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Outstanding Iowa Jr. Academy of Science Papers

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OUTSTANDING IOWA JR. ACADEMY OF SCIENCE PAPERS

Listed below are the abstracts and authors of the three top papers presented at the Iowa Jr. Academy of Science Meeting held at Drake University on April 23 and 24, 1977. The ISTJ Advisory Board wishes to congratulate the winners and their teachers for their outstanding efforts.

The Physiological and Psychological Detriments from Induced Stimulation of Auditory Nerves in Mice

Doug Farris, Lewis Central High School, Council Bluffs, Iowa

The primary purpose of this research was to determine the effects of environmental noise on mice and their adaptability to it. The experiment and laboratory research involved the relation of noise exposure not only to physical illness, but also mental illness. Seven sets of sixty-day old female mice were used. A fundamental group of four sets of mice were subjected to different levels of sound. The four different sound levels were at 65 decibels, 90 decibels, 115 decibels, and 140 decibels. The mice were exposed for one hour each day to their designated sound tape which contained a measured sound level. These sounds, produced by an oscilloscope, were a constant and patterned beat. Also included in the seven sets of mice was a control group which was exposed to approximately a 40 decibel sound level with the same characteristics.

It was found that as the sound levels increased from 40 decibels to 140 decibels, so did the detrimental effects to the mice. The heart rate, taken by a carbon microphone, increased as the decibels increased. Hypertension was observed by excessive jumpiness and muscular activity. In certain circumstances noise was able to produce some sign of fear, and so presumably consitutued an element of stress. Noise as loud as 110 decibels inflicted physical damage to the ears of the mice.

The second portion of the experiment included exposing two sets of mice to 90 decibel and 140 decibel sound levels which differed from the first group in that the sounds were intermittent and of no pattern. The relative intensity, although the same as two of the preceding groups, augmented the injurious effects even more than the constant patterned tapes. In all cases, it was noted that food intake increased with increments in sound levels. Sleep was also interrupted by tension.

Transfer of an Acquired Response to Naive Rats by Injection of Ribonucleic Acid Isolated from the Brains of Trained Rats

Renae Steinke, Tri-County Community School, Thornburg, Iowa

Nucleic acids are components of all living cells and contain the genetic code of life. Recent experiments have shown that ribonucleic acid (RNA) can be isolated from rats trained to a single conditioned response and injected

into untrained rats. These naive rats learn the response much faster than a control group. Can RNA coded with a more complex response of a maze be induced with similar results?

Thirty-two rats were divided into four groups of 8, labeling them Group A, B, C, and D. A maze box was built with an allotted sum of food at the end.

Each rat in Group A, which had been deprived of food for 24 hours was timed through the maze in three to five trials a day for a period of ten days. The rats learned to run the correct course to receive their daily feed. On the tenth day, the rats were sacrificed and their brains extracted. RNA was isolated by the phenol method approximately one hour after extraction. The RNA extracted from Group A was injected intraperitoneally into each of the rats in Group B. The same isolating process was followed with the brains of the untrained Group C. This RNA was injected into the rats of Group D, a control group.

The rats of Groups B and D were timed individually through the maze an equal number of trials and days. The averages of the times of the two groups were then compared to note if the coded RNA made any difference.

The Computed Path of a Mass Subject to Formulated Forces

Steve Isaacson, Lincoln High School, Des Moines, Iowa

The primary purpose of this research was to develop a computer program to determine the most desirable path when accelerating a satellite of one mass towards a satellite of a second mass. It was hypothesized that an accurate course could be derived relative to a system of moving masses.

The original program, written in BASIC computer language, was designed to simulate the acceleration of a mass from the earth to the moon. The earth and moon were used because of their known masses and gravitational forces. The final, more complex program was written using two dimensions. Pertinent data relating to the earth and moon were entered into the program to test the results. This program was written to accept masses in any moving system. Since Newtonian physics have been used as the basis for all space flights, the results of this research could be compared to known results.

The basic ideas and concepts used in the development of the programs have high application and undoubtedly many further possibilities. The more versatility gained by introducing a larger number of masses, the greater the application possibilities. The possibilities range from the acceleration of charges on an electron to the acceleration of universes.