

## **The Effects of a Changing Medium upon the Velocity of Sound in a Gaseous Atmosphere**

**LEX FRIEDEN, Senior, Alva Senior High School, Alva**

**(Conrad Knox, Teacher)**

A device capable of accurately determining the velocity of sound over short distances was designed and constructed. It was used to study the effects of a changing medium upon the velocity of sound, particularly those effects of changing temperature and atmospheric density. The experiment substantiated previously accepted figures. This method of velocity determination creates many possibilities for future experimentation concerning other such changes.

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## **Polonium Radioisotopes in Tobacco and the Atmosphere**

**JIM FROST, Senior, Thomas A. Edison High School, Tulsa**

**(Donna McErory, Teacher)**

Polonium-210, an alpha particle-emitting radioisotope, is a natural contaminant in cigarette tobacco. Upon smoking a cigarette, much of this  $Po^{210}$  is transferred to the lung, where it may cause types of bronchial cancer. People also ingest other polonium radioisotopes through breathing. In this study contaminated tobaccos were analyzed for their content of  $Po^{210}$ . The amounts found were compared to data giving the Po absorption from other sources to find that such contamination in smog and other industrial contaminants in certain areas was of much greater significance.

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## **Homeostasis as it Concerns pH in Plant Tissue Fluids and Mammalian Blood**

**DAVID HARTSON, Junior, Edison High School, Tulsa**

**(Naomi Pedersen, Teacher)**

The purpose of this experiment was to demonstrate and determine the extent of maintenance of homeostasis in plant tissue fluids and mammalian blood. The experimental procedure involved the titration of blood, orange juice, and the controls (anti-coagulant and distilled water) with 0.5 molar HCl and 0.5 molar NaOH. The pH was read from a meter after the addition of each drop of acid or base. All of the curves of blood and orange juice showed extensive buffering action against both NaOH and HCl.

## **The Effects of Radiation and Gravitational Forces on Living Ova and Zygotes**

**MARTIN HENDREN, Junior, U.S. Grant High School, Oklahoma City**

**(Bradley Brauser, Teacher)**

Eggs were obtained for use by injecting four anterior pituitary glands into the abdominal cavity of a female frog, *Rana pipiens*. These eggs were centrifuged at 1500 rpm/10 min, 2000 rpm/5 min, 3000 rpm/1 min, and irradiated at 50, 100, and 150 roentgens.

Eggs irradiated showed the best results in that there was a different growth rate to the operculum stage as follows: eggs at 50R had 44%, at 100R had 9%, at 150R had 4%, and the control had 5% growth. Eggs that were centrifuged progressed no further than the blastula stage.

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## **The Effect of Various Wave Lengths of Light on the Maturation Rate of *Artemia salina***

**RAYMOND STANLEY LIEBER, Senior, Ponca City**

**High School, Ponca City**

**(Bill Garwood, Teacher)**

Cultures of brine shrimp were subjected to light of various colors. It was found that light affected their maturation and that the longer wavelengths of light promoted maturation more than did the shorter wavelengths. Any light waves shorter than 4,800 A hindered the maturation of *Artemia salina*.

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## **Through Open-Heart Surgery**

**JOE MORGAN, Senior, Enid High School, Enid**

**(Harold Duckett, Teacher)**

An attempt was made to show that valvular pulmonary stenosis can be corrected by excising the valve cusps, without the necessity of prostheses in the domestic rabbit. Open-heart surgery was performed under hypothermia by temporarily occluding venous inflow from the vena cavae. Cardiomy was effected over the pulmonic outflow tract of the right ventricle and the cusps excised under direct vision. Following closure of the incision, normal venous flow was restored, the incision closed in layers, and air evacuated from the thoracic cavity. Postoperative observation of the animal's performance during exercise indicated that the pulmonary valve was not essential; death resulted from coccidiosis, evidenced by severe diarrhea on the seventh postoperative day. It is postulated that excision of the pulmonary cusps is a better procedure than that of dilation or of prosthesis. In contrast to prosthesis, this technique lessens the possibility of thrombus formation.

## **A Study of Mathematical Possibility**

**JACK DOUGLAS MYERS, Freshman, Miami High School, Miami**  
(Lois Q. Shipley, Teacher)

This study deals with the probability patterns of a dodecahedron. A device was built to simulate the throwing of a dodecahedron. The graphs made all show a pattern, which remained consistent as the device was spun repeatedly. Further, a model of a dodecahedron was built and thrown, and the results were recorded. Although the observations could have been inconsistent, these experiments indicate that it is possible to predict probability patterns on a device that has a consistent structural fault.

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## **A Trilogy of Studies Dealing with the Neosho River and Related Effects of Linear Alkylate Sulfonate on Bony Fishes**

**EDWIN R. REAVIS, Junior, Miami High School, Miami**  
(Lois Q. Shipley, Teacher)

The hypothesis that linear alkylate sulfonate (LAS) affects the organ of smell and taste of *Pomoxis annularis*, *Alosa* sp. and *Perca flavescens* was evaluated by histological examinations taken after various experiments. During the testing all the species reacted much the same, with *Pomoxis annularis* displaying slightly more sensitivity.

As a means of testing a possible harmful concentration of LAS in the Neosho River, a bioassay was performed using these species. The water upstream and downstream from the point of major effluence did little damage to the organ of smell. Water near the point of effluence proved to be the most detrimental. All the results show evidence that synthetic detergents may harm the essential organs of smell and taste in native fishes.

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## **Plant Growth in Relation to Magnetism**

**ANDREE SINGLEY, Sophomore, Forgan High School, Forgan**  
(Gayla Guffy, Teacher)

A relationship between the earth's magnetic field and seed germination and plant growth was shown in this project.

A seed growth chamber was used to eliminate environmental factors. Control boxes, petri dishes, and porcelain dishes were used. Seeds were aligned north - south, or east - west to the earth's magnetic field. Also, seeds were exposed in a parallel and perpendicular fashion to a bar magnet.

The seeds that were aligned north - south germinated faster, were sturdier, and grew to greater height. Seeds aligned parallel to the bar magnet gave better results than those perpendicular to it.

## **A Colorimetric Examination of Some Metal Complexes**

**BLAINE SHAFFER, Junior, Duncan High School, Duncan**

**(Marion Nottingham, Teacher)**

The determination of the number of ligands (the molecule or ion that is bound to a metallic ion) necessary to completely complex one molecule of copper can be accomplished by the use of colorimetry. This method is based on the intense colors of the complexes and on the assumption of complete reaction of copper with the ligand.

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## **Learning of a Maze Habit by Siamese Fighting Fish**

**PHYLLIS SHOCKLEY, Junior, U.S. Grant High School,**

**Oklahoma City**

**(Bradley Brauser, Teacher)**

To test a hypothesis that benzedrine produces its effects by reducing "inhibition" within the central nervous system, both drugged and non-drugged *Betta splendens* were trained to swim a simple T-maze. During the acquisition (learning) phase of the experiment, the effects of the drug on their learning behavior were observed. In the reversal (re-learning) phase of the experiment, each fish was trained to make the response opposite to the one originally learned. One fish in the nondrugged group and one fish in the drugged group were given the opposite "drug solution" to the one previously used. The other fish in each group received the same "drug solution" given it during acquisition. These were the control group. The increase in correct responses and the decrease in swimming time as the trials progressed was considered evidence that learning had occurred. During the experiment, the saline-trained fish reached four perfect runs sooner than the drugged fish. The saline-trained fish also had a greater number of perfect runs.

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## **Construction of an Algebra Based on 180° Rotations**

**MICHAEL ROYCE SWEENEY, Senior, C. E. Donart**

**High School, Stillwater**

**(Jean Carr, Teacher)**

An algebra was constructed using 180° rotations (symmetric to axes) as elements and addition as the binary operation. Rotations of an object were found to be commutative and associative, closed under addition, and possessed additive identity and inverse elements, thus fulfilling the postulates of an Abelian group. Methods were found to compute rotations in any  $n$ -space. Rotations in higher space were found to be function-associated with rotations in lower space. Several properties of rotational addition were found that are not shared in conventional mathematics.

**A Study of the Changing Plant and Animal Populations from  
the Base of a Hill to the Hilltop in a Hardwood Forest  
Near Lake Wedington, Washington County, Arkansas**

**JAMES A. TAYLOR, Senior, Thomas A. Edison High School, Tulsa  
(Naomi Pedersen, Teacher)**

The area was divided into four zones, each of which was sampled for study. Vegetation was sampled by arms-length rectangles, variable-radius plotless method, and an ocular sighting device. A Density-Dominance Index (DDI) was computed. Soil samples were analyzed for pH, temperature, moisture, and percentage of potassium and phosphorus present. Mulch weight per square foot and average evaporation for a 24-hour period were determined. *Quercus velutina* in the upper zones (hillside and hilltop) and *Q. alba* in the lower zones were the dominant woody species. *Vaccinium* (sp.) was the dominant species of the ground cover. Insect, arachnid, and small mammal counts were made. *Peromyscus leucopus* was the dominant vertebrate taxon while Insecta (Coleoptera) were the dominant invertebrates.

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**A Study of the Effects of Gamma Radiation on  
Radish Plants Through Two Generations**

**CLAUDIA TEDDY, Senior, U. S. Grant High School, Oklahoma City  
(Bradley Brauser, Teacher)**

Radish seeds were exposed to the rays from a dental X-ray machine and then planted. The first generation radish plants had 100% germination. Increased radiation was found to reduce plant size, radish size and seed production. The radishes of treated plants contained black spots. The seeds from the first generation were planted to study the mutations passed on to a second generation. This resulted in only 85% germination. The treated groups were less severely stunted. Radish size decreased with increased radiation and black spots were still present, but fewer in number. Elongation in the stems and damage to the phloem of treated plants occurred. It appears that this is the result of a genetically carried radiation-produced chemical imbalance.

## **The Comparison of the Nicotine Content in Twelve Different Cigarettes (before Smoking)**

**ANNE WALLER, Junior, C. E. Donart High School, Stillwater**

**(Paul Jones, Teacher)**

Nicotine, known to be the principal toxic alkaloid in tobacco and to be partly converted to other compounds during smoking, was isolated from the tobacco of single cigarettes selected at random from each pack of some leading brands. The tobacco was subjected to steam distillation to isolate the nicotine. The clear distillate was assayed spectrophotometrically to determine the total nicotine recovered. Thin-layer chromatography performed on an ether extract of distillate proved that nicotine was the main alkaloid present. The alkaloid content varied from 9.45 to 19.05 mg/cigarette, with *True* having the lowest and *Benson & Hedges* the highest of the brands tested. When expressed in terms of mg nicotine/g tobacco, the difference is not quite so great (*True*, 11.25 mg/g; and *Benson & Hedges*, 19.45).

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## **Clear Air Turbulence—A Laboratory Method of Simulation**

**KATHRYN L. WATSON, Senior, U. S. Grant High School,**

**Oklahoma City**

**(Bradley Brauser, Teacher)**

Clear Air Turbulence (CAT) is caused by vertical updrafts and down-drafts which occur at altitudes used by jets. CAT is an area of concern to the developers of supersonic transport. A divided water tank holding salt water and clear water was used to simulate CAT. A small plane was hung from a set of four balances. When the salt water was allowed to mix with the clear water slight turbulence was created. The balances showed the turbulence by moving.