The Elements of a Man.

It depends, of course, on how one looks at a man. That was the reflection of a Washington *Star* reporter, as he stood before a case forming a part of the exhibits in the section of foods at the National Museum. The contents of the case showed one what a 154 pound man appears like from the chemist's point of view. In other words, a supposititious man 5 ft. 8 in. high, weighing 154 pounds, had been passed through the chemist's laboratory, and divided and subdivided into his ultimate elements. There stood all these elements and chemical compounds in glass jars, properly labeled. All of the man was there, except the subtile breath of life, which in some way escapes before the chemist can get it corked up in a jar and labeled. Hence, as this important element is lacking, it would be difficult to make a man that would amount to anything out of the contents of these jars. The case of exhibits forms a part of a series being prepared under the direction of Mr. Romyn Hitchcock, curator of the section, and which, when complete, will illustrate not only the chemical composition of the human body, but the daily income and expenditure of the body, based upon the results of analyses made by Prof. W. O. Atwater.

The story or meaning of the exhibits is told so plainly by the different sizes of the jars and the graphic and explicit statements of the labels, that it can be easily understood even by one who knows little or nothing of chemistry. The first series of exhibits represent the thirteen elements which a large label informs you enter into the chemical compounds of which our bodies are made. Five of these are gases and eight solid substances. The oxygen is shown in a jar with a label which states that the weight of oxygen in a man weighing 154 pounds is 97 pounds. This jar, which would hold about a gallon, represents only one ten-thousandth part of the oxygen of a man of that weight. If the 97 pou ds of oxygen were set free from the body, it would fill a space of 1,090 cubic feet. The oxygen is the great supporter of combustion in the system.

The next jar represents the 15 pounds of hydrogen going to make up the 154 pound man. This amount of hydrogen set free would fill 2,750 cubic feet, and the jar represents only one ten-thousandth of the whole amount. Another jar or bottle, having a capacity of a little over a quart, represents the 3 pounds and 13 ounces of nitrogen found in the imaginary man. This nitrogen, if free, would fill 48·3 cubic feet. Another small bottle contains, combined with calcium, the 3·5 ounces of fluorine, and another jar contains one-tenth of the 4 ounces of chlorine to be found in the man. Chlorine is one of the constituents of bleaching powder. After the jar of chlorine was put in the case the stopper was blown out, and the gas bleached all the tinted labels in the case.

Thus the elements of the human body are shown to comprise five gases, existing in such quantities, as if they were set free, would fill a space of about four thousand cubic feet, which, if paid for at the rate of $1.75 a thousand at the usual discount for promptness, would amount to $6. If the gases of a 154 pound man began to expand, and expanded to their utmost, the man would fill a large room or hall. The Hall of Representatives, commodious as it is, could hold only a few men in the gaseous state.

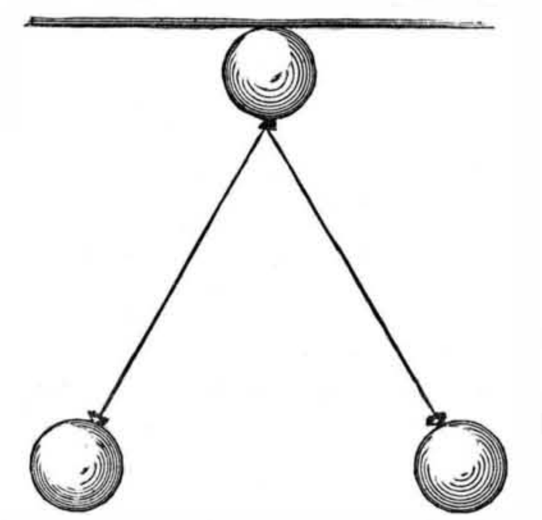
The next series of jars or exhibits represent the solids of the body. First, there is the carbon, represented by a solid cube of charcoal weighing 31 pounds. If a man had to take his carbon out and carry it around with him in a basket all day, he would be pretty tired at night. Yet every man, millionaire or tramp, is weighted down with a load of carbon which, if coined into diamonds, would enable him to rival the splendors of Monte Cristo. Then the 154 pound man yielded 1 pound and 12 ounces of phosphorus, and 3·5 ounces of sulphur. After the gases, the carbon, the phosphorus, and sulphur have been extracted from the man, there is nothing left of him but metals. It is doubtful whether metal exists in the human body in such paying quantities as to offer inducements to mining companies, still one would be surprised to look into this case and see how much a man is weighted down with various metallic substances.

First, there is iron, of which the average man described carries one-tenth of an ounce in his system. This quantity is shown in the exhibit in the form of iron wire. The metal with which the body is most abundantly provided is calcium, the basis of lime, of which the man, supposed to have been resolved into his chemical constituents, yielded 3 pounds and 13 ounces. This is a yellowish metal, and the amount obtained is shown in a cube about 3 inches high. A little block of magnesium, a silver-hued metal, weighing 1·8 ounces, and then 2·8 ounces of potassium were taken from the man, and all that remained was a little quantity of sodium, weighing 2·6 ounces. The weights of the chemical elements in the body of a man weighing 154 pounds are summarized on one of the labels as follows: Oxygen, 97·20 pounds; carbon, 31·10; hydrogen, 15·20; nitrogen, 3·80; calcium, 3·80; phosphorus, 1·75; chlorine, 0·25; fluorine, 0·22; sulphur, 0·22; potassium, 0·18; sodium, 0·16; magnesium, 0·11; iron, 0·01. Total, 154 pounds.

This, however, is only one way that the chemist has of looking at a man. These elements are chemically combined with each other, forming numerous compounds, and another series in the same case represent the result obtained by resolving another 154 pound man into his principal chemical compounds. First, there are two large jars of water, containing together 96 pounds or 46 quarts. Then another large jar represents the proteine compounds, of which the man yielded 24 pounds. The next in order of quantity are the fats, weighing 23 pounds; the mineral salts, weighing 10 pounds 13 ounces; and the carbohydrates, starch and sugar, weighing 3 ounces. Among the proteine compounds appears hemoglobin, the red coloring matter of the blood, and which serves to carry and distribute the oxygen from the lungs to the different parts of the body. Two little vials contain protagon and lecithin, substances found in the brain, spinal cord, and nerves. Then there is a pound of carbonate of lime, 8¼ pounds of phosphate of lime, 7 ounces of fluoride of calcium, 6 ounces of phosphate of magnesia, 6 ounces of chloride of sodium, 5 ounces of chloride of potassium, that exhausted the man with which the chemist started.

A NEW EXPERIMENT IN STATIC ELECTRICITY.

In devising some electrical experiments suitable for exhibition to a small audience, I sought for a simple and novel way of showing the fundamental phenomena of electrical attraction and repulsion; and reflecting on the strong electrical properties of rubber, it occurred to me to test the possibilities of the common toy rubber balloons, as they seemed to offer the advantages of large exciting surface and small weight, both of which are important desiderata in experiments of



A NEW EXPERIMENT IN STATIC ELECTRICITY.

this kind. A trial proved them particularly adapted to striking and interesting demonstration. My first experiments were made with the ordinary grade of toy balloons, which have a red-stained wooden mouthpiece containing a "squawker," well known to small boys and adults who have been harassed by their intermittent squawking. These common balloons may be procured at almost any toy store for a few cents each.

They are inflated with the breath and tied at the end with silk or thread, when they may be pushed off the tube. If one of these inflated balloons be thoroughly stroked with a cat skin, it becomes strongly electrical, and will fly to the body or adhere to the hand if held over it, or it may be rapped up to the ceiling with a small stick.

Its adherence to the ceiling is remarkably persistent. I have repeatedly had balloons remain in such positions for more than four consecutive hours. Numerous instructive experiments may be made with them singly or in combination, and the few here described will suggest others. Their strong attractive force implies, of course, strong repellent force. If two are suspended by threads of the same length, and excited with the catskin, they will be pushed apart two or more feet, the distance depending to a great extent on the length of the suspending threads. If the hand be now brought between them, they will be attracted to it, and if it be suddenly withdrawn before the balloons have touched it, they will bound away from each other almost as if they had struck a wall.

A very pretty experiment is illustrated by the engraving. Two of the balloons are hung with equal threads to a third, the threads being of such length that when the third balloon is against the ceiling the others may be conveniently reached. The third balloon is now excited, and put against the ceiling by means of a long stick. If properly done, the attraction is amply sufficient to support the two other balloons. These latter are now excited, care being taken not to pull the supporting one away from the ceiling; and as their mutual repulsion forces them apart and they float airily around each other, the whole group affords a demonstration of both the attractive and repellent forces of electricity so striking that it can hardly be appreciated until it is seen. If a strip of hard rubber be electrified with the cat skin a d put between the suspended balloons, they fly still further apart, and one of them may be chased around, or made to rise vertically by a little dexterity with the rubber strip. By arranging say half a dozen balloons in the form of a hexagon horizontally on threads strung across a room or on a suitable light frame, it is quite possible that another balloon could be suspended in mid-air by the combined repulsion of the group when in a good state of electrical excitement. This would be a very effective experiment, although it has not yet been tried.

There is a choice among the balloons of different grades for these experiments. The cheaper kind I have found almost unexceptionally satisfactory, but it seems impossible to electrify the better ones, which are heavier and more highly colored. Probably the coloring matter gives them more or less conductivity, so that the charge excited on them easily flows off. It may be, however, that by thoroughly extracting the coloring matter with alcohol or otherwise, they may be made available for electrical purposes, in which case their larger size might make them specially desirable in some experiments. It should be added that, like most experiments with statical electricity, these succeed only in cold weather. H. A. DOTY.

Bloomfield, N. J.

Chrysamin.*

This coloring matter, which I have already had occasion to refer to when it was first brought into the market, possesses, besides the remarkable property of dyeing cotton a bright yellow without the intervention of a mordant, one or two peculiarities which may be of some interest to dyers and painters. A short time after I had received the first sample of the dye, I was informed by a member of the firm that manufactured it that cotton dyed with chrysamin in the ordinary way possessed an affinity for anilin green, and that by topping it with the latter a series of compound colors could be produced. I have lately conducted a few experiments with a view of verifying this statement, and find that it not only applies to anilin green, but also to several other basic coal tar colors. Cotton dyed with chrysamin and then in a solution of malachite green assumes a full shade of green, which is characterized by its great brilliancy. A similar shade is obtained by using methylene blue in place of malachite green. When topped with safranine, a scarlet is obtained which is quite equal in brilliancy to Turkey red (yellow shade) or crocein scarlet. Magenta yields an equally brilliant shade of crimson.

It is interesting to note the effect of temperature in dyeing these mixtures. If the solution of the basic coloring matter is used cold, the above brilliant effects are produced; while if the solution is heated, the color gradually loses its brilliancy, and a dull, worthless shade is the result. This property applies alike to all the basic dyes cited above.

These results led me to infer that the combination which takes place on the fiber is not of a mechanical, but of a chemical, nature. Solutions of malachite green, methylene blue, safranine, and magenta all yield characteristic precipitates when mixed with a solution of chrysamin; and by adding the latter cautiously, the liquid can be completely decolorized. Reactions of this kind usually point to a chemical combination. Experiments are at present being carried out with a view of ascertaining the composition of these precipitates, and, if possible, to explain the effect of heat on the colors obtained in the cold, on which, as well as on the fastness of the compound colors, I hope to be able to report shortly.

By passing cotton dyed with chrysamin through baths of metallic salts, various shades can be obtained. Bichromate, copper sulphate, and ferrous sulphate all sadden the original yellow, ferrous sulphate yielding a light brown somewhat similar to a catechu brown. Lime water yields an orange.—*E. Knecht.*

The Pecan Tree.

The pecan tree is found in a wild state in the woods of the various sections of the South and West. It grows to a very large size, and bears yearly many bushels of fine flavored nuts. Though little or no attention has been paid to these valuable trees, cultivation greatly improves them, the nut growing much larger and improving in flavor. The pecan tree lives to a great age, and continues long in bearing. There is no good reason why it should not be grown extensively in all parts of the United States. It is well adapted to almost any kind of soil, doing well even on rocky hills and waste land. There is no nut or fruit tree more valuable and requiring so little attention. Every farmer, in my opinion, should have his nut orchard, and cultivate especially the pecan for home use or sale. The nuts always find ready sale at fancy prices. In planting the trees, the only object is to obtain good fresh nuts, and of a good early variety, of large size, from which to grow the trees. If it is preferred to set out the plants, get healthy trees of a good variety one to two years old.

* Communicated from Edmund Knecht, Ph.D., to the *Journal* of the Society of Dyers and Colorists.