

twenty-five directors, among them the chairman and four members of the naval consulting board. The action of the board of directors is said to affect the status of twenty-one German men of science and one Austrian professor who held either honorary or active membership in the association. The institute now has a membership of about 6,600 in this country and there are more than 1,000 members abroad.

DR. GEORGE D. HUBBARD, head of the department of geology at Oberlin College, spent the summer in Wyoming doing research work for the federal government. Dr. Hubbard's special problem was the location of war materials, particularly petroleum. His course in the Oberlin Summer School in the principles of geography was given by Mr. E. T. Thomas, supervisor of geography in the Shaker Heights Schools, Cleveland, Ohio.

UNIVERSITY AND EDUCATIONAL NEWS

REED COLLEGE is awaiting the decision of the War Department and the Federal Board for Vocational Education in regard to the college's offer to undertake extensive service in the reeducation of the wounded for industrial activity. An offer of \$200,000 in equipment for a school of this nature and another offer of grounds and buildings suitable for a convalescent hospital and remedial workshops have been made to the college.

PLANS have been prepared for a laboratory building for the Yale Medical School, New Haven. The building is to be of brick and steel construction.

THE West Riding Education Committee has renewed for another year its grant of £500 to the Department of Glass Technology at Sheffield University.

As a memorial to their son, William Frederick Drughorn, an old King's scholar, killed in action, Mr. and Mrs. Drughorn have endowed King's School, Canterbury, with laboratories, to be known as the Drughorn Science Buildings, at a cost of £25,000.

PROFESSOR ELIAS J. DURAND, of the University of Missouri, has been appointed to a professorship of botany in the University of Minnesota.

DR. ALBERT EDWARD HENNINGS, of the University of Saskatchewan, Canada, has been appointed to an assistant professorship in the department of physics of the University of Chicago. The following promotions have also been announced: Associate Professor Albert Johannsen, of the department of geology, to a professorship; Assistant Professors Albert D. Brokaw and Rollin T. Chamberlin, of the same department, to associate professorships; and Dr. Eugene A. Stephenson, of the same department, to an assistant professorship.

DR. HARRY SHIPLEY FRY, former associate professor of chemistry, has been appointed professor and head of the department of chemistry at the University of Cincinnati. Other appointments in this department are as follows: Dr. Earl F. Farnau, associate professor of organic chemistry, formerly assistant professor of chemistry at New York University; Dr. Ralph E. Oesper, associate professor of analytical chemistry, formerly assistant professor of chemistry at Smith College; Dr. Clifford J. Rolle and Dr. Leonora Neuffer, instructors in chemistry.

CHARLES L. RAIFORD, Ph.D. (Chicago), head of the department of chemistry at Stillwater, Oklahoma, has been elected associate professor of chemistry at the University of Iowa. He will take charge of some of the classes of Professor Hixson, who is now consulting chemical engineer in the ordnance department of the U. S. Army.

ERIC THERKELSEN, who for several years has been a member of the engineering faculty of the University of Washington, has accepted an assistant professorship of mechanical engineering at the Montana State College.

DISCUSSION AND CORRESPONDENCE BARLEY BREAD, OPTIMUM REACTION AND SALT EFFECT

WHEN the attempt is made to make barley bread with a wheat flour content lower than

70 per cent., the result is a heavy, sour bread. The difference in chemical composition between barley gluten is scarcely sufficient to account for the difference in behavior of the two flours to yeast (Plimmer):

	Wheat	Barley
Total protein	10.00	11.00
Gliadin	4.25	4.00
Glutenin	4.00	4.5

Accordingly, it seemed that physical chemical factors might enter into the question. With some colloids at least, the viscosity is increased by raising the content of inorganic salt (Loeb) and this is apparently what is desired in the case of barley gluten.¹ At the same time, it seemed desirable to determine the optimum hydrogen ion concentration of some of the flours in the presence of yeast. Accordingly, the following experiments were performed:

Wheat, barley, rice and potato flours were used. When prepared without wheat, rice and potato flours failed to rise, owing to the lack of a protein similar to gluten, whose physical characters permitted the holding of the gases, CO₂ especially, to "lighten" the dough. When used with distilled water, barley flour alone gave practically the same sort of bread as that when wheat flour is used in amounts smaller than 70 per cent., the heaviness and sourness rendering its use impossible. An attempt was made to mix barley and rice, barley and potato, etc., but the results were even worse than with barley alone.

The influence of various degrees of alkalinity and of acidity were then examined. By the aid of the chart of Sørensen, mixtures of KH₂PO₄ and Na₂HPO₄ were made. Twenty-five grams of barley flour were weighed into an evaporating dish and 35 c.c. of one of the various solutions were added, together with one gram of Fleischman's compressed yeast. The whole was then intimately mixed, transferred to a cylinder and left to rise at 35° C. for one half hour, in the constant temperature room. Solutions of phosphates were used as follows: Ph = 8.0, 7.6, 7.4, 7.0, 6.4, 6.0, 5.2, 4.6.

¹ Cf. Upson's work.

The optimum rise was obtained at 5.2 and later it was determined that with solutions at Ph = 5.0, the best results were obtained. Controls were conducted with wheat flour, using distilled water.

In passing it may be remarked that similar experiments with wheat flour have the optimum at a lower acidity than that given here for barley flour.

It has been supposed that there is a specific chemical effect in the phosphates, owing to the difference in phosphate composition in wheat and other gluten-bearing flours. Inasmuch as we are able to use lactic and acetic acids at Ph = 5.0, it seems that the effect is rather one concerned with reaction.

After the dough had risen, the preparation was removed and mixed with ten grams of fresh barley flour, the whole kneaded well and transferred to a pyrex beaker which was placed in an electric baking oven for one hour at 220° C. Besides barley flour, we also used rice and potato flours, separately, but without improving the resulting bread.

The bread thus made is fairly good and greatly superior to that made from water preparations.

We repeated the experiment just described with barley, this time using 2 per cent. NaCl (introduced dry) in the dough. A much lighter loaf was obtained, the initial rise being greater and the subsequent dough on the second rising being more similar to that of wheat preparations. A good crust is formed and there is less sourness, characteristic of all barley breads.

It is apparent, then, that by maintaining a reaction approximating Ph = 5 and a sodium chlorid content (added) of 2 per cent., barley flour may be utilized by itself to make a passing war bread. By suitable manipulation, we have little doubt that an experienced baker can derive a formula whereby an excellent bread can be produced at will.

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