tive spirit that admittedly exists. Be there other professors who are worried by such a spirit, probably even they are more useful than they would be in the absence of such a spirit.

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6 December 1954

More on "A New University"

The proposal of William Seifriz [*Science* 120, 87 (1954)] for "a new university" that would be "a center . . . from which will emanate a culture that man will respect, an intelligent biological system of ethics," will strike a responsive chord in many who feel that the well-rounded man, scientist no less than nonscientist, is the man best equipped to make the greatest contribution toward a sane, orderly and wholesome society.

I wonder whether it is generally known that there already exists in this country an organization—not on so elaborate a scale as a university, but one nevertheless that is well founded, stable, and rapidly growing—which has as its primary objective the effectuation of substantially the same ideals as those the university proposed by Seifriz would advocate.

I refer to the American Humanist Association, with headquarters at Yellow Springs, Ohio. This is a membership organization, which is open to all interested in its program of promoting Humanism—a way of life, or philosophy, firmly based on the findings of science, imbued with the democratic outlook, and cultivating a rational system of ethics, all combining to forecast a culture truly worthy of the respect of mankind. Some call Humanism a religion—not however in the sense of indicating a belief in a deity, for Humanism finds no reliable evidence of a deity in the cosmos, but rather as indicating a personal commitment to the highest ideals human insight has yet evolved.

Humanism emphasizes the dignity inherent in every human being. It teaches that man, within the limitations of his natural environment, has the capability of solving his problems, not only material, but moral; that, just as man has outgrown a supernatural basis for his interpretation of natural phenomena, so also has he outgrown a supernatural basis for his ethics and must develop his ethical concepts on a naturalistic foundation; and that, because this is the only life it seems likely he will live, he ought to make the best of it for himself and for others.

Whether or not the American Humanist Association will evolve into the university that Seifriz envisions, only time will tell. But it offers here and now an opportunity for all interested to participate in and to advance the general program that such a university would foster.

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13 December 1954.

Hydrolyzed Fish Protein from the Flesh of Waste Fish

During the last few years there has been a fight going on throughout the world against protein malnutrition, which is more serious than vitamin and mineral deficiencies, since protein is essential to the body for its growth, repair, and nutrition and is needed by children and adults alike. The existence of life without protein is not possible. In almost every country today the supply of protein is not adequate, and, as a result, cases of malnutrition are increasing day by day, leading to higher and higher death rates. It is time that attempts were made to correct this deficiency by supplying protein from some untapped resource that is also inexpensive.

Fish is a well-known source of protein, but as yet no attempt has been made to extract cheap protein from the flesh of tons of waste fish that is neither properly utilized nor consumed by human beings. For example, the flesh of sharks and rays is not properly utilized in many places in India because it is not considered palatable. However, we have found that the protein content in these fish is as high as in other edible fish. Our preliminary work has been done on sharks and rays.

The first step in our procedure is to mince thoroughly the flesh of the fish and then to wash it. When this has been done, the fish is boiled from ½ to 1 hr with very dilute acetic acid solution under 80°C until the muscle becomes threadlike when pressed. Then the fish is washed thoroughly to remove the acid and lipids. When the overflow water runs clear, the washing is completed, and the water is pressed out. This substance is completely dried and treated with petroleum ether to eliminate the fat and to increase the keeping quality. This last step is repeated several times.

The resulting complex fat-free protein is insoluble in water and is nondiffusible and difficult to absorb. Therefore, hydrolyzation is necessary to make this protein easily assimilable. Since there is the possibility of destroying some of the amino acid end-products by acid hydrolysis, we used alkali hydrolysis by caustic soda, 10 to 12 percent caustic soda under 80°C. This method is simple to use and is suitable for both laboratory and commercial purposes. When the substance becomes completely liquefied, it is neutralized by commercial acetic acid (85 percent). This neutralized liquid is spray-dried to a flourlike powder that is cream colored and retains its natural flavor. The yield of the finished product is nearly 10 percent of the raw material. The fat-dissolved petroleum ether is distilled to remove pure ether. More than 50 percent can be recovered.

The finished product has an 85-percent protein content, which is much higher than that contained in other foods, both foreign and local. For example, raw or boiled eggs have 11.9-percent protein content; dried eggs, 43.4 percent; cheese, 36.8 percent; roasted chicken, 29.6 percent; frozen raw beef, 20.3 percent;

Table 1. Approximate percentage composition of selected animal protein.

Amino acids	Beef muscle	Casein	Egg albumen	Protein from waste fish flesh
Cystine	1.1	0.35	1.9	0.49
Lysine	8.2	7.6	5.0	1
Histidine	2.9	2.1	1.7	2.5
Arginine	7.2	4.3	5.9	2.5
Serine, glycine, aspartic acid	16.7	14.3	18.7	7.3
Threonine, glutamic acid	20.6	27.1	21.5	12.9
Alanine	5.6	5.5	7.2	1.5
Tyrosine	4.4	6.7	4.3	3.0
Methionine, valine	8.12	9.9	11.9	8.0
Leucine, isoleucine	13.1	16	17.1	5.3

and fresh whole milk, 3.3 percent. This hydrolyzed fish protein contains all the principal amino acids in amounts that are fairly adequate for human consumption (Table 1) in comparison with other food products. It is very useful in treating cases of malnutrition, tuberculosis, and duodenal and ventricular ulcers and as a supplement to the diets of convalescent patients.

The general properties of hydrolyzed fish protein are the following. (i) It is easily soluble in water. (ii) The keeping quality in powder form is quite good. (iii) The whipping power is greater than that of egg albumen. Its properties are such that it could be used in the plastics, paint, leather, and rayon-fiber industries.

By preparing hydrolyzed fish protein on a laboratory scale, it has been found that the cost of the product is such that it can be sold much less expensively than many similar products manufactured by other means. Another aspect to consider in manufacturing this product is the fact that waste resources would be utilized that might otherwise have never come to such prominence in combating malnutrition in the world.

After testing the product on only a few patients, the demand has become very great. The investment for establishing a small plant would be moderate. And there is no doubt that the establishment of such a plant would certainly help millions of children and adults dying of malnutrition.

We express our gratitude to the superintendent and to the staff of the S.C.B. Medical College Hospital, Cuttack, for experimenting with our product on their patients. Affidavits to show the beneficial effects from hydrolyzed fish protein in treating hospitalized patients can be obtained by writing to us. R. Rajgopalan and the staff of the Department of Biochemistry of the Indian Institute of Science, Bangalore, also deserve our gratitude for their scientific help.

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10 November 1954.

Report on Wax from Several Species of *Tillandsia* and from *Ananas comosus* (L.) Merr.

In 1953 we reported (*1*) that a hard wax, melting at 79° to 80°C, was extracted with organic solvents from *Tillandsia usneoides* L., Spanish moss. This wax imparted a glossy finish to woodwork and leather and has since, according to Bennett (*2*), been utilized in automobile polishes on an experimental basis. An investigation of the waxes of other species of this family was undertaken to determine whether the waxes of the epiphytic and terrestrial species were similar and also to find other sources of commercial supply if extraction of Spanish moss wax on a commercial basis became practical. Some species, such as *T. Balbisiana* and *T. fasciculata,* have already been cultivated by florists (*3*) on a limited scale. Cultivation of some species would be necessary if Spanish moss wax became a commercial item.

Tillandsia tenuifolia L., *T. juncea* Poir., *T. Balbisiana* Schult., *T. aloifolia* Hook., *T. simulata* Small, *T. fasciculata* Sw., and *T. circinata* Schlecht. all have hard waxes similar to that in *T. usneoides* L. It was reported earlier (*4*) that these species contain estrogenic substances. The waxes of these species comprise 4 to 5 percent of the fresh weight of the plants. From the pineapple, *Ananas comosus* (L.) Merr. of the same family, a soft wax, melting at 51°C, was extracted with organic solvents, such as acetone, chloroform, and petroleum ether. From the waste of pineapple fruits 1.4 percent wax was reclaimed. The pineapple wax had a saponification number of 232.4, an acid value of 57.1, an ester value of 175.3, and an iodine number of 49.9. The wax contained 59.5 percent unsaponifiable material. A positive Liebermann-Burchard reaction (*5*) for steroids was obtained as well as a positive vaginal smear in ovariectomized rats tested by the Allen-Doisy method (*6*), indicating the presence of a substance possessing estrogenic activity in the steroid fraction.

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