"It appears to me, that what is wanted is, not a test which will simply tell us whether or not the milk contains more than the normal quantity of water, without giving any indication whether the water has or has not been added to the milk. If this were all, the estimation of the water, by evaporation, would accomplish it; but, what really is required, is a test which will show if the milk has been purposely diluted with water, and, if so, what quantity of water has been added. Such a test, I believe, we have in the specific gravity of the serum, or liquid portion of the milk, from which the casein and fat have been removed by coagulating and straining. The gravity of this liquid I have found to be remarkably constant, ranging, in that obtained from genuine milk, from 1·026 to 1·028; and, by carefully ascertaining the specific gravity of the serum of genuine milk diluted with various quantities of water, we may obtain a standard of comparison which will enable us to say, within a few per cents, what quantity of water has been added to any sample of milk that may come under our notice."

DIVISIBILITY OF MATTER AND SIZE OF CHEMICAL ATOMS.

Atoms as indivisible material elements of unchangeable form, size, and weight, are a convenient hypothesis conceivable in so far as the properties above enunciated are concerned. But any attempt to conceive of them as they really are is futile. Even if we could by improvements in optical instruments render them visible and demonstrate their existence by actual sight there would still be inconceivable things about these seen atoms, differing, as they would, from all other things that we can see, and from each other, not only in size and weight, but in qualities, of which we can have no conception, but which are inferred to exist from the chemical comportment of the elements to each other.

A correspondent has asked in what solution is the extremest division of matter apparent, and the nearest approximation to the size or bulk of the atom made. The first part of this query may be answered; the second is unanswerable, because the size of neither the atomic or molecular intersticial spaces are yet determined, so that if we could determine that a definite number of atoms were mingled with a given number of atoms of another kind we should still lack data for any estimate of their relative size. Assuming them to be spheres with their sides in absolute contact, such a calculation might be made, but all we know of the various states which matter assumes teaches that they do not touch each other.

To answer even the first part of the query would, however, require much research. We shall content ourselves with giving some remarkable instances of extreme divisibility. One three-hundred-and-sixty millionth of a grain of gold may be seen by the use of a microscope magnifying 500 diameters. A grain of copper dissolved in nitric acid will, upon addition of ammonia, give a blue tint to 392 cubic inches of water; one three-hundred-and-ninety-two millionth of which may be seen by the aid of a microscope. The ammonia contained in a small drop of water may be detected though only one part in two hundred thousand by the use of chloride of mercury.

Thompson, the celebrated physicist, has lately been performing a very interesting calculation with a view to determine approximately the size of atoms, the calculation being based upon the phenomenon of capillary attraction, the work performed in overcoming the contractile force of soap bubbles, the kinetic theory of gases (first suggested by Bernouilli, and since worked out by Herapath, Joule, Clausius, and Maxwell), together with the laws of optical dynamics. As the result of these calculations, he concludes that the diameter of gaseous molecules, or atoms of elementary gases, are not less than 0·0000000007942 of an inch. How much larger than this they may be, he does not tell us in numbers, but he does say that, if a drop of water should be magnified to the size of the earth, and each molecule magnified in the same proportion, the molecules would even then be smaller than cricket balls.

ENTERPRISING JOURNALISM.

The Atlantic Cable dispatch containing a full account of the great battle of Gravelotte sent to the New York *Tribune* and published in that paper on the 24th ult., is probably the longest and most costly dispatch ever sent over the transcontinental wires. It cost the *Tribune* $2,260 in gold. As a specimen of enterprising journalism this is absolutely unprecedented, but it may be surpassed ere the war closes. The slow moving dailies of London and other foreign cities will stand wide-mouthed with astonishment at the absolute disregard of expense shown by their American cotemporaries in obtaining news. We doubt whether any of them ever paid as much for news in an entire week as the *Tribune* paid for this single dispatch.

$20,000 BONUS FOR A NEW PRESS.

The circulation of the New York *Sun* has become so enormous that the publisher, Mr. I. W. England, finds it almost impossible to print the edition. Five presses are now employed for that purpose, but the utmost capacity of either is only equal to printing 17,000 copies per hour.

Mr. England wants a press that can strike off 40,000 copies per hour, printed on both sides, and he authorizes us to offer a bonus of $20,000 for such a press—one that will do its work well. This question of more rapid printing is one that must engage the earnest attention of our inventors, and it seems that the tendency of the *Sun* is in that direction.

THE School of Mines, of Columbia College, will re-open on Monday, Oct. 3. The announcement of Dean Chandler appears in our advertising columns.

SCIENTIFIC INTELLIGENCE.

FUORIDE OF SODIUM.

This valuable reagent can be made on a large scale by fusing 100 parts fluor spar, 140 parts of carbonate of lime, 200 parts of sulphate of soda, and an excess of carbon. The fluor spar is completely decomposed, all of the sulphur remains with the lime as sulphide of calcium, and the flux yields a colorless, pure solution.

The difficulty of obtaining a sufficient amount of material has prevented an extensive use of the fluoride of sodium, but now that it can be easily made it ought to attract more attention. It could be advantageously used for the resolution of many silicates, as it forms insoluble double salts with some of the sesquioxides, and in this way the soluble protoxides could be removed. Take, for example, the beryl, by treating it with fluoride of sodium, the aluminum would combine with the soda to form the insoluble double fluoride of aluminum and sodium (cryolite) while the glucina would be separated in an insoluble state.

Feldspar, treated in a similar way, would, no doubt, leave the potash in an available state, while the aluminum would form insoluble cryolite with the sodium. Fluoride of sodium would prove a valuable flux and reagent in the laboratory.

PLATINIZING GLASS.

R. Bottger recommends the following process: Pour rose mary oil upon the dry chloride of platinum in a porcelain dish, and knead it well until all parts are moistened; then rub this up with five times its weight of lavender oil, and leave the liquid a short time to clarify. The objects to be platinized are to be thinly coated with the above preparation and afterwards heated for a few minutes in a muffle or over a Bunsen burner.

This recipe is much simpler than the one given by us some time ago, and can be easily tried by any one. In order to recover the platinum from defective or broken glass, moisten with hydrochloric acid, and touch the spot with a zinc rod, when the platinum will fall off in thin leaves.

WRITING INK.

According to R. Bottger, a very good copying ink can be prepared as follows: Pulverize 30 grammes of extract of Campeachy wood and 8 grammes of crystallized carbonate of soda, and pour on 250 cubic centimeters of distilled water, and boil until the liquid has assumed a deep red color, and the extract is fully dissolved. Then remove the vessel from the fire, and add, with constant stirring, 30 grammes of glycercin of specific gravity of 1·25, and also 1 gramme of the yellow chromate of potash, previously dissolved in a little water, and 8 grammes of finely-pulverized gum-arabic, also previously moistened with water, and the ink will then be ready for use. This preparation will keep indefinitely in well-stoppered bottles, and there is nothing in it to attack the pens. Manuscripts can be copied by it without the aid of the press, by simply moistening the paper and using an iron knife or the thumb nail. The carbonate of soda prevents the gelatinizing of the ink, and the glycerin is a substitute for the sugar formerly employed.

TO DETECT THE AGE OF HANDWRITING.

Attempts have been made to invent a method for approximately determining the age of any writing. Iron inks suffer a change in process of time, and become yellow, the organic constituents disappear, and the iron becomes more prominent. By moistening the writing with weak hydrochloric acid (1 acid, 12 water) if the ink is old only a faint copy can be obtained, and the newer the writing the plainer will be the copy.

In experiments made by Carre, handwriting 30 years old gave scarcely any impression—an authentic document from the year 1787 yielded mere traces. Soaking the paper in weak hydrochloric acid gives opposite results, as handwriting a few months or a few years old is at once removed by the acid, while old ink has suffered such a chemical change that the acid no longer acts upon it. After the experiment it is well to neutralize the acid by suspending the paper over a capsule containing sal ammoniac. The test appears to be only applicable to writing several years old, and is confined to iron inks.

TO RENDER PAPER WATER-TIGHT.

The ammonia oxide of copper is a solvent for silk, paper, and cellulose. If its action be limited to a few moments it converts the surfaces into a gelatinous mass, and Scoffern proposes to employ this property to render the paper water-tight. If in the mill the endless sheet of paper is made to pass at a proper velocity through the ammonia copper solution, and is afterwards dried and pressed, the surfaces will be converted into a species of parchment, and will be water-tight. The rate of speed for the rollers must be a matter of experiment.

LIQUID GLUE.

Experience has shown that glue undergoes a chemical change when dried in the air, and its adhesive properties are decidedly deteriorated. To avoid this, says Prof. Wagner, in his report for 1869, some of the manufacturers have introduced a pure liquid glue in close packages, which is said to be superior to the dry article. It is prepared by digesting bones in a peculiarly constructed apparatus, and is sold according to a fixed specific gravity, so that the purchaser does not pay for the water, which in dry glue sometimes amounts to 12 per cent. The price is also less than for dry glue.

CEMENT FOR IRON AND STONE.

Glycerin and litharge stirred, to a paste, hardens rapidly, and makes a durable cement for iron upon iron, for two stone surfaces, and especially for fastening iron in stone. The cement is insoluble, and is not attacked by strong acids.

HIGHT AND WEIGHT.

[Condensed from Nature.]

One of the earliest efforts made to obtain anything like a fixed relation between hight and weight was that of Dr. Boyd, who weighed a certain number of inmates in Marylebone Workhouse. He took the hight and weight of 108 persons laboring under consumption, and found they measured 5 feet 7 inches, and weighed 90 pounds. He then measured and weighed 141 paupers who were not consumptive, and found that their average hight was 5 feet 3 inches, and that they weighed 134 pounds.

This subject attracted the attention of the late Dr. John Hutchinson, and he determined to take the hight and weight of all classes of persons in the community. In this way he collected the hight and weight of upwards of 5,000 persons. This list, however, included persons who exhibited themselves as giants and dwarfs, and other exceptional cases. He therefore reduced his instances to 2,650 persons, all of whom were men in the vigor and prime of life, and included sailors, firemen, policemen, soldiers, cricketers, draymen, gentlemen, paupers, and pugilists. This group of cases was intended to make one class as a set off against another, so as to get a fair average.

The following is the result of Dr. Hutchinson's observations:

Hight.		Weight.	Hight.		Weight.
Ft.	In.	lbs.	Ft.	In.	lbs.
5	1	120	5	7	148
5	2	126	5	8	155
5	3	133	5	9	162
5	4	139	5	10	169
5	5	142	5	11	174
5	6	145	6	0	178

Of course the result of these investigations of Dr. Hutchinson can only be considered as approximative, and he himself thought that a larger number of observations would lead to a more perfect law. The fact is, his observations are quite sufficient to establish all that we need, and to show that among a certain set of healthy men his estimate of weight and hight may be regarded as an approach to a healthy standard. It is only where considerable departures from the estimates given by Dr. Hutchinson take place that any particular case demands attention.

If the table is examined, it will be seen that the increase in weight for every inch of hight is a little more than five pounds. In fact, allowing for any error in observation, we may say that Dr. Hutchinson's table is reducible to the law that for every inch of stature beyond 5 feet 1 inch, or sixty-one inches, a healthy man increases five pounds for every inch in hight. If this deduction be accepted, we may very much simplify Dr. Hutchinson's table, and say that, as a rule, a man's weight increases at the rate of five pounds for every inch of hight, and this rule holds good for all practical purposes.

Although this law is approximately good for a certain number of cases, even above and below this table; it is practically found, and especially in the case of children and growing persons, that there is a wide difference of weight at hights below 5 feet.

Attention may also be drawn here to the fact that there will constantly occur in the community instances of persons where either the muscular or bony systems are excessively developed, and who consequently weigh more or less than their hight.

Dr. Chambers gives the hight and weight of certain celebrated prize-fighters, the result of Mr. Brent observations, which makes it very obvious that in certain cases the great weight depends on muscular and osseous development.

	Hight.		Weight.
			lbs.
Perrins	[illegible]	[illegible]	[illegible]
[illegible]	6	2	[illegible]
Spring	6	11	[illegible]
Jackson	5	11	[illegible]
Bendigo	5	9	168
Johnson	5	8	187
Slack	5	8	192
Mendoza	5	7	172

The conclusion we come to with regard to these weighings and measurings is that all ordinary departures from the average hight and weight of the body deduced from Dr. Hutchinson's tables are due either to an increase or decrease of the fatty matter or of the adipose tissue in the body. Thus, taking the composition of a human body weighing 154 pounds, and measuring 5 feet 8 inches, it will be found that it contains 12 pounds of fat. It is then mainly due to the diminution or increase of this substance that human beings weigh more or less than the standard weights given in the above table. It will be therefore here worth while to inquire what is the use of fat in the system, and what indications are afforded by the hight and weight of the human body for caution in diet and regimen.

The exact way in which fat is produced in the tissue of plants and animals is not known, but there is evidence to show that it is found very generally in the tissues of plants and especially in the seeds. Oil when used for commercial purposes is mostly obtained from the seeds of plants, as seen in castor oil, rape oil, linseed oil, cocoa-nut oil, palm oil, and a hundred others. As it is found in the seeds of plants, so it is found in the eggs of animals. The embryo of all animals is developed in contact with oil, of which we have a familiar instance in the yelk of the egg of birds. It appears also that the muscular and other tissues grow under the fostering influence of the adipose tissue.

Besides this primary influence on the growth of the body, fat subserves many other purposes. In the first place it seems to be a reserve of material for producing muscular force when needed. Animals grow fat in summer, but as the supply of this material becomes scanty in winter