examples. Using these examples, I derived a formula which may be stated as follows.

Discord is produced by two sounds when the difference in cycles is approximately twice the square root of the lower frequency. Hence my formula is:

$$F_1 - F_2 = 2 \text{ x square root of } F_2$$

This formula has been checked by the Physics Department at the University of Tennessee and confirmed as correct.

With this essential background knowledge it is now possible to full understand my project. Since it is possible to set up similar vibrations by blowing over a tube, I cut two tubes so that their fundamental frequencies were 2029 and 2118. Therefore, they would produce discord when jets of air are blown over them. Although the resulting sound was not particularly "sour," it produced no pleasing effect. My dog, who appeared restless, seemed to hate me the next morning for exposing her to such an ordeal. Discord on the piano created a similar effect. However, the human voice proved to be a good stand-by, as the dog reacted violently by howling to a note about 650 cycles, or between E_1 and F_1. A similar reaction occurred when a test tube having a frequency of about 1722.2 cycles was sounded. Apparently the dog actually experienced pain, rather than a mere annoyance.

Next I played "Brahm's Lullabye" on the piano with its full rich chords. The effect was so pleasing to the dog that she almost fell asleep.

By way of conclusion, harmony seems to have a soothing effect on both humans and dogs. Discord has the well-known "sour" sound to humans and makes dogs restless. Certain notes of high volume cause a violent reaction with the dog, who seems to actually feel pain.

REGENERATION IN EARTHWORMS[1]

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My objective in this project was to study the development of regeneration from various segments of the earthworm (*Lumbricus terrestris*). Every authority that I consulted agreed that if an earthworm lost some of its posterior segments, it could regenerate them, but they were indefinite as to the ability of regeneration in the anterior region of an earthworm.

[1]The project described in this paper was one of the prize-winning projects exhibited at the meetings of the Junior Academy of Science in Murfreesboro, November, 1956.

During the course of this project I used the following materials:

1. One wooden box divided into twelve compartments.
2. Two bushels of humus soil.
3. Sixty-six earthworms.
4. Two cups of corn meal.
5. One box of non-fat dry milk.
6. Uncounted gallons of water.

I began my project by cutting the earthworms in eleven various places using six earthworms for each cut. The cuts were made at the end of the second, third, fourth, fifth, sixth, eighth, eleventh, thirteenth, sixteenth, nineteenth, and twenty-second segments.

The cuts were made through the earthworms with a razor blade. After the earthworms were cut, the anterior segments were thrown away and the remaining segments were placed in a wooden box containing soil.

Whenever the moisture content was low, water was applied to the soil. The earthworms were fed only once during their two weeks of growth. The food given them consisted of corn meal and milk. The corn meal was sprinkled on top of the soil and the milk was poured over the corn meal.

After the two weeks of growth, the earthworms were examined for signs of regeneration. The earthworms that had been cut on the second, third, fourth, and fifth segments had completely regenerated the segments that had been removed. The earthworms cut on the sixth, eighth, eleventh, thirteenth, and sixteenth segments had regenerated only five segments. These five regenerated segments had the characteristics of being a new anterior region. The ones cut on the nineteenth and twenty-second segments had regenerated a varying number of segments ranging to as many as ten. An earthworm from each group which had been cut after the nineteenth and twenty-second segments was dissected. It was found that the regenerated segments had the characteristics of posterior ones. Consequently, the earthworms cut after the nineteenth and twenty-second segments had two posterior ends, therefore, they will starve to death.

From my project I have derived the following three conclusions:

First, when an earthworm loses its first five segments or less from the anterior end, the earthworm will regenerate the number lost.

In the second place, when an earthworm loses not less than six or more than eighteen segments, it will regenerate only five segments. These five segments form a new anterior region.

My third conclusion is, when an earthworm loses more than eighteen segments from the anterior end, it can replace several segments, but they will form a posterior region.

In the future I plan to work on the effect of regeneration on the internal structure of the earthworm and enter the proposed project in the Fifth Annual Southern Appalachian Science Fair. During my next two years in high school, I would like also to work with grafting in earthworms. But generally speaking, I am interested in learning more about this animal which is the farmer's helper.

NEWS OF TENNESSEE SCIENCE

(*Continued from Page* 151)

Research on metals at extremely high temperatures is being conducted at U-T under the direction of Dr. E. E. Stansbury, professor of metallurgical engineering. The studies are being conducted with the aid of a high-temperature calorimeter which has been built and improved in the last six years at U-T under Atomic Energy contracts. A new AEC contract of $7,800 has been granted this year for the continuation of these studies.

The National Institute of Mental Health has awarded a $25,000 grant to Dr. Ernest Furchtgott of the U-T department of psychology to continue studies on X-ray treatment of rats with unborn young. After birth, the learning, coordination and emotions of the young rats are tested.

A new phase of research on the rare metal rhenium is being opened at the U-T Chemistry Department. The experiments are being directed by Prof. Michael J. Joncich and will lead to exact data on rhenium's anti-corrosion properties. Its known properties plus observed resistance to tarnish lead researchers to expect the metal to prove highly resistant to corrosion and extremely long-wearing.

Daniel P. Hale, who has received his Ph.D. from the U-T department of Physics, will be one of 70 American scientists participating in a scientific investigation of the South Polar region. This investigaton is a part of an international endeavour to correlate scientific data and is sponsored by the International Council of Scientific Unions.

Dr. Ralph F. Morton, instructor in medicine at the University of Tennessee College of Medicine, has been awarded the C. Riley Houck Investigatorship established by the Tennessee Heart Association. Dr. Morton's research program has involved studies in congenital and acquired heart disease; investigation of new drugs to combat hypertension and heart block; and research in basic electrocardiography and work with the artificial kidney used in case of acute rennal failure.

Dr. Webster Pendergrass, University of Tennessee agronomist, will become deant of U-T's College of Agriculture February 1, 1957, succeeding Dean J. H. McLeod. Dr. Pendergrass has been on the U-T faculty since 1936, and has served on the agricultural staff as teacher, county agent, and extension agronomy specialist.

(*Continued on Page* 167)