vegetables, fruits, fish, eggs, dairy products, and meat (which has increased the most). For example, while bread, oatmeal, and milk have approximately doubled in price since 1939, the present prices of beef and tinned salmon are about 4½ times those of 1939. Cheese, butter, eggs, and fresh vegetables are about 3 times as costly as in 1939. Table 1 gives the cost of the diet as listed.

TABLE 1

Year	Average cost *at retail price*	Percentage increase *over 1939*
1939	$2.28	
1940	2.28	0
1941	2.96	30
1942	3.59	57
1943	4.72	107
1944	4.26	87
1945	4.26	87
1946	4.40	93
1947	5.96	161
1948	6.81	199

Prices used for carrots and beets are those for the trimmed vegetables and represent strictly the cost of the edible portion. It is unfortunate that in most cases retail stores continue to sell these by the bunch rather than by net weight.

Since fortified margarine is now to be regarded as an acceptable substitute for butter and tinned mackerel is considerably cheaper than tinned salmon, even though somewhat lower in vitamin A, we have decided in the future to substitute these two items for butter and tinned salmon, respectively, in these dietary surveys. The hamburger now available locally, appears to be of higher quality than that sold in 1939, although in composition it is not yet satisfactorily defined. Nonetheless, it is widely consumed. If the list of foods published above were to be amended by the replacement of butter, salmon, and chuck roast of beef with margarine, tinned mackerel, and hamburger, respectively, the cost of the liberal diet would fall from $6.81 to $5.53 for 1948.

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Diversity of Amino Acids in Legumes According to the Soil Fertility

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AGRICULTURE IS CONCERNED WITH the synthesis of food. Our ultimate goal in this industry has always been the increase of production, *i.e.* greater numbers and more pounds, per acre. Too often only such physical attributes of the products—even of people—are of prime consideration when some other criteria are of more fundamental importance. We neglect the quality of our food products and continue to measure our output only in bushels and tons per acre.

In accordance with the long-held belief that a specific crop is of value because it produces much bulk, we have imported many exotic plants in the hope of maintaining a high level of food production. While watching the delivery of bulk, we have kept up the synthesis of caloric compounds by plants, but much of their capacity to synthesize proteins has been lost. For these latter, or body-building, substances, more than good weather is necessary; plants, like animals, can be said to be, and to behave, only according as they are nourished via the soil.

When the soil fertility declines, our attempts to adapt crops to this lower level of plant nutrition become a fallacy in terms of the demands of the animal diet. Of the many requirements of any diet, protein presents itself for first consideration. In the production of healthy animals the major problem is this one of obtaining sufficient protein of the quality commensurate with nutritional demands. Just as the furnace must be constructed prior to its service in consuming fuel, so must the animal use proteins to build its body prior to any consideration of its expenditure of energy. In the animal the mere hanging on of fat is much of a luxury performance to which we have all wantonly subscribed. In agriculture we must become concerned with the biosynthesis of the building stones of the body, namely, the amino acids, making up the proteins and not be content to adopt as our criterion the photosynthesis of the carbohydrates composing the plant bulk.

While this plant bulk may reflect other factors of the environment, we have been able to trace many of our nutritional problems to the effects of the ash constituents coming via the plant. These soil-borne nutrients control plant metabolism more than we yet appreciate. Biosynthesis requires these inorganic elements, not only to catalyze various reactions within the plant, but also to fashion and to build its structure. In turn, animals depend on the plants to synthesize the protein constituents for them. Herein lies the vital function of the soil. According as the different soils deliver divergent quantities of the inorganic elements, so we experience the pattern in the ecological array of the plant species. Each species represents a different organic composition according to the differences in the soil fertility.

In some recent studies, lespedeza was grown on 5 outlying experiment fields with 5 different soil types representing the 5 major soil regions of Missouri. The protein quality of this crop in terms of the different amino acids was assayed by using the newer microbiological techniques. The diversity in the plants' contents of these constituents of the protein molecule manifests itself in going from one soil to another, as shown in Table 1. Here, in terms of the quality of the protein produced through biosynthesis by the plant, we have a more significant yardstick by which to measure our agricultural production according to the different soils, to say nothing of the different products themselves.

In order to determine what fertility elements might be the cause of these diversities, alfalfa was grown on a single soil given treatments of the separate trace elements, manganese and boron, and a mixture of these with some others, as supplements to the common fertilizer elements calcium, phosphorus, and potassium. Wide diversity in the amino acid array in the protein could scarcely be expected when relatively small amounts of these trace elements are applied on the surface of the soil. Yet the quality of the alfalfa protein in terms of its constituent amino acids was modified by these soil treatments, as shown in Table 2. While a marked diversity manifested itself in the case of each amino acid, the methionine content varied most widely of all the amino acids measured in this study. Seemingly these results substantiate the hypothesis that these two trace elements, namely, manganese and boron, function in the conversion of the carbohydrate into protein.

The data in these two tables illustrate well the wide variations in concentrations of these amino acids because of (a) differences in the crops and (b) differences in the fertility of the soils. Since the need to grow protein is greater than that of growing carbohydrates, both for man and animals, here is the suggestion that we should use a more critical measure of our agricultural production—the quality of it according to the fertility of the soil.

TABLE 1

AMINO ACID CONTENT OF LESPEDEZA HAY ACCORDING TO DIFFERENT SOIL TYPES AND TREATMENTS
(Per Cent Dry Weight)

Soil type and treatment	Valine	Leucine	Arginine	Histidine	Threonine	Tryptophane	Lycine	Isoleucine	Methionine
Eldon—treated	.895	1.055	.646	.375	.632	.294	.992	2.08	.092
untreated	.917	.978	.429	.343	.569	.205	.943	1.67	.086
Lintonia—treated	.922	1.038	.451	.342	.625	.279	.872	1.63	.077
untreated	.780	1.014	.329	.306	.544	.181	.878	1.68	.077
Putnam—treated	1.023	1.280	.716	.362	.639	.244	.894	1.89	.084
untreated	.986	1.289	.563	.503	.606	.227	1.007	2.26	.080
Grundy—treated	1.010	1.174	.627	.367	.690	.196	.797	2.00	.079
untreated	1.137	1.460	.456	.381	.671	.195	.938	2.00	.082
Clarksville—treated	.853	1.025	.340	.389	.585	.258	.930	1.59	.076
untreated	.941	1.199	.367	.356	.557	.215	.870	1.38	.074

TABLE 2

AMINO ACID CONTENT OF ALFALFA HAY ACCORDING TO SOIL TREATMENTS WITH TRACE ELEMENTS
(Percentage of Dry Leaves)

Plot No.	Treatment	Valine	Leucine	Arginine	Histidine	Threonine	Tryptophane	Lycine	Isoleucine	Methionine
1	Calcium	2.19	4.37	0.380	0.654	0.862	0.546	1.57	2.64	0.100
2	Calcium and manganese	2.40	4.89	0.434	0.807	0.954	0.640	2.12	3.63	0.242
3	Calcium and boron	2.13	5.55	0.418	0.726	1.071	0.856	2.13	4.09	0.173
4	Calcium and mixture*	2.59	5.24	0.415	0.835	1.014	0.670	1.87	3.44	0.229

* Mixture of cobalt, copper, zinc, manganese, and boron.

A more critical examination of the final crop products is needed. We need to measure not only their physical attributes as bushels and tons but also the amount and quality of their protein, thereby giving fuller consideration to the fertility of the soils on which the products were grown. The diversity of the amino acids within these crops demonstrates clearly that the fertility level of the soil determines our agricultural production in terms of the protein output, which is much more significant than its commonly considered control in terms of only bushels and tonnages. When the national food problem is now looming larger, we believe it is high time to adopt this newer criterion by which to view and direct the creative business that is agriculture.

Encouragement of these studies by the support of Swift and Company is gratefully acknowledged.

AAAS Centenary—A Preliminary Report

J. M. Hutzel, *Assistant Administrative Secretary*

SEPTEMBER 20, 1948, MARKED THE COMPLETION of the first 100 years in the history of the AAAS and followed by a few days the week-long eventful celebration of the 100th anniversary meeting in Washington, D. C. It is estimated that more than 5,000 persons attended the various sessions and functions. Registration, required for attendance at the morning symposia, was officially tabulated at 2,000, more than half of this number having registered in advance. Unlike previous meetings of the Association, with 60 or more sections and societies organizing as many as 360 sessions, the Centennial Meeting was comprised of only 14 technical symposia and 19 evening lectures. Each symposium consisted of three papers, augmented by a panel of two or three discussants. These sessions ended with a question period during which the audience submitted written questions to the speakers. It was the consensus of the chairmen that audience participation was enthusiastic and contributed much to the high success of the meetings.

The afternoon tours were among the major attractions of the Centenary. In every case the number wishing to participate in the tours exceeded expectations, and with one exception approached the capacity of the cooperating institutions to handle visitors. Chartered buses carried 300 to the Agricultural Research Center at Beltsville, Maryland; more than 500 to the National Institutes of Health and the Naval Medical Center; 180 on the circulating tour to the Geophysical Laboratory and the Department of Terrestrial Magnetism of the Carnegie Institution of Washington and the National Bureau of Standards. An additional busload of sightseers spent an entire afternoon at the Bureau of Standards, and many more participated in the "open house" activities sponsored by this institution on Friday, September 17, the final day of the meeting. The national defense tours to the David Taylor Model Basin, at Carderock, Maryland, and to the Naval Research Laboratory by way of the National War College, were participated in by 156 and 88 persons, respectively. That the tours were interesting and stimulating was generally acclaimed, and the administrative officers of the Association warmly acknowledge the generous cooperation of the participating laboratories in accommodating visiting scientists. All the host institutions welcomed the inspection of those assembled for the occasion of the Centenary, and many scientists who could not take the formal tours found time to make a leisurely survey of research activities related to their special interests.

An outstanding exhibition of the investigations carried on by the Division of Biology and Medicine of the Atomic Energy Commission was on public display in the Statler Hotel during the week of the Centenary. Special exhibits illustrated isotope distribution, the inducement of mutations by radiations, instrumentation, and methods of safeguarding the health of employees engaged in atomic research. By operating instrument controls, visitors were able to detect with Geiger counters radioactivity in inanimate and animate subjects, e.g. a bar of uranium and frogs in a tabletop pond. Automatic devices demonstrated the shielding effect of several materials against the different emanations of a variety of radioactive substances. This exhibition, prepared under the direction of Dr. James H. Jensen, chief of the Biological Branch of the Division of Biology and Medicine, proved to be one of the principal attractions of the meeting.

The opening session on Monday evening, September 13, in Constitution Hall was addressed by the President of the United States and Dr. Shapley, retiring president of the AAAS. It is customary for the president of the AAAS to deliver an address before