Journal has been replaced by a single issue covering the whole meeting. Clearly it will be a strenuous time. To-day eleven of the twelve sectional presidents deliver their addresses, on subjects ranging from the constitution of the stars to the intensive cultivation of gooseberry bushes. The detailed proceedings of the sections in the morning and the afternoon should be full of interest. An announcement is to be made as to the third of the three practical tests proposed by Einstein for his new theory of relativity, two having been already successfully passed. The chemists are to consider the production of alcohol for industrial purposes. The geology of the district and the possible effect of the narrow valleys in provoking feelings of imprisonment and isolation on their thronged population are to engage the attention of the geologists and geographers—unfortunately, in two separate sections. The economists are to discuss decimal coinage, the Danish credit system, and the business side of agriculture, while the agriculturists are busy over the growing of potatoes. The importance of psychology, the mental effects of alcohol, and training in citizenship are all on the day's program. In the evening, Professor Herdman, president-elect, will be inducted into the chair, and will discourse on Oceanography and Fisheries. The following days, if not quite so arduous, are at least to be well filled. Since the Association held its first meeting, at York in 1831, there has been a great advance in science, and an increasing specialization of its branches. At first there were only six sections, and the next year, at the Oxford meeting, these were reduced to four, dealing respectively with mathematics and physics, chemistry, mineralogy and electricity, geology and geography, biology. By 1855 they had grown to seven; they are now twelve, and a proposal for still further sub-division is to be discussed. We wonder if it is all gain. The reverse tendency is also at work, and several sections are to combine for occasional joint discussions. There is much to be said in favor of a concentration at the annual meetings on subjects whose problems concern many different branches of science and require illumination from many points of view.—The London *Times*.

SPECIAL ARTICLES

EXPERIMENTS IN THE TRANSPLANTATION OF THE HYPOPHYSIS OF ADULT RANA PIPIENS TO TADPOLES

THE writer has for some time past been engaged in experiments upon the extirpation of the hypophysis and the thyroid glands of tadpoles. These experiments have yielded interesting results. Absence of the thyroid gland wholly prevents metamorphosis while the removal of the pars buccalis of the hypophysis, *i. e.*, all but the posterior lobe brings about the following results:

1. Failure to metamorphose.
2. Retardation of growth in size.
3. A striking change in color from black to a silver white.
4. Lowered resistance to unfavorable conditions.

Experiments in transplanting of the hypophysis were undertaken by the writer two years ago, but failed because of faulty technique, and were for the time being abandoned owing to press of other work. This year the experiments were carried through with surprisingly little difficulty and have given such striking results that it seems well worth while to offer a brief and necessarily rather superficial account of them at this time. These experiments are based on 384 operations upon tadpoles.

It is well known that the hypophysis is composed of four elements: the anterior lobe, intermediate lobe, pars tuberalis, and posterior lobe. All but the last named come from the same embryonic anlage—the portion that has been removed in the extirpation experiments mentioned. For the sake of brevity we shall speak of these as "pituitaryless" tadpoles. For the present work three out of the four lobes—all except the pars tuberalis—were employed. In each case a fair amount of care is exercised to prevent infection but these precautions are in no case perfect. Greatest reliance is placed upon the remarkable resist-

ance of the tadpoles to infection. In each case the portion transplanted is placed in a pocket under the skin above the right eye. A delicate knife made from a needle ground to a cutting edge is used in making the pocket into which the piece of material is thrust.

The chief aim of these experiments is to study the several functions of the different portions of the hypophysis. It is quite easy to separate the anterior lobe from the other portions but the intermediate and posterior lobes are tightly applied together although the difference in texture makes it quite easy to distinguish them. In a large portion of the experiments these lobes were both transplanted together. In other series they were laboriously dissected apart and separately transplanted.

The experiments show in clearest fashion that each part functions quite differently from the others.

1. The anterior lobe transplanted to normal, to pituitaryless, and to thyroidless tadpoles in each case produces a marked acceleration of growth so that the tadpoles thus treated are conspicuously larger than those into which the other parts of the hypophysis have been transplanted. They are larger than normal controls and larger than controls into which muscle tissue has been transplanted in the same way and at the same time as the above operations.

The anterior lobe also produces a marked acceleration in the development of the hind legs. This happens to be most conspicious in the pituitaryless specimens probably because they were the first operated; but at the date of writing—June 14th—the same appears to be true of the normal and the thyroidless specimens into which this lobe has been transplanted. The white pituitaryless tadpoles into which this lobe has been transplanted show not the slightest tendency to return to the original black color except for a slight temporary tendency at the beginning. This may be due to the adhesion of particles of the intermediate lobe or to a certain amount of secretion that had diffused from the latter. It soon clears up however.

2. Normal tadpoles into which the intermediate lobe is engrafted become much more darkly colored than the controls, while those which have been made to turn white as a result of removal of the anlage of the hypophysis exclusive of the posterior lobe are made to change back from white to black when the intermediate lobe is engrafted into them. There is not the slightest doubt that this lobe is responsible for the conspicious color changes controlled by the hypophysis. This return to the black color takes place slowly, being scarcely completed inside of ten days. Specimens into which the intermediate and posterior lobes together have been transplanted show this phenomenon of deepening of the black pigmentation as well as those into which the intermediate lobe alone has been engrafted.

3. Tadpoles into which the combined intermediate and posterior lobes are transplanted show not only the color change mentioned above but they also suffer a marked contraction of the body walls. Within twelve hours they appear very emaciated. This characteristic gradually disappears, in the course of ten days. These tadpoles show apparent retardation of growth. When the intermediate and posterior lobes are dissected apart and transplanted separately it is seen that this phenomenon is wholly due to the posterior lobe. It is probably caused by the well-known property that this portion of the hypophysis possesses for bringing about muscular contraction. The details of this will need further study. The posterior lobe does not produce a restoration of the black color to pituitaryless tadpoles.

In summing up it may be said that although we have not taken the pars tuberalis into account and can not make a complete analysis of the functions of the different parts of the hypophysis until we do, the following conclusions are justified.

1. The anterior lobe of the hypophysis stimulates growth and metamorphosis.

2. The intermediate lobe is very largely if not wholly concerned in regulating such color changes as are controlled by the hypophysis.

3. The posterior lobe causes marked contraction of the body walls and at least apparent retardation in growth.

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THE AMERICAN CHEMICAL SOCIETY. VII

The determination of the specific heat of heavy mineral oils: Herbert Bailey and C. B. Edwards. There is apparently very little information available concerning the specific heats of heavy mineral oils at temperatures of 150°–250° C. Such information is often needed in connection with the proper design of plants in which such oils are used as the heat transfer medium. In order to ascertain the specific heat of a particular oil over short temperature intervals between 120°–235° C. a simple apparatus was devised, consisting of a quart vacuum jacketed fruit jar, a small electrically heated resistance coil, and a motor driven glass stirrer. After obtaining, experimentally, the water equivalent of this calorimeter, and its cooling curve, measurements were made of the rate of rise in temperature of a definite amount of oil in the apparatus when heated with a nearly uniform input of electrical energy. For the particular oil varied from 0.543 for the range 120°–140° C. to investigated, it was found that the specific heat 0.630 between 215°–235° C.

The freezing points of mixtures of sulphuric and nitric acids: W. C. Holmes. Freezing points were determined on three sets of mixtures of sulphuric and nitric acids, having total acidities of 100 per cent., 95 per cent. and 103 per cent. respectively, in which the content of nitric acid was varied from 0 to 50 per cent. In the case of the 100 per cent. acidity mixtures, the freezing point of the sulphuric acid was depressed by the addition of nitric acid until a minimum was reached, when 5.5 per cent. HNO_3 was present. On further increasing the nitric content, a sharp rise in the freezing point to 2.3° took place, with a nitric content of approximately 11 per cent. It seemed probable that the composition at this maximum represented a definite chemical compound between sulphuric and nitric acids, the acids being present at that point in the proportion $5H_2SO_4$–HNO_3. The freezing point curve showed a similarity to that of sulphuric acid and water. The freezing point curve for the 95 per cent. and 103 per cent. mixtures showed a general similarity to that of the 100 per cent. acids, and possessed similar maxima and minima. They were complicated by the presence of a third constituent, water and free sulphur trioxide, respectively.

Strength and velocity of detonation of various military explosives: W. C. Cope. The strength of various military explosives that were used or proposed for use during the European War has been determined by the ballistic mortar in terms of TNT which is taken as a standard. Several explosives not used for purely military purposes are also given for comparison to aid in fixing the comparison in the mind. The velocity of detonation of several explosives confined in iron pipes $1\frac{3}{16}$″ inside diameter was determined by the Dautriche method and compared with TNT. The velocities ranged from 5,870 to 7,600 m./sec. Several explosives contained in three inch base detonating shells were detonated and the resulting fragments compared using TNT as a standard.

Potash and reconstruction: J. W. Turrentine. Since the signing of the armistice, when most of the American potash-producing plants suspended operations, imports of foreign potash have not been great enough to supply America's requirements even at the lower prices prevailing. The situation is critical, for the American industry has been demoralized and the foreign industry has not been able to function. This is bad enough, but there is the additional fact which makes matters many times worse; namely, Germany is quoting to the German farmer potash at a price of $2.70 to $3.00 per unit which was formerly sold to the American farmer at 60 cents wholesale, delivered free. On this basis the American farmer will have to pay Germany seventy-five millions per annum for even that quantity of potash used ten years ago and for which he paid an annual bill of fifteen millions. Can American agriculture stand this price for an essential fertilizer ingredient and can it afford to do without?

The experimental kelp-potash plant of the U. S. Department of Agriculture. Second report: J. W. Turrentine. The processes under development have been brought to the point where the only potash produced now is high-grade muriate (85 per cent. KCl). This is being yielded and marketed in such quantity as to pay a very substantial part of the entire expenses, both operating and experimental, of the enterprise. By-products, bleaching carbon and iodine, are being commercial-