chemists), 29 percent are organic chemists, 12 percent are inorganic chemists, 11 percent are analytic chemists, 8 percent are biochemists, and the remaining 5 percent are not classified. Where more than one specialty was indicated, only the first mentioned was counted.

A high concentration of physical chemists at Princeton, Yale, Cornell, Columbia, Chicago, California (Berkeley), and the Massachusetts and California Institutes of Technology was noted, 48 percent of their faculties being so classified, with only 25 percent listed as organic chemists. The schools of the Big Ten (Illinois, Michigan, Minnesota, Wisconsin, Northwestern, Purdue, Indiana, Ohio State, Iowa, and Michigan State) had 31 percent in each of these two major specialties.

The universities from which the faculty members received their own doctorates were few. A total of 34 percent held a Ph.D. degree from Princeton, Harvard, Yale, Columbia, Cornell, Chicago, California (Berkeley), M.I.T. or Caltech, while another 28 percent came from the Big Ten schools. Only 50 persons in the group received a foreign doctorate. It is interesting that 18 of the 19 schools listed in this paragraph obtained 84 percent of their own faculties from within this select group of universities. (Harvard did not provide data for its faculty.)

Regional and environmental preferences are important in a teacher's location. Thus, 48 percent of Big Ten faculty members have a Ph.D. degree from a Big Ten school; 52 percent of the faculties of Princeton, Yale, Cornell, Columbia, and M.I.T. have degrees from these institutions or Harvard; and 63 percent of the California, Caltech, and Chicago faculties have the Ph.D. degree from one of the three. Less than 15 percent of the faculties of the other 71 universities in the report have the Ph.D. degree from the same school at which they work.

The age distribution of the group was as follows: 73 were born before

1890, 228 from 1890 to 1899, 273 from 1900 to 1909, 457 (31 percent) from 1910 to 1919, and 418 (29 percent) from 1920 to 1929. Some declined to list a birth date.

Only 153 are not listed in *American Men of Science* (Physical Sciences volume). Of those who are married (at least 77 percent), 46 percent married between ages 25 and 29, inclusive, and 28 percent between 20 and 24. Only two persons were married before the age of 20, and only 20 listed more than one marriage. The total number of children is 2100, an average of 1.9 per faculty marriage.

Approximately 20 percent reported full-time industrial employment as part of their experience. However, for the purposes of this survey, employment by government agencies, as well as wartime work at Oak Ridge and similar installations, was not counted as industrial experience.

One may reasonably conclude from the foregoing data that university chemists are social and occupational conservatives.

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19 July 1955

Hazards of Biological-Social Analogy

I suppose that H. W. Stunkard may have been teasing, or at least writing with his tongue in cheek, when he contributed "Freedom, bondage, and the welfare state" [*Science* **121**, 811 (1955)]. I can hardly believe that he intends to argue that, at present, we live in the most perfect of all imaginable human societies, and that any further cooperative action to assist our fellow-citizens must necessarily lead us downhill to biological degeneration. I hope that Stunkard will agree that much of the social progress that is now generally accepted as beneficial (universal suffrage, child labor laws, and so forth) was once considered very controversial and dangerous, if not actually contrary to nature.

Of course, Stunkard has the right to hold fast to his own opinions regarding the value of various forms of animal life, even when these opinions appear to have originated from his reaction to situations in human society. However, it is possible to come close to logical sophistry in this way.

To take just one example, it seems a shame to have Stunkard declare that the honeybee is *in reality* ". . . a most pathetic little creature . . . a martyr, and [a] victim of the 'welfare state'." As a person who has had some slight contact with bees, I would like to offer the dissenting opinion that the bee's world appears to be very full, satisfying, and creative, at least from the point of view of the bees. They certainly resent interference. The moral is this: If I hope to establish any sort of meaningful relationship with the bees (and occasionally share in their honey), I must, in some degree, be willing to accept the bees as they are and to cooperate with them in their own way of life. Would it be more patriotic for me to boycott the bees until they agree to accept the principle of universal suffrage and to choose their queen every 4 years in a general election?

I sincerely hope that Stunkard's paper will not be used to give quasi-philosophic support to an idea that has already become one of the chief plagues of our times. This is the idea that we cannot live securely in our American society until we have managed to recreate the entire world in our own image.

In conclusion, I think that we are merely deceiving ourselves, and other people as well, when we take hold of any special political and social philosophies (no matter how worthy), dunk these ideas in the sacred waters of some scientific specialty that has been developed to explain and interpret entirely different phenomena, and then fish them out and bring them back to where they originated in the first place, but now representing them as part of the *cosmic scientific secret of the universe.*

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23 June 1955

I cannot agree that Stunkard's conclusions follow from the facts and discussion that he presented. After a considerable array of descriptive information and theoretical deduction about the probable phylogeny of the animal phyla, he stated that "The welfare state offers security to workers on terms of contingent subjection and dependency, but such a social order reduces the individual to abject subservience, and results in the development of a rigid caste system. Dependency and degeneration are cognate phenomena, they go hand in hand. . . ."

Although analogy may be both inspiring and educational, we must recognize the limitations of such illustration. Theory may be contrived, but conclusions, especially those about ethics and morals, should have some relationship to reality. Stunkard's analogy between biological dependency and degeneration on the one hand, and dependency between men, and degeneration of men, in human society on the other, does not warrant the conclusion quoted in the preceding paragraph.

Human beings, by their very nature, must be as dependent as, if not more so than, many other animals, not only in kind but also in degree. Is a dairyman less dependent on his cows than an ant? What organism, other than man, could be more dependent on others for food and survival during childhood and even adolescence? Infants are certainly more helpless than many, if not most, mammals at birth. *Homo sapiens* is even less adequately able organically to synthesize the vitamins necessary for his growth and development than is the lowly bread mold. Have any of these types of dependency any causal relationship with degeneration?

Socially we depend upon one another for the proper maintenance of all aspects of civilization. Industrialization and specialization in research are obvious facets of the interdependence of men. Is an employer less dependent on his workers than the queen bee upon its workers?

Sweden is usually cited as the nation that has developed its consumer cooperative movement more than any other. In my book, cooperation is a form of voluntary dependency, which acknowledges the universal, economic interdependence of men in modern society. "Swedes" have not impressed me as having sunk to "abject subserviency," nor do I recall any slave castes in Sweden.

If degeneracy appears imminent, it may be because of our extravagance with natural resources and because of the days of overpopulation in the foreseeable future. The lack of proper diet that will result can cause the degeneration of coming generations. For biological as well as economic reasons, an atomic war may cause racial degeneration. These are imminent dangers and sources of possible degeneration; compared with them, the likelihood of degeneration owing to a welfare state seems a remote possibility at most.

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11 July 1955

The thesis that social problems can be solved by applying biological principles can only retard the progress of the social and the psychological sciences. Human societies develop historically, not biologically. Man has changed very little from the biological viewpoint in many thousands of years, and yet he has lived in a series of very different societies that have evolved one from the other as his productivity has grown. Along with changes in his social organization go changes in his ideas resulting from, and also contributing to, the changes in society. Biol-