

a warm fall afternoon lost 14 pounds during the afternoon and in this time he had played strenuous football for one hour. Now, thanks to careful analysis and studies in the physiological laboratory it is perfectly possible to analyze this loss. Is it all body tissue? Is it fat? Is it water? What part of it is water and what part of it is fat, etc.?

Thirteen Pounds Water

We know that when a football player plays to the limit of human endurance he cannot produce more than say 600 or 700 calories of heat in one hour; in an extreme case 900 calories. Of course during this time he is eating nothing and his heat must come from material that is burned in the body and we will assume that it comes from fat. If this is all derived from fat it would require about 100 grams of fat to furnish these 900 calories. 100 grams of fat would be about $3\frac{1}{2}$ ounces. As a matter of fact, he probably would not burn exclusively fat; he would burn a little carbohydrate and some protein, but we can make an extreme case and say that he might have burned all told 100 grams of fat and 50 grams of either protein or carbohydrate. This is an extreme illustration. This makes a total of 150 grams of dry body tissue burned, that is about $\frac{1}{3}$ of a pound. Now dry body tissue is not peeled off the body either internally or externally as such; it is accompanied by water, and in this particular case we can see that if he burned only $\frac{1}{3}$ of a pound of dry body material and lost 14 pounds there must have been $13\frac{2}{3}$ pounds of that loss due simply and solely to water. This was really a drying out of the body and it was probably all regained in the water and other liquids consumed, so that in one or two days at the outside the weight was essentially back to the original level. This furthermore illustrates the futility of trying to "work off" fat that has been deposited in the body. If it takes the terrific strain of one hour's football competition to work off or burn up $\frac{1}{3}$ of a pound of body tissue what chance has the untrained, soft non-athlete to work off *any* material amount? Work means heat. The heat is derived from food or from body substance, so that by working one does work off body substance, but as we have seen in very small amounts.

To come back to our ounce of fat, let us make it rather than an ounce, a pat of butter, about $\frac{1}{3}$ of an ounce. This $\frac{1}{3}$ of an ounce yields a certain number of calories when burned in the body. Now if this $\frac{1}{3}$ of an ounce is taken in

excess of the daily needs, *only a little more*, to work off that particular extra pat of butter taken on that particular day you would have to do work equivalent, for example, to a walk from the bottom to the top of the Washington Monument.

The best way of all to lose fat is not to get fat. If you are fat then it is nearly hopeless to attempt to "work it off." There is only one way to lose it intelligently, and that is to limit your daily food intake slightly and burn it up slowly, but remember that if we ate each day 3 pats or one ounce of butter *less* than we really needed 25 pounds of fat would disappear in the course of a year. Of course, this could be done more rapidly although with some danger by complete fasting. In thirty-one days of complete fasting you could lose nearly 30 pounds, but again a good deal of this loss would still be water. It is impossible to lose weight and not lose some water, for the body is really 60 per cent. of water, but what you want to lose is the fat and that is the main objective in weight reduction.

Bathroom scales are a very good index for the long pull, for reduction covering months, and you cannot reduce except in terms of months. These fat zealots wish quick results, but think, those of you who are really overweight, how long you were putting on the extra poundage, usually several months if not years, so that you must take off that fat in a proportionately moderate way.

Reduction without the continual cooperation of a good physician may really be dangerous. Rapid results cannot be expected. No overnight treatment is of value. Most of the innumerable proposals for weight reduction other than by intelligent diet control are not worth serious consideration.

Each Calorie Counts

Every extra calorie that you eat, be it from starches, sugars, fat or protein, must be looked upon as a potential fat producer. Fats are, so to speak, twice as concentrated as starches and sugars; hence if one avoids all visible fats in the food this is helpful. Cutting out visible fats is usually not a great hardship, but of itself is of value only when there is no compensation by overeating of other equally fat-producing materials. It is useless to cut out any particular article of the diet, such as bread or potatoes, and then have the person fill up with ice cream. Diets of salads and greens which produce a feeling of fullness are sound in principle but may

easily be overdone and produce digestive disturbances.

Exercise in moderation is, of course, essential to health. Extreme exercise, especially if one is not used to it, may be easily overdone, and then there is always this point to bear in mind. A ten-mile walk to "work off fat" usually is a wonderful stimulant to an appetite all too ready to be appeased.

The use of patent preparations to produce slimness, such as various chewing gums, is nonsense. While it is true that certain glandular extracts and drugs hasten the burning up of material in the body and thus contribute in a small way, at least, to reduction, they are without exception dangerous to use without the continued advice of a competent physician. There is no royal road to slimness. Diet reduction, at times demanding a Spartanlike abstinence from especially loved foods, is the only really logical procedure. It all boils down to a careful, intelligent curtailment of food or fuel intake. It might be termed "scientific stoking."

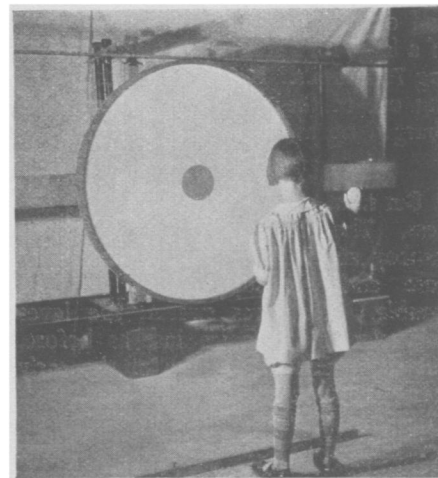
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PSYCHOLOGY

Children Learn Without Taking Special Training

IF YOUR boy wants to be champion basket-ball tosser, just growing older is likely to help him improve his skill as much as long hours of arduous practice.

For children improve in their ability at certain skills, such as weight-lifting, ball-throwing and other games or tasks requiring motor coordination, whether they are specifically trained to do these things or not, Dr. J. Allan Hicks, of



MATURING HELPS

This young lady to improve her skill in throwing a ball at a moving target.

the committee on child development of the National Research Council, has found.

Dr. Hicks believes that other factors such as the physical maturing of the

child and general physical training may contribute just as much to the learning of special skills as does special drill. His conclusions are reported in the current issue of *Child Development*.

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PHYSICS

Physicists Now Sure Vibrations Occur in Heart of Atom

Firing Alpha Rays Into Nucleus of Aluminum Atom Causes Ejection of Protons When Heart Is In Tune With Rays

VIBRATIONS within the innermost core of the atom have been proved to exist by firing high speed alpha rays into aluminum atoms, scientists of the Physical Institute of the University of Halle report.

The capture of a helium bullet by the excessively small heart or nucleus of an aluminum atom has been used in this work by Dr. H. Pose and Prof. G. Hoffman to probe the last great secret of the structure of matter. For this collision of the alpha particle with the aluminum atom is the signal for the ejection from the aluminum nucleus of a still faster kind of rays, the proton rays.

Those protons have been successfully cross-questioned by Dr. Pose and made to tell the story of the aluminum nuclei they have so suddenly left. Actually they are the cores of hydrogen atoms in rapid motion.

Four to five million volts would be required to give the hydrogen cores their high speeds by artificial means.

The speeds of those protons and of the particular alpha ray projectiles which start them on their way, give the new evidence of vibrations in the target atoms of the aluminum. At least Dr. Pose calls them vibrations.

Nothing material vibrates, however. Only a mathematical function with a highly complicated formula and the Greek name Psi. Physicists have been way of making concrete pictures of the inside of the atom recently since the arrival of the new quantum theory.

The Psi vibrations are found in tune with oscillations which accompany certain of the alpha rays on their journey, called the De Broglie waves, another of the conceptions of the new physics. A proton is ejected when these two kinds

of oscillations get into step, just as an organist by playing the right note may wreck a building.

Distances traveled by the hydrogen particles before coming to rest in the air are used to measure their starting speeds. Dr. Pose found that three groups of hydrogens of differing speeds were sent out by the aluminum atoms.

The two faster groups which pass through 20 and 24 inches of air before stopping, appear only when special

CHEMISTRY

Chemists Hail Methyl Freed for Tenth of Second

METHYL, the atomic grouping found in poisonous wood alcohol as well as in a great many other natural and synthetic organic substances, has been isolated as a free compound. But it remains uncombined for only a tenth of a second.

By heating in a quartz tube a stream of the vapor of lead tetra-methyl, a substance similar to the anti-knock substance of ethyl gas, Drs. F. Paneth and W. Hofeditz of the University of Königsberg, have, for the first time, obtained the free radical or parent group of the methyl series of compounds. They have thus solved a problem that baffled the great chemists of the last century.

The substance triphenyl-methyl, first prepared in 1900 by Prof. Moses Gomberg of the University of Michigan, is the closest relation to the free methyl radical. Methyl contains one carbon atom united to three hydrogen atoms whereas in all other compounds, carbon

speeds of alpha-helium rays are present in the projectile atoms. The speed of the alpha rays determines the frequency of the accompanying De Broglie waves.

Dr. R. W. Gurney, working at the Institute of Physical and Chemical Research, Tokio, Japan, had previously suggested that resonance phenomena might be found in the nucleus similar to that observed in the outer layers of the atom. Dr. Pose believes that his own experiments show this. Slower projectiles with a voltage equivalent of 10 to 20 volts, for instance, cause the emission of colored light from the target atom when their speeds reach a very definite value.

Recent experiments of Drs. J. C. Chadwick, J. E. R. Constable and E. C. Pollard at the University of Cambridge, England, however, show that "alpha particles which are not in resonance with the nucleus are nevertheless able to cause a detectable amount of disintegration."

The alpha rays used by the German investigators are helium atom kernels given out by polonium, a radioactive substance similar to radium.

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has four bonds joining it to other atoms or groups of atoms.

Dr. Gomberg's compound and the new methyl radical of Drs. Paneth and Hofeditz are like political radicals in breaking the rules of the game. But they are broken only for a short time. The methyl radical very quickly decomposes or it combines with lead or zinc and forms normal compounds in which the carbon has its usual combining power of four.

The combinations of atoms like methyl or ethyl, which chemists call radicals, are found in compounds with other atoms. Thus methyl forms methyl chloride, CH_3Cl , a substance used as an anesthetic and refrigerant, and methyl hydroxide CH_3OH , which is wood alcohol, just as the metal sodium forms chloride, which is common salt, and sodium hydroxide which is caustic soda.

Methyl has the chemical formula CH_3 .

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