in the hybrid seed in some cases. Grown through the past winter and spring, and coming into maturity during July, it became apparent as the heads came out, that but one of the supposed hybrid plants was to exhibit rye characters in its gross morphology. This one, however, is most interesting. The general type of the head is that of the rye throughout, long, narrow and nodding. The spikelets have the elongate narrow form of rye spikelets, but lack the awns on the flowering glumes, which are, moreover, markedly pubescent like those of the wheat parent. The empty glumes are of the *Triticum* rather than the *Secale* type. In form of outline the anthers differ altogether from those of either parent. The leaves of the hybrid were free from the rust that affected the wheat parent. Four heads were produced by the hybrid plant, all of which were alike in type. Variance among the different heads borne on the same plant has been observed by the writer in the case of wheat variety-hybrids. But in this instance no such phenomenon was evident. Any observer would have recognized at a casual glance the extraordinary rye form in the entire group of hybrid heads. Material killed in Flemming's solution of the sporophyte vegetative structures and of stages in the development of the spores in the hybrid and of both of its parents, will be studied later, with respect to cytological details. It should be stated that attempts at crossing the rye again on the hybrid failed, and that none of the hybrid flowers became self-fertilized with one exception. The result, however, is a seed badly shriveled in the region of the embryo, and which does not promise germination.

H. F. ROBERTS.

KANSAS EXPERIMENT STATION,
MANHATTAN, KANSAS,
July 29, 1904.

NOTES ON INORGANIC CHEMISTRY.

THE MELTING POINT OF GOLD.

No little work has been done in recent years on the determination of the melting point of pure gold, as owing to the ease with which gold can be obtained in a very pure condition, this affords a valuable constant for high temperature work. In the latest experiments, which have been carried out by Jacquerod and Perrot and described in the *Comptes Rendus,* advantage has been taken of the fused quartz nitrogen thermometer, as owing to the small coefficient of silica, the correction for the expansion of the bulb is very small. The gold was heated in a special type of electrical resistance furnace, in which the temperature could be very accurately controlled, and the comparison with the thermometer was direct. The fusing point was found to be 1067.2° C. which is slightly higher than the 1061° determined by Callendar, Heycock and Neville, but lower than some other recent determinations.

FUSED SOAPSTONE FIBERS.

THE use of fused quartz was first brought to notice by Professor Boys, who found that quartz could be drawn into exceedingly fine fibers, which especially on account of their small elastic fatigue were superior to all other fibers for suspensions. From this beginning, by the labors of Professor Shenstone and others, the possibility of using fused quartz on a much larger scale has been realized, and now all the commoner forms of laboratory utensils can be made of this material. The chief advantages are the great resistance of quartz to most reagents, and its small coefficient of expansion. In a recent number of the *Physical Review,* Mr. K. E. Guthe shows that fused soapstone can be used to some extent like fused quartz. When heated in the gas-oxygen flame, it melts readily to a clear glass and can be drawn out into very fine fibers which have all the advantages of quartz fibers, and it is possible that other industrial uses may be found for it.

EXPLOSIONS FROM FERROSILICON.

LAST January two mysterious explosions took place at Liverpool in drums containing ferrosilicon. The cause of these explosions has been investigated by A. Dupré and M. B. Lloyd, and a paper dealing with the subject was read by them at the meeting of the Iron and Steel Institute. They consider that the probable cause of the explosions was the presence in the drums of water, which by its action upon the ferrosilicon occasioned the gen-

eration of silicon hydrids. These with the air in the drums formed an explosive mixture, which could be readily ignited by the friction between the lumps of ferrosilicon, or possibly by the presence of a phosphin which was spontaneously inflammable. Although these particular explosions were not very serious, the authors feel that attention should be called to the possibility of accidents of this kind in storing and shipping ferrosilicon, and make the suggestion that care should be taken that it always be kept dry and in a place where it will be well ventilated, thereby insuring against the possible accumulation of inflammable gases.

BESSEMER VS. OPEN-HEARTH.

At the same meeting Mr. F. J. R. Carulla made an appeal for the preservation of the Bessemer steel-industry. He described the manufacture of Bessemer rails in 1874 and held that the uniformity of the product then obtained left nothing to be desired. These requirements could and should be equally well fulfilled at the present day, and improvements should be made in the modern Bessemer process to enable this. This process ought not to be completely relegated to the rear by the development of the open-hearth furnace.

ROYAL SOCIETY CONVERSAZIONES.

The two conversaziones of the Royal Society held this year in May and June contained, from the descriptions in *Nature,* less than usual of interest to chemists. Naturally there were several exhibits in connection with radioactivity, the most interesting being an apparatus showing the spontaneous electrification of radium by Hon. R. J. Strutt. The radium salt in a glass tube is hung by an insulating support in an exhausted vessel. An electroscope is attached to the radium tube. Negatively electrified particles from the radium penetrate the glass tube which is covered with a conducting coating of phosphoric acid, so as to act as an inductor. Thus a positive charge is left and causes divergence. When the electroscope leaf touches the outer vessel, which is grounded, it collapses, and then begins to charge up again. This action goes on as long as the radium lasts.

Dr. Alan B. Green exhibited photographs illustrative of induced radioactivity of bacteria. Small masses of bacterial growth were exposed to the β and γ rays of radium bromid. Many of these masses when removed from the influence of the radium and placed between two thin plates of glass, were capable of affecting the photographic plate, even through a double layer of lead foil.

Mr. William Burton and Mr. Joseph Burton exhibited specimens of newly discovered crystalline glazes developed on English earthen and stoneware. These are artificial crystalline silicates, formed during the firing and cooling of the wares. In the 'sunstone' and 'fiery' glazes, the crystals show the optical properties of micas, in the starry and opalescent glazes the radiating needles are akin to the mineral willemite, as is shown both by their optical properties and chemical composition. The writer recalls that a year ago an American potter showed him a number of tiles with glazes similar to these last, with which he was then experimenting, hoping to produce them upon wares. They were remarkably beautiful, but it is not known whether they have yet been produced commercially, either in this country or in England.

NATURE OF SOLUTIONS.

Two important papers on solutions have recently appeared from Lobry de Bruyn in the *Recueil des Travaux Chimiques des Pays-Bas.* The first, in collaboration with L. K. Wolff, is on the possibility of detecting the presence of molecules in solutions by Tyndall's optical method. Spring has devised the method of rendering liquids optically clear, that is, showing no trace of a strong ray of light directed through them, by producing in them a precipitate of a colloidal hydroxid. This precipitate on settling carries down with it every solid particle which may have been suspended in the liquid. It was noted, however, by Spring that solutions of certain salts like alum and ferric chlorid could not be made optically clear and this was attributed to the formation of basic salts by hydrolytic dissociation. These basic salts form solid particles of ultra-microscopic size, which never-

theless are large enough to reflect and also to polarize light. These luminescent solutions are called pseudo-solutions. In true colloidal solutions the maximum diameter of the particles was found to be 5 $\mu\mu$, that is about ten times as large as the mean diameter of molecules. This raises the question as to whether there is any real boundary between true solutions and colloidal solutions. If not, substances with very large molecular weight ought to give evidence when in solution of interruption of a ray of light similar to that of colloidal solutions. It was found that water rendered optically clear was not affected by the addition of urea, acetamid, methyl or ethyl alcohol, but light reflected vertically from a solution of saccharose (mol. wt. 342) and raffinose (mol. wt. 504) was polarized. Strong luminescence was given by a solution of phosphomolybdic acid. The authors consider it probable that with sufficiently strong source of light even substances of lower molecular weight would show reflection from the dissolved molecules.

The second paper, whose co-author is R. P. Van Calcar, is on the effect of centrifugal force on dissolved substances. The solutions were submitted to a centrifugal force 400 times that of gravity. Under these conditions a one fifth normal solution of potassium iodid showed after three hours pure water in the upper portion, a concentration of 0.1 normal immediately below, 0.32 normal at the top of the lower half and one fourth normal at the bottom. In a number of other cases solutions became manifestly more concentrated at the periphery. In a solution containing 8.78 per cent. of sodium sulfate after five hours rotation a considerable amount of Glauber's salts, Na_2SO_4, $10H_2O$, had crystallized out and the remaining solution contained only 5.54 per cent. of sodium sulfate. These results are the more important, as it has generally been accepted since the negative experiments of Gay-Lussac, that the molecules in a true solution were unaffected by gravity, and hence were in a different state from those in colloidal or pseudo solutions, and it also confirms from a different point of view the results of Lobry de Bruyn and Wolff described above.

J. L. H.

SOCIAL AND ECONOMIC SCIENCE.

UNIVERSITY COMPETITION FOR GRADUATE STUDENTS.

IN his latest annual report President Hadley, of Yale, calls attention to this phase of university effort in the following statement: "For some time past many of the universities of the country have been engaged in a rather unfortunate competition for graduate students. There was in certain quarters a tendency to measure the success and usefulness of an institution by the numbers enrolled for graduate study. Under the influence of these ideas there has been a strong tendency to treat graduate students in the present generation as divinity students were treated a generation ago—giving them not only free tuition, but a great many other pecuniary inducements to pursue special studies for the degree of doctor of philosophy.

"This course of action involves an inversion of the true order of things. If you have real interest in science and literature you will probably have a number of men pursuing courses for the degree of doctor of philosophy; but it by no means follows that if you have a number of men pursuing courses for the doctorate of philosophy you will have a corresponding amount of interest in science and literature. On the contrary, this attempt to subsidize graduate students too often increases numbers at the expense of quality; and so far as it does this is bad. A good graduate student is about the best man that we have in the university; a poor graduate student is about the worst man. The same conditions which allow a man to rise above the average of his fellows if he has the ability and stimulus in himself allow him to fall below his fellows if he has not that ability and stimulus. * * * If the numbers of the graduate students increase instead of diminish it will be a source of congratulation; but it will be far better to submit to some loss of numbers than to continue a form of competition which is prejudicial to the quality of the students, wasteful of the resources of the university, and based upon an imperfect appreciation of the purposes and scope of university work. A uni-