

SELECTED ABSTRACTS OF OTHER JUNIOR ACADEMY PAPERS

Regeneration in *Dugesia tigrina*

SANDY HAILEY, Central Junior High, Miami

Several "generations" of *D. tigrina* were formed by periodical transverse bisecting of a single individual. The interval of time between operations was sufficient to allow the observation of apparently complete regeneration. A specimen with two "tails" was produced by making a mid-sagittal incision through the posterior portion of the animal. No apparent permanent injury or malfunction resulted from the operations.

The Effects of Radiation on the Electrocardiographic Development of the Chick Embryo Heart

GERALD SERWER, Harding High, Oklahoma City

This work sought to determine if small doses of radiation would have any effect on the development of the chick embryo electrocardiograph and if the time at which this radiation was given would have any effect on the development of this electrocardiograph. The embryos were divided into four parts: a control and three experimental groups irradiated at six, seven and eight days after fertilization. The experimental groups were again divided into four groups and were given radiation in amounts from 50 to 400 roentgens. When the embryos reached the age of fourteen days, the electrocardiographs were made. The radiation given at six days after fertilization caused the greatest retardation of the growth of the embryo but induced no permanent defects; while the embryos irradiated at seven days after fertilization showed new waves which indicated permanent defects with a slight retardation in growth rate. Those irradiated at eight days showed only a slight retardation in growth and no permanent defects. Each of the effects described became more apparent as the radiation dosage was increased, but no dosage given was lethal.

The Effect of Vitamin K on Tadpoles

PHILLIP WRIGHT, Central High, Tulsa

In attempting to determine the effect of vitamin K, menadione, on tadpoles I added additional amounts of menadione solutions in the following concentrations: $\frac{1}{8}$, $\frac{1}{4}$, 1 ppm in 3000 ml of pond water, 5 and 10 ppm in 2000 ml of pond water, to groups of twenty-five tadpoles. The result was that, as the concentration increased, the growth rate decreased until death occurred. Thus, this information helps support the hypothesis that excessive amounts of vitamin K not only inhibit the growth of living cells, but also have a toxic effect on them in large enough doses.

The Effect of Blending in Crossing *Drosophila melanogaster* Wing Alleles

JAMES N. THOMPSON, JR., Northwest Classen High, Oklahoma City

If a pair of identical chromosomes carry different genes at the same relative locations, the genes are called alleles. In these experiments pairs of alleles which do blend were found and investigated. The general characteristic in most of these experiments is for the blended wing forms of the first generation to be midway in structure between the two parental types. The second generation offspring do not show the blended wing forms in all individuals. There has been approximately a 1:2:1 ratio with one of each of the parent types for each blended fly. The presence of the parental types indicates that the effect of blending is not caused by some change in the gene but is due only to their unusual effect.

The Effects of a Pulsating Electromagnetic Field on the Development of the Stem and Root Systems of Pea Plants

SCOTT DOUGLAS ROBB, Nathan Hale High, Tulsa

The study was based on information that constant magnetic fields affect the maturing time and the stem and root system lengths of various plants. The problem was to determine the effects of a *pulsating* electromagnetic field on the stem and root lengths of pea plants. Mira green pea seeds produced by Ferry-Morse Seed Company were used. They were planted in a plastic box so that they were over or near the poles of an electromagnet. The electromagnet received two amperes of rectified alternating current at 60 cycles per second. The magnetic field went from zero to maximum 120 times per second. The results indicate that the pulsating field had a detrimental effect on the lengths of the stem and root systems and that the field had its least effect at the south pole and its greatest effect at the north pole. Stem and root lengths increased as the field intensity decreased. In addition, as the field strength increased and as distance to the field's north pole decreased, the seeds took longer to germinate and develop. Reports of other experiments indicate that the presence of a magnetic field has stimulated the plants aligned to the south pole of the field and repressed the development of plants nearer the north pole. Apparently, the alternating current set up by the pulsating field, or some other factor associated with the pulsations, can repress the stem and root development of pea plants.

Production of Lateral Root Growth with Vitamin K

MARY MARTHA HOWELL, Horace Mann Junior High, Tulsa

Vitamin K is generally associated with the clotting of blood in humans. It has been found to cause the formation of lateral root growth in onions. In this project 100 ml of vitamin K solutions in amounts from 10 to 100 ppm were applied to *Allium*, grape hyacinth and Dutch iris bulbs. At the end of four weeks the bulbs were examined and the number of lateral roots formed were counted. Those in the 40 ppm solutions produced the largest number of roots. The results supported the hypothesis that vitamin K caused other bulbs to form lateral roots.

Experiments with the Growth of *Fusarium vasinfectum*

JO GREEN and MARLYS EASTON, Donart High, Stillwater

The purpose of this series of experiments was to determine how variation in sucrose concentration and in pH level affects the growth of *Fusarium vasinfectum*. Nutrient agar was used as a medium; the pH was varied from 4 to 11 (all with 8 per cent sucrose) and sucrose additions were from 0 to 60 per cent (all at pH 6-7). Maximum growth, measured by diameters of colonies, occurred at pH 8-9 and 12 per cent sucrose. No level of minimum growth was found. The greatest amount of the pigment lycopersin was present at 4 per cent sucrose and at pH 4.5. Further research varying the pH with each sucrose level is suggested using a liquid medium.

Comparing the Influence of Electrical Currents on Microorganisms

CHARLES DOUGLAS WALKER, Central High, Tulsa

"Pure" and mixed cultures of *Euglena*, *Paramecia*, and *Daphnia* were subjected to 1½ volts of direct current at low amperage for five minutes through electrodes placed at opposite ends of the chamber containing the proper culture. Samples were collected with a pipette near each electrode in each case and examined microscopically. *Euglena* and *Paramecia* were found to be much more numerous near the positive electrode. *Daphnia* were more numerous near the negative electrode.

A Thin-Layer Chromatography of the Volatile Oil of *Cotoneaster pyracantha* Berries

ELLEN WEAVER, Donart High, Stillwater

Oil from *Cotoneaster pyracantha* berries collected from three different areas in Stillwater was extracted in a continuous steam distiller-ether extractor for study using thin-layer chromatography. Chloroform proved to be the best solvent for these oils. The three oils were found to be relatively simple essential oils of slightly different composition, containing not more than eight compounds under the conditions studied.

Experimental Combinations of Tissues from Different Species in Tissue Culture with Special Reference to the Antigen-Antibody Effect

BRUCE FARRAR, Central High, Muskogee

This experiment is part of a long-term investigation into the compatibility of the cells of different species and their possible antibody production *in vitro*. The procedure consisted of culturing 1 - 2 mm explants 1 - 2 mm apart and observing the cultures twice daily for evidence of a cellular reaction. The criteria watched for were: an abnormal accumu-

to certain mental illness be found? In general the experimental procedure consisted of (1) a testing period of fifteen weeks to determine chronic toxicity (long-term effects of the drug) and (2) combining these drugs to see if their synergistic reactions would result in a more nearly normal behavior in rats. Although the problems set forth were adequately dealt with, the results of these tests represent only the first step in finding a "working area" for mental illness. All tests suggested that it is certainly possible. Further research in this area could prove quite successful. Possibly if we can understand the reasons for hyperstimulation of the central nervous system, we can find a cure for some related mental illness.

The Hormonic Effect on the Blood Clotting Mechanism of Rats

ANGELIA K. HICKMAN, Star Spencer High, Oklahoma City

This study was stimulated by the findings of some investigators that some hormones caused a marked change in the clotting mechanism and that stress causes these same changes. Primarily it is the purpose of this investigation to study the effects that the thyroid, pituitary, adrenal glands, testes, and ovaries have on the clotting mechanism of the rat. The control clotting time of a rat was determined by drawing blood from the heart of a normal rat that had not had an injection of hormones. Then, two control groups were run, on which physiological saline was injected intraperitoneally. A silicone clotting time was taken on succeeding days as necessary to determine the effect of the trauma involved plus the bolus injection. The injection of the following hormones into rats was then performed: adrenocorticotropin (ACTH), cortisone, thyrotropin, diethylstilbesterol, progesterone, and testosterone. Then, from the data, appropriate conclusions and generalizations were drawn. The results of this study showed that: (1) The silicone clotting time of the rat is decreased with high blood levels of each of the following hormones: thyrotropin, cortisone, adrenocorticotropin, testosterone, and diethylstilbesterol. (2) Progesterone did not significantly alter the silicone clotting time of the rat. (3) The association of treatment with hormones, surgical procedures and stress is closely related to intravascular thrombus formation (clotting) due to high blood levels of the adrenal, pituitary, thyroid, and testicular hormones.

The Effect of Thyroid Therapy on Hypercholesterolemia

ELLIOTT K. GORDON, Claremore High, Claremore

Coronary heart disease is the leading cause of death in our society today. One of the leading causes of coronary heart disease is high blood cholesterol levels. This report is the most recent of a three-year series of experimental work with drugs and diets and their effect on hypercholesterolemia. A newer concept of maintaining safe cholesterol levels is thyroid therapy. I began with three groups of rats: one control group, a saturated fat-diet group, and a depressed thyroid group. The thyroid activity was depressed by the use of thiouracil. Clinical observations, weights, temperatures, and blood cholesterol levels were determined periodically. The results showed that cholesterol levels are in inverse proportion to thyroid activity. Thyroid therapy may be the answer to safe cholesterol levels and a preventive of coronary heart disease.

Environment in Space

ROBERT DALGARN, Central Junior High, Lawton

An environment chamber was built out of a ten-gallon aquarium, plywood, glass jars, and glass and rubber tubing. The chamber was used to simulate an artificial temperature-humidity environment by raising and lowering the humidity in the chamber. The chemical used to control the humidity was calcium chloride, which draws moisture from the air. Temperature fluctuations came from the body heat of the experimental animal (hamster). When first placed inside, the animal lost weight; but, after becoming adjusted to the environment, it regained all the weight. The conclusion was reached that an animal may adjust to different conditions of environment if the changes are not too great.

A Study of Pituitary Function Using Follicle-Stimulating Hormone

DAN POTTS, John Marshall High, Oklahoma City

Since the hypophysis or pituitary gland regulates a large portion of the endocrine activity of an organism, *hyper-* or *hypo-*function of this gland will result in widespread physiological alterations. Because of this, it is necessary to have some means of measuring pituitary function. One of the better ways of measuring this is to calculate the output of a hypophysis-produced hormone, which is the basis of this project. The objective is to obtain an accurate account of the function of the hypophysis by measuring the amount of follicle-stimulating hormone produced by the adenohypophysis in a 24-hour period. This is accomplished by finding the degree of weight increase produced in rat ovaries when FSH extract from human urine is injected subcutaneously into the rat. The weight increase is compared to a standard graph of FSH activity and the number of FSH rat units are determined. Since the normal human follicle-stimulating hormone output is 5 to 35 rat units, any secretion of units outside this range is considered abnormal.

Phenylketonuria — An Experiment Dealing with Hamsters

MARY LOU OSTER, Clinton High, Clinton

This project was for the purpose of studying the susceptibility of hamsters to *phenylketonuria*, its effects, and general observations. Inducement was achieved by intra-muscular injections of 10 per cent phenylalanine in 0.85 per cent salt solution injected in $\frac{1}{2}$ cc doses daily. The controls were active and alert; treated animals were depressed, and their various reflex patterns such as walking, eating and drinking without attention, and cleaning themselves were also impeded. The hamsters used were apparently susceptible to *phenylketonuria* and gave fine examples of hypothesized results.

The Effects of Sodium Phosphate on Muscular Endurance and Physiological Recovery

JAMES BUELL DENNEY, John Marshall High, Oklahoma City

The purpose of this investigation was to study the effects of a patented food supplement containing active ingredients of phosphate salts on endurance, rate of recovery from exercise, and muscle soreness. Fourteen college students participated in the complete study which lasted three months. A "double blind" experiment was carried out with the treatment and placebo capsules being administered for periods of four weeks to both experimental groups. All groups were tested on the motor driven tread mill at 3.4 mph with a grade increase of 1 per cent per minute until exhaustion. Following each four-week period, the same test was given. In each test measurements included resting, working, and recovery blood pressures and pulse rate, and during the final minute of work ventilation was measured and expired air collected for O₂ and CO₂ analysis. The subjects when receiving treatment capsules performed equal work with less effort than those using placebo capsules, basing work on the time on the mill, and effort on CO₂ production, O₂ consumption and O₂ kg of body weight. There was no significant difference in rate of recovery of blood pressure or pulse rate. Other tests involving maximum effort on various muscle exercises failed to show differences in muscle soreness, although further study is needed in this area.

Effects of Cortisone on Immunological Response to Skin Grafts

JOHN W. McREYNOLDS, John Marshall High, Oklahoma City

This research involves the injection of cortisone into hamsters which had previously been skin grafted. Injections of amounts smaller than 0.0025 per cent of the body weight did not prevent the graft from being rejected after the normal four-day period. Amounts of 0.005 per cent permitted the graft to be rejected only after twelve days. Large doses of 0.008 per cent injected over short periods of time gave the best results—rejection after fourteen days. These results imply that even larger doses should be injected over a period of about three days. Injection previous to the operation may have more significant results than those afterwards.

An Electron Paramagnetic Resonance Absorption Experiment Using a Transistor Marginal Oscillator

ROBERT FRANKLIN, Donart High, Stillwater

An experiment was designed to demonstrate electron paramagnetic resonance. To keep the equipment simple, a transistor marginal oscillator was constructed for the detection of energy absorption by the sample. The basis for the experiment is the fact that a spinning electron, when in a DC magnetic field, will precess about that field at a frequency determined by the field strength, and that the electron exists in two states, one of high and the other of low energy. The state can be changed by an AC magnetic field whose frequency is equal to the precessional frequency. This change of state (low to high) absorbs energy from the coil indicating resonance.

Determining and Exploring the Optimum "Simple" Communications Satellite Orbit

RONALD D. JONES, Welch High, Welch

This report discusses the limitations of simple communication satellites and problems of the space environment, leading to the conclusion that circular polar orbits in the 5000 to 8000 N. M. range are the most desirable for such spacecraft. Also, a satellite I am developing to obtain environmental data is described.

A New Concept of Color Vision

DAVID ALAN WILSON, Claremore High, Claremore

Since the time of Sir Isaac Newton, scientists have believed that color is the result of the mixtures of the three primary colors. Recent experiments, initiated by Dr. Edwin Land, have proven that only two are necessary. In order to demonstrate this theory, I constructed a viewing box so that a white light would shine through two transparencies mounted in frames positioned at right angles. A beam-splitter mirror was placed at a 45 degree angle to the transparency frames. Black and white film was used in a 35 mm camera to take two photographs of colored objects. These were taken through red and green filters respectively. The film was developed by the reversal process. The transparency made through the red filter was inserted in the left frame of the viewing box and the transparency through the green filter was inserted in the right frame. The beam-splitter mirror was adjusted so that the two images were superimposed. When a red gelatin filter is placed in front of the left transparency, the image appears in full color.

An Experimental Three-Dimension Color Television System

JOHN A. MITCHELL, Blackwell High, Blackwell

A study was conducted to determine what kind of system would provide the best quality color three-dimensional television system most inexpensively. It was discovered that a mechanical system was noisy and inefficient. The all-electronic method was both complex and costly. By separating a standard television picture into two smaller pictures, side by side, an optical system was found to enable such a camera to be constructed. Two perspectives of a scene are obtained by a mirror arrangement, simulating the function of two human eyes. Employing the Land Effect, the color-producing information in the scene is converted into monochromatic shades by two color filters: one, a red-orange filter, for one perspective; the other, a blue-green filter, for the other view. Recombining the images in the observer's mind with optical prisms and replacing the color information with a second pair of colored filters, a good quality picture may be obtained. The system will probably find increased use in space travel in addition to its present functions in the military, nuclear, and medical fields.

Amateur Rocketry

GARY BRADLEY, LARRY MEESE, and LARRY MEHEFKO,
Central Junior High, Lawton

The students involved in this project built and fired a solid-fuel single stage rocket. It was approximately $55\frac{1}{2}$ inches in height and $1\frac{1}{4}$ inches in diameter. A z'nc and sulphur mixture was used for the fuel. The body of the rocket was made of low carbon steel, the fins were of light steel, the nose cone was lathed from a block of magnolia, and the nozzle was milled from cold-roll steel. The rocket attained an altitude of 2400 feet and a range of 1950 feet, one third of the estimated maximum performance.

Chance and Sampling

EDWIN R. REAVIS, Central Junior High, Miami

Chance is an intriguing subject. There are many interesting experiments to perform. My younger sister, who is five, was the subject of an experiment that would test random motion. She arranged six appropriately lettered blocks, in any order that she chose, to see if by chance the name *Robert* could be composed. This test showed, by accident, that experiments do not always agree with the mathematical predictions in a problem.

Today statistics, a branch of probability, is used abundantly in the sciences. I have run a few polls to find the full value of statistics. I have hardly grazed the surface of statistics but have found many informative facts.