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Something from Nothing

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respiration administered as for a case of suffocation, until medical help arrives. Do not delay in calling a physician.

The ingenious teacher should not merely lecture to her pupils on this subject. They will benefit more if they help to collect the information. She must not neglect the use of such devices as the following as an aid to interest: Assign the class recent magazine articles on carbon monoxide. Start a clipping file of articles pertaining to it from the local papers. Have oral or written reports on various phases of the subject. Debate the question: Resolved that all exhaust pipes on automobiles should extend to the top and rear of the car. Require the pupils to compile a list of safety-first rules for the prevention of accidents from this gas. Have a demonstration on the administration of first aid for carbon monoxide poisoning.

If high school pupils become really interested in such worth-while health topics as the one given here, they will realize their lack of authentic information on how to maintain or improve their health and should become ardent seekers of knowledge concerning such matters.

BELVA L. SWALWELL

SOMETHING FROM NOTHING

Physics

Matter made while you wait—hydrogen, helium, oxygen, iron or what will you have? No, it has not quite come to this! But the time-honored law of conservation which states that matter is neither destructible nor creatable is no longer accepted as unquestionably and universally true.

The first doubt was cast upon this law about thirty years ago, when it was found that the electrons which constitute the current in a Geissler or Plucker tube do not have a definite and invariable mass. Their mass was found to increase with increasing velocity, and since the velocity of these electrons depends upon the degree of evacuation of the tube and the voltage impressed upon it, this added mass is, within limits, under the control of the experimenter. He can create matter at will.

But it must not be supposed that by speeding up electrons one can create any kind of matter whatsoever or in any amount. Neither real estate nor pocket money can be obtained in this way. It is only the electronic mass that is increased and this to only a small degree. The speeds attainable in the tube are far too small to enable one to augment this mass by more than a few per cent. Electrons emitted spontaneously by radium and other radioactive materials are much swifter, in some cases attaining a speed almost as great as that of light. The swiftest of these electrons have their masses increased by several hundred per cent.

In the swift movement of electrons, then, there is an apparent creation of mass, due merely to the expenditure of energy in producing the motion. But it is not a mass that persists. According to the relativity theory, the increase in the mass of a moving electron is not a creation, but is due to the transformation of an equivalent amount of energy into inert matter, which in turn is reconverted into energy when the electron is stopped. It is now believed that this conversion of matter into energy is possible in other realms, that in fact it is going on continuously and at a stupendous rate in the sun and other stars. The various other hypotheses that have been advanced to account for the energy radiated by these bodies have been abandoned for the reason that the amounts available from the assigned causes are far too small.

If the sun is actually converting some of its own mass into radiant energy, the amount available per second or per day depends only on the rate at which the transformation takes place. According to the theory of relativity, in order to supply from this source alone the amount of energy the sun is known to emit, it would be necessary to convert 4,500,000 tons of its own mass each second into radiant energy. This energy is broadcast to the universe without possibility of the return of more than an infinitesimal fraction. Will not the sun soon be completely dispersed, like a drop of water on a hot stove? No doubt in future ages its mass will be far smaller than now and its temperature much lower. But even at this stupendous rate of loss,

the sun will have lost only one per cent of its mass in the next 1,600,000,000 years.

Notwithstanding the above mentioned transformations of energy into inert matter and the converse, it should be said that for everyday affairs we may still believe as firmly as ever in the validity of the laws of conservation of matter and of energy. The conversion of inert matter into energy or the converse is seen to occur only under conditions outside the experience of the majority of men. As long as we are dealing with objects having moderate masses and temperatures and speeds, we may still consider mass and energy as distinct entities, each indestructible and uncreatable, and we may deal with them in the customary manner.

W. H. KADESCH

FALL AND WINTER MATERIAL IN ANIMAL HUSBANDRY

Agriculture

Swine are now going to market in large numbers. This offers an excellent opportunity to study market types as represented in the herd and compare them with the sows from which they were produced. If brood sows for spring litters have not all been selected, the teacher has some valuable work for pupils in selecting the better prospects from the available groups.

The method of procedure will depend upon the quality of hogs that are available. If a herd can be found in which the farmer has marked the pigs so that litter mates can be recognized, no more valuable work can be found than that of separating the litters and comparing one with another. Usually in such cases a few outstanding litters will be found, as well as one or more that are inferior. This will suggest the desirability of keeping the dams of the best litters for further use in the herd, and will also show the value of marking pigs and keeping records so that we can apply the best of all tests to our breeding stock; ability to produce desirable offspring. This should be followed by a comparison of the dams of the better litters with the dams of the poorer ones, and a discussion of the value of conformation as compared with other factors in the profitable production of pork. Finally, a selection of a number of gilts from the best litters should be made, by a process of eliminating the poorer individuals. This method presents a practical working plan with a motive and is far superior to the mere formal judging of a few head of hogs. It should, of course, have been preceded by a thorough study of desirable types.

In case marked pigs are not available—and this is often true—a different method of procedure must be used, but the same general results should be sought. It would be best to begin with the old sows if any are left on the farm. By so doing we can often find characteristics which have reappeared in their offspring so that when we study the younger pigs, we can select litter mates even though they are not marked. This will be especially true if the old sows present any very great variations in type, and will enable us not only to recognize litter mates, but to obtain a valuable lesson in heredity also.

In many cases we will find that the pigs have not been marked, records have not been kept and, as happens far too often, the old sows have been disposed of without any regard for their breeding value. Even here we can make an attempt to select litter mates, and get a valuable lesson in types while so doing.

Another valuable practice, when hogs nearly ready for market and also breeding stock are found, is to assign grades to the market hogs and then check these classes or grades against the breeding herd. It will be well to place considerable emphasis on market classes, on grades of swine and upon the ability to determine grades, because of the modern tendency to sell by grade. If the formation of county concentration points, using direct sales by grade to the packer, continues to develop, it will be of great value to the farmer to be able correctly to appraise the value if his swine.

After having selected the breeding herd and assigned grades to those which are to go to market, consider next the question of winter quarters for the breeding herd and the requirements involved. If the members