flock settles readily until a p_H of 6.6 is reached. The Highland Park filtration plant operated most efficiently at a p_H of 7.3 but most economically at 7.5-7.6.

Formulation of equilibria in the coagulating basin: A. M. BUSWELL.

Report of committee on standard methods of analysis: A. M. BUSWELL.

CHARLES L. PARSONS,
Secretary

THE KENTUCKY ACADEMY OF SCIENCE

THE ninth annual meeting of the Kentucky Academy of Science convened in the physics lecture room of the University of Kentucky on May 20, with President G. D. Smith in the chair.

Twenty-three new members were elected. Officers elected are: Lucien Beckner, Winchester, *president;* John A. Gunton, Transylvania College, Lexington, *vice-president;* A. M. Peter, University of Kentucky, Lexington, *secretary,* and W. S. Anderson, University of Kentucky, Lexington, *Treasurer.* A. M. Peter holds over as representative in the council of the American Association for the Advancement of Science.

The following are abstracts of the communications:

The Boleti of Kentucky: G. D. SMITH, Eastern Kentucky State Normal School (President's address). Colored lantern slides and stereoscopic photographs of 37 species of boleti observed in the vicinity of Richmond were presented and explained.

Factors affecting the germination of the sclerotia of Claviceps (Ergot of rye): FRANK T. MCFARLAND, University of Kentucky. Most mycologists are fairly well acquainted with the method of germination of sclerotia of Claviceps, but there still remain several factors which are poorly understood. During the past two years, the writer has been engaged in a study of the sclerotia of ergot from various countries. In the course of these investigations it has been found that sclerotia more than one year old failed to germinate. Sclerotia sown out of doors, on the surface of the soil, without any covering showed good germination of the sclerotia with many well-formed stromata but the stalks usually are short. Some mycologists seem to have the idea that these sclerotia may have the power to retain their germination ability for more than one year. It is quite unlikely that any sclerotia under out-of-door conditions should remain dormant during the first spring after their maturity and germinate the second season. Sclerotia of Claviceps must go through a period of rest. The shortest period of rest so far found is about eight weeks. During this time when the sclerotia are at rest, they must be kept stratified in moist sand. Removal of the cuticle of sclerotia with a scalpel does not prevent the germination, but the stromata are nearly always deformed, and all seem to rise from a stromatic cushion. Treating the sclerotia with a 5 per cent. and a 30 per cent. NaCl salt solution, and then completely removing all traces of the salt and stratifying the sclerotia in the usual manner did not injure their germination power.

The rôle of manganese in plants: J. S. MCHARGUE, Kentucky Agricultural Experiment Station. The purpose of this investigation was to determine if manganese has any definite function to perform in plant economy. The method of attack has been the preparation of plant nutrient compounds and quartz sand, free from manganese, and the growing of plants in different portions of nutrient solutions or sand cultures from which manganese was withheld and in another equal number of portions of these media to which manganese was added. All the plants were grown until those that received manganese showed signs of fructification and a few to maturity. The plants from which manganese was withheld made a normal growth for about six weeks only. Thereafter they became chlorotic and the young leaves and buds died back and the plants made no further growth of any consequence, whereas the plants to which manganese was available grew in a normal way and fructified where the plants were grown to that state of maturity.

The author concludes that manganese is necessary in the plant economy and that, therefore, eleven elements are necessary for the normal growth of autotrophic plants, whereas it has been taught previously that only ten are necessary.

The hydroxy-anthraquinone derivatives in plants: JOHN ABERDEEN GUNTON, Transylvania College. A résumé was given of the various plants containing derivatives of this type as well as a description of the forms in which these occur. The cathartic principles of cascara, senna, rhubarb, aloes and buckthorn were shown to be irritant anthracene derivatives that exist in the plant in the form of glucosides to which the physiological action is presumably due. Plants containing these bodies are found widely distributed throughout the globe and present an interesting

stage in the chemical evolution of plant life. Considerable remains yet to be done on this group from the analytical and synthetical standpoints.

Some seed-borne diseases of agricultural crops: W. D. VALLEAU, University of Kentucky. Further studies on the extent of seed infection of corn with *Fusarium moniliforme* confirm previous reports that it is practically universal. The organism is carried between the various seed-coat layers and may extend in as far as the aleurone layer. In very flinty corn the organism remains dormant a longer period after the seed is planted than in the poorly filled starchy kernels. A preliminary study of 8 lots of barley from 3 states, 12 lots of oats from 4 states, and 38 varieties of wheat from 5 states indicates that small grains are infected to a higher degree with pathogenic organisms than has generally been suspected. Morphological studies of lettuce seeds have demonstrated the presence of an organism in a high percentage of seeds which is believed to be the causal organism of lettuce root rot. The universal presence of root rot on clovers and the results of preliminary tests of seed infection suggest that the causal organism is constantly present in clover seed. Observations on crops affected by seed-borne root disease organisms, grown under different seasonal conditions, suggests that these organisms may play an important part in geographical and seasonal distribution of certain wild and crop plants.

A preliminary report on a study of various clovers as found on three soil experiment fields of Kentucky with special reference to root systems: E. N. FERGUS and W. D. VALLEAU, University of Kentucky. An ecological and pathological study is being made of various clovers, particularly red clover, growing on three soil types of Kentucky, in order to determine the causes of clover failure. Actual counts showed that red and alsike clover stands were practically equal throughout the first year whether on productive or "clover sick" soils. Much diminution of stand occurs on most soils during the second summer, reaching 100 per cent. on the least productive soil. Root rot was present to some extent on all root systems examined. Those developed in least productive soils were badly diseased or dead at the end of the first season. All tap root systems examined were badly diseased or dead at the end of the second season. The persistence of a clover plant after death of the tap root system depends on its ability to produce new roots from the crown.

Extraction of crude oil by means of shafts and tunnels: HENRY MEIER, Centre College. This method of recovery of oil from beds has been successfully carried on in Alsace since 1917. Experience has shown that by means of wells and pumps not more than 20 per cent. as a maximum of the oil contained in a bed can be brought to the surface. The recovery by sinking a shaft and digging tunnels through oil-bearing sand enables the recovery by seepage and by treating the sand with hot water, of two and a half times as much oil as by means of wells. This method of recovery increases the value of a concession. It opens to countries whose oil-bearing regions seem to have reached the end of production, new and encouraging prospects.

Depletion of Kentucky crude oils: W. R. JILLSON, State Geologist, Director of the Kentucky Geological Survey. Although petroleum was first produced on the South Fork of the Cumberland River in 1819, the industry in Kentucky may be said to have gained its feet in 1900, when 62,259 barrels were produced. Production increased steadily until it exceeded 1,200,000 barrels in 1905 and 1906, after which it steadily fell off to 407,081 barrels in 1915. From that time it increased rapidly to 9,226,473 barrels in 1919 and has continued near 9,000,000 barrels. The author thinks that a production of 150,000,000 barrels in the next 60 years is a conservative estimate.

Oil shales of Kentucky: C. S. CROUSE, University of Kentucky. The oil consumption in the United States is outstripping the domestic production, creating an alarming situation. New sources of oil must be found. Oil shale will solve the problem so soon as the extraction of oil from this source is made commercially feasible. A research has been in progress at the University of Kentucky for three years with the development of a commercial retort as its object. The results are more than encouraging. Kentucky has 90,000,000,000 tons of shale immediately available for steam shovel methods of mining. This shale, conservatively figured, represents 40,000,000,000 barrels of crude oil. Kentucky shales show marked superiority over shales in other parts of the United States. Such being true Kentucky is the logical place for the genesis of the oil shale industry in this country.

Model showing structure of Gainesville oil pool, Allen County, Ky.: E. S. PERRY, University of Kentucky. The author exhibited the model showing the stratification and explained its construction.

Table moving by so-called spirits: GLANVILLE TERRELL, University of Kentucky. An example of table-moving produced in daylight by a girl of fifteen and a boy of ten with no possibility of

collusion, was described by the author, as having come under his observation. The author is convinced that the phenomenon was genuine but asserts his disbelief that it was a spiritual manifestation.

A Kentucky chemist of the old school: ALFRED M. PETER, University of Kentucky. J(ohn) Lawrence Smith, M.D. (1818-1883), a citizen of Louisville, Ky., from 1854 to 1883, is most esteemed by the chemist engaged in mineral analysis by reason of the unique and very practical method for the determination of alkalies in silicates of his devising. Indeed, the extensive study of the potassium content of Kentucky soils, by the experiment station, was made practicable by the application of this method. Dr. Smith's publications number some 150 titles, a large proportion of which appeared in the *American Journal of Science.* His work was mainly in mineral chemistry. His investigations on emery led to the development of the emery industry in the United States. He made a life study of meteorites, of which he had a very fine collection, now owned by Harvard University. Dr. Smith occupied a high position in the scientific world and was an active member of many learned societies both foreign and American, including the National Academy of Sciences. The Lawrence Smith medal of the National Academy, a gold medal worth $200, to be awarded for research upon meteorites, was established by Dr. Smith's widow, who used for the endowment the sum of $8,000 received from the sale of his collection of meteorites to Harvard University. The medal has been awarded only twice: to H. A. Newton, in 1888, and to Dr. Geo. P. Merrill, in 1922. Dr. Smith was a man of means, charitable, public spirited, always ready to contribute his scientific knowledge for public good, and was held in high esteem in the community.

Home economics as a science: MARGARET WHITTEMORE, University of Kentucky. Before considering home economics in relation to natural sciences it must be remembered that it has a vital connection also with social sciences and with the fine arts. For this reason, and also because it is distinctly an applied subject, its relation with the natural sciences should be chiefly that of producer and consumer. Home economics, however, should contribute to scientific knowledge by suggesting problems which need attention and by providing the situations for application and experimentation. The earnest attention now being given to home economics reveals several weaknesses. One is the fact that as a course of study it has been organized too much upon a logical in opposition to psychological basis. This seems still true of much of the teaching of the natural sciences, as shown by the requirement of inorganic before organic chemistry. Another cause of weakness is the failure to recognize the desirable limits of home economics and the frequent attempt to teach in the department the principles as well as the application of the arts and sciences involved.

The measurement of the mental changes after the removal of diseased tonsils and adenoids: GLADYS MARIE LOWE, University of Kentucky. A group of thirty-five school children operated upon for diseased tonsils and adenoids was compared with a group of twenty-five which did not undergo the operation. This study is unique in the use of a control group of children with diseased tonsils and adenoids but not operated upon. Three lines of evidence were used, namely, changes revealed by a scale of tests of mental alertness, by the teacher's estimate of certain traits, and by the actual scholarship records. The comparisons are made between data obtained just preceding the operation and those obtained one year after the diagnosis. The Stanford Revision of the Binet-Simon Scale for measuring mental alertness was used. The teacher's rating for each trait was obtained by estimating in which fifth of the class the pupils belonged. The traits estimated were: (1) companionship with fellows, (2) emotional self control, (3) initiative, (4) self expression (speech), (5) interest in school work, (6) attention and (7) scholarship. The results show that: (1) While the average scholarship of the operated group continued to be the same as that of all the classes represented, the average scholarship of the non-operated group fell one scholarship rank below the average of all the classes represented. (2) The operated group showed no more change in the mental age, or in "brightness" (I.Q.) than did the non-operated group. The differences compared with the error were so slight as to be negligible. (3) The teacher's estimates showed no significant change. (4) Pronounced improvement was found in three or four cases.

The importance of scientific investigation in marketing: O. B. JESNESS, University of Kentucky. Attention was called to the growing complexity of marketing methods and a comparison of present methods with the comparatively simple methods that sufficed a century ago was made in order to suggest some of the reasons why the marketing system of to-day necessarily is involved. Mention was made of the prevalence of loose thinking and talking on marketing questions.

Emphasis was placed on the importance of scientific investigations in marketing. Facts are the only safe basis for action and careful studies are needed in order to obtain essential facts. Agricultural experiment stations and departments have studied production problems for years but have taken up marketing activities only recently. Much work in this field is now being undertaken and the future should witness the accumulation of much helpful material.

Factors involved in the standardization of tobacco grades: ERLE C. VAUGHN, University of Kentucky. Standardization of tobacco grades is designed to avoid confusion, to stabilize prices, and to protect both producer and buyer. The factors involved are the conditions which must be considered in bringing about these results. The chief ones are: descriptive terms used, natural grades, manufacturers' grades, methods of buying and selling, interest of producer in grading, and the many variations which occur both in the product and in opinions and practices concerning it. These factors, their true value and their relation to each other must be carefully considered in establishing practicable standard grades of tobacco.

Factors which influence the cost of gain in feeding cattle: WAYLAND RHOADS, University of Kentucky. The foundation of the beef cattle industry is the production and sale of fat cattle for beef, so when cattle feeding is profitable, both the breeders of purebreds and the producer of feeder steers have a good market for their stock. Pasture is the basis of the cheapest gains while the winter feedlot is necessary to produce fat cattle at that time, in order to have an even supply of beef. The cost of putting gains on cattle varies with a number or a combination of things. They are the age of the cattle, the time of year the cattle are fed, whether on grass or on dry feed, the length of the feeding period, the feeds fed, conditions under which the cattle are fed such as barn room and water supply, the daily gain which the cattle make, the quality of the cattle, the way they were fed before going on feed, the condition of the cattle and last the individual feeder himself. The old saying is true that "the eye of the master fatteneth the cattle."

Geology of eggs: G. DAVIS BUCKNER and J. H. MARTIN, University of Kentucky. An experiment was discussed wherein two lots of ten White Leghorn hens each, all hatched the same day and coming from a common parent stock, were fed rations consisting of: No. 1, corn, buttermilk and limestone, and No. 2, corn and buttermilk. During the first six months of laying lot No. 1 consumed 11.1 pounds of limestone and produced 651 eggs while No. 2 laid 343 eggs. Among other things it was shown that the average dried eggshell was 4.7 grams in lot 1 and 3.5 grams in lot 2. This means that lot 1 produced 1,789 grams of dried eggshell more than did lot 2. The relation of egg production to geology may be inferred.

Testing for moisture in transformer oil: C. C. KIPLINGER, Mt. Union College, Alliance, Ohio. Freshly cut sodium dropped into the oil to be tested is a convenient and sensitive means of detecting traces of moisture. Evolution of gas bubbles is produced by smaller quantities of moisture than can be detected by the usual test of rubbing the oil with eosin.

A simple apparatus for demonstrating heat of absorption: C. C. Kiplinger, Mt. Union College, Alliance, Ohio. A Bunsen ice calorimeter with a long horizontal capillary tube attached serves as an air thermometer which may be used to demonstrate thermal changes due to absorption of liquids by charcoal.

The present status of the cancer problem: (lecture) DR. H. GIDEON WELLS, professor of pathology, University of Chicago. Many lantern slides, most of them from photomicrographs, were exhibited to show the nature of cancer, which may be described as the continued unnatural growth of cells. This growth cuts off the supply of nourishment for other cells and makes conditions more favorable for the growth of bacteria around the affected area. It seems to have been established that the disease is not caused by a specific parasite, nor has a specific causative agent been isolated. Improved methods in the use of radium and X-rays seem to give the best promise for the control of cancer, and great advances have been made in the last six years. Drugs are useless. A very important factor is education of the people to recognize superficial cancers and have them treated before they become serious. Cancer is not properly a contagious disease and is not necessarily inherited by humans, though it has been shown to follow the Mendelian law of inheritance in rats, and some animals are more susceptible to it than others. A study of statistics shows that cancer is not on the increase, the apparent increase being accounted for largely by more exact diagnoses; the actual number of deaths caused by cancer is decreasing because of improved methods of treatment.

ALFRED M. PETER,
Secretary

MAY 27, 1922