

motion until it stops; and each point throughout the line of its ascent must mark a degree in the reduction of its velocity, and hence it must sacrifice one degree of its velocity in attaining the height of each succeeding point throughout the entire line of its ascent until it comes to a stop.

Now let us project a like body from the earth in the same manner and with equal force; but let us conceive of a gravitative force twice as great, which, acting upon the ascending body with double the retarding force exerted upon the first body, would bring it to rest at half the height attained by the first body.

Hence it must instantly lose twice as much velocity at each point of its ascent as did the first body. It must instantly lose twice as much velocity in the same time as did the other body when acted upon by the lesser gravitative force.

Therefore Spencer's argument amounts to nothing; for what he claims as impossible is so simple a truth that it may well be considered an axiom, as follows:

A moving body encountering a resisting force instantly loses such velocity as is exactly equal to the resisting force it at each or any instant encounters.

The theory of Boscovich is substantially that the constituents of matter are centers of force or ultimate units of force, points without dimensions which attract and repel one another in such wise as to be kept at specific distances apart. That is, that matter is but an attribute of force, instead of force being an attribute of matter.

We have already demonstrated this theory impossible. However, let us for argument's sake conceive of one of these force centers of Boscovich as existing entirely alone in all space, as we have already considered the ultimate solid.

Now it is self-evident that force as stated in Axiom 15, "is any action between bodies which changes or tends to change their relative condition as to rest or motion," and as a thing cannot be, and not be, at the same time, it is certain that force cannot be, where it can have no effect or tendency to induce change.

Now a single force center or unit of force existing alone in all space must still exist as force if it exist at all, and existing alone, there would be nothing but itself as an object of its action, or tendency; and as force can exist only as action or tendency to induce change, the claim that a unit of force could exist alone is untenable, for it could so exist only in action or tendency to produce itself, which already existing would negative the possibility of such action or tendency, and consequently negative the possibility of a unit of force existing alone, and the possibility of any truth in the force center theory.

But it is asked in argument by disciples of Boscovich, if matter be composed of solid units of substance, what is it that holds together the parts of that body if it be not a cohesive force? And if one of these solid bodies were sundered by a sufficient force, what, but a cohesive force, would hold together a fragment into which it might thus be broken? And so on until we come to centers of force without any dimension.

Division of a body is not annihilation of the body, and no matter how far we carry division in thought, or how far conceive of possibility of carrying it, still a whole must be equal to all its parts taken together; and however infinitely small the parts into which a body may be divided, still the sum of the dimensions of extension of all the parts taken together must equal the dimensions of extension of the original whole; and thus any part, however small, must have dimensions of some extent.

The fact is, our ideas of breaking and separating of bodies are but our impressions from associated ideas. Could we possess infinite powers of vision, we would see that what we deem breaking of substance is in all instances but a moving apart of different substances, the same as the moving of a stone from the earth by lifting the stone, and that absolute fracture or breaking into fragments of absolutely solid substance is not in the course of nature or range of possibility.

We have come to reason inductively that all things must be breakable by the application of a sufficient force, and that some force must be sufficient.

Let us see about this. Suppose we conceive of an absolute solid, a perfect sphere in form and of sufficient size to be tangible to our senses.

Let us apply to every part of its surface a force "sufficient" to compress it. It is evidently not compressible. (Axiom 11.)

In the consideration of a force as tending to compress an absolute solid, all forces are equal to one another and hence all equal 0—thus the term sufficient is inapplicable, the same as no time could be sufficient to end eternity, or distance sufficient to extend to the end of space. Nothing could be sufficient to render an impossibility possible.

Let us reverse this force and let there be a force acting upon every point on its surface sufficient to pull an absolute solid asunder; is it not evident that it would be equally as unbreakable as incompressible?

It is self-evident that no force whatever, equally applied to every point of the surface of an absolute solid sphere could compress it. Suppose we reverse that force, and consider force in any degree of amount as drawing equally in all directions outward from every point of its surface, how and where could fracture occur? Being a perfect solid, its cohesive force or tensile strength, if considered in the light of a force or strength, must be absolutely equal throughout every point of its entire dimensions, hence such force could tend to produce no other effect than absolutely equal expansion throughout its entire dimensions. That is, it must expand so that no one point or portion shall be more solid or rarefied than any other—that is, it must expand and still retain itself a perfect solid, which is impossible. (Axiom 10.)

#### SUMMARY OF DEDUCED TRUTH.

*First.*—All matter exists in ultimate atomic units of absolutely solid unchangeable substance.

*Second.*—With but one ultimate atomic solid existing alone in all space, all force, motion, or change of condition would be impossible.

*Third.*—With but two or three ultimate atomic solids existing alone in all space, attraction, or repulsion, or both, according to distance from one another, would be the only possible forces that could exist. And the only possible change that could be wrought by these forces in the condition of these atoms would be a

change of their conditions as to rest or motion by changing their positions relative to one another. Adding any number of atoms adds no new force, neither makes any new force the more possible, but increases the possibilities of the same force directly as the squares of their numbers, and inversely as the squares of their distances from one another.

*Fourth.*—The sum of all the forces of all nature at the present moment is exactly that of the sum of gravitative force and of the momentum acquired by its ultimate atomic solid units in their nearer approach to one another, occasioning the passage of matter from a rarer to a denser form.

*Fifth.*—All events of all history, and all phenomena, and all evolutions of organic and inorganic, animate and inanimate nature during all time, have been exactly those which have resulted from the sum of the combined forces of all the atoms in existence acting upon one another.

*Sixth.*—Every atom in existence follows a course mathematically exact—that which is determined for it by the combined forces exerted upon it of all the other atoms in existence. And every atom in existence follows a course as mathematically exact under the combined influences exerted upon it as do the heavenly bodies.

*Seventh.*—Could all the atoms in existence be instantly placed in exactly the same position relative to one another that they occupied just one thousand years ago, possessing the same acquired momentum they then possessed, every heavenly body would again pass through exactly the same change of position relative to one another that they have passed through during the last thousand years, and all would again at the end of one thousand years be in exactly the same positions that they now occupy. And the same with every earthly event, everything would reoccur in the history of men exactly the same, and all things reoccur exactly the same and in the same order as they have occurred during the last thousand years, and we should again all be here, the history of all our lives be the same, and we should all again be actuated by the same influences which determine us to work our own destiny without changing the nature of a single atom or swerving one from its destined course.

There can be no effect without a cause, and there can be no cause which is not itself an effect of a preceding cause. Every effect is a cause for effects exactly equal to itself.

There can be no more effects in nature than are exactly equal to producing causes. And there can be no more causes for effects than is exactly equal to the effects to which nature owes those causes, which are the causes of those causes.

The ultimate atom is the unit of measure of power in all effects.

#### SCIENCE AT BREAKFAST.

By JOHN MICHELS.

THE sterling goodness of Dr. Johnson's heart, notwithstanding many apparently blunt demonstrations to the contrary, was never more clearly demonstrated than when he remarked to Boswell, "I encourage this house, for the mistress of it is a good civil woman, and has not much business."

The house referred to was the "Turk's Head Coffee House." But coffee houses, nay coffee drinkers, have much changed in outward form since the days of the sturdy old philosopher. The beau and the belle no longer, in picturesque costumes, discourse scandal sipping the Eastern beverage from exquisite specimens of china ware, and tea and coffee, no longer a luxury, are now enjoyed by the toiling millions, and esteemed a blessing by all classes.

Although tea and coffee is universally used by the civilized nations of the world, few understand the natural potent properties of these substances, or even are conscious of their powerful action upon the human system, and as it is a subject interesting to so many, I offer the following sketch, treating of the more important points:

Coffee, tea, and chocolate all contain in common a nitrogenized basis, to which they owe most of their important chemical properties. Tea and coffee even contain the selfsame basis, denominated indiscriminately *theine* or *caffeine*. In chocolate the cocoa principle called *theobromine* is richer in nitrogen than the *theine*.

The chemical constituents of these substances are as follows: While in tea the basis is combined with tannic acid, in coffee it forms a salt, with a peculiar tannic acid containing a greater proportion of nitrogen, which together with tanno-caffeic acid is united with potash into a so-called double salt. Tanno-caffeic acid when roasted develops the agreeable odor of coffee.

Not only the same basis, but also two similar organic acids, one contained in tea, the other in coffee, increase the conformity between the leaves of the former and the beans of the latter.

Legumin, cellulose, gum, sugar, citric acid in addition to oleine, and what is called palm fat, accompany the organic acids and the theine of the coffee beans.

But the tea leaves, apart from the basis and the acids, are composed of albumen, cellulose, gum and wax, the green pigment of the plant and the volatile oil of tea.

This peculiar oil is the principal source of the aroma of tea, by which, in spite of the conformity between tea and coffee, it essentially differs from the latter.

The inorganic constituents of tea and coffee are moreover different. While, in coffee, chlorine, phosphoric and sulphuric acids are combined with potash, lime, magnesia, and oxide of iron, tea contains another inorganic acid besides, consisting of manganese and a large proportion of oxygen.

So much for the chemical constituents of coffee and tea. Let us now examine their peculiar properties and nutritive qualities.

Chocolate, from its large proportion of albumen, is the most nutritive beverage, but at the same time, from its quantity of fat, the most difficult to digest. But its aromatic substances strengthen the digestion. A cup of chocolate is an excellent restorative and invigorating refreshment even for weak persons, provided their digestive organs are not too delicate. Cardinal Richelieu attributed to chocolate his health and hilarity during his later years.

Tea and coffee do not afford this advantage. Albumen in tea leaves, and legumin in coffee berries, are represented in very scanty proportions, for while in the former the albumen is coagulated by boiling water, in the latter the legumin is prevented from being dissolved by the lime with which it is combined.

The praise of tea and coffee as nutritive substances is, therefore, hardly warranted, because, as restoratives for the body, the alimentary principles and not the elements are to be taken into account. The former principle cannot be ascribed to "theine," which is excreted again as urea, with surprising rapidity, and to this swift transformation tea and coffee owe their diuretic action, which is considerably assisted by the warm water of the infusion.

Tea and coffee, though of themselves not difficult of digestion, tend to disturb the digestion of albuminous substances by precipitating them from their dissolved state. Milk, therefore, if mixed with tea or coffee, is more difficult of digestion than if taken alone, and coffee alone without cream promotes digestion after dinner by increasing the secretion of the dissolving juices.

The volatile oil of coffee and the empyreumatic and aromatic matters of chocolate *accelerate* the circulation, which, on the other hand, is *calmed* by tea.

Tea and coffee both excite the activity of the brain and nerves.

Tea, it is said, increases the power of digesting the impressions we have received, creates a thorough meditation, and, in spite of the movements of thoughts, permits the attention to be easily fixed upon a certain subject; a sense of cheerfulness and comfort ensues, the functions of the brain are set in motion, the thoughts are concentrated and not apt to degenerate into desultoriness.

On the other hand, tea, if taken in excess, causes an increased irritability of the nerves, characterized by sleeplessness, with a general feeling of restlessness and trembling of the limbs; spasmodic attacks may arise, with difficulty of inspiration in the cardiac region. The volatile oil of tea produces heaviness in the head, first manifesting itself in dizziness and finally in stupefaction.

These symptoms have been called an evidence of a real tea intoxication. Green tea, which contains much more of the volatile oil than the black, produces these obnoxious effects in a far higher degree than the latter.

While tea principally revives the faculty of judgment, and adds to this activity a sensation of cheerfulness, coffee acts also on the reasoning faculties, but without communicating to the imagination a much higher degree of liveliness.

Susceptibility to sensuous impressions is intensified by coffee; the faculty of observation is therefore increased, while that of judgment is sharpened, and the perceptions adopt more quickly certain forms, activity of thoughts and ideas is manifested, a mobility and ardor of wishes and ideas, which are more favorable to the shaping and combination of already premeditated ideas than to a calm examination of newly originated thoughts.

Coffee, also, if taken in excess, produces sleeplessness and many baneful effects very similar to those arising from tea drinking. Coffee, however, produces greater excitement, and a sensation of restlessness and heat ensues. For throwing off this condition fresh air is the best antidote.

Much depends upon the proper roasting of coffee, in which process it loses weight but increases in bulk, two pints of unroasted berries giving three pints when roasted.

Several empyreumatic substances created by roasting produce the reddish or brown color, and the tanno-caffeic acid, altered by roasting, produces the aroma; the sugar loses a part of its amount of hydrogen and oxygen, and is thus decomposed into burnt sugar or caramel.

Liebig states that the berries should be roasted until they are of a dark brown color. In those which are too dark there is no caffeine; and if they are roasted black, the essential parts of the berries are entirely destroyed, and the beverage prepared from them does not deserve the name of coffee. This fact should be noted by drinkers of *caffé-noir*.

The berries of coffee when once roasted lose every hour somewhat of their aroma in consequence of the influence of the oxygen of the air, the porosity of the roasted berries allowing it to penetrate easily. Liebig recommended a process by which much of this pernicious change can be avoided. "Strew," says he, "over the berries, when the roasting has been completed, and while the vessel in which it has been done is still hot, some powdered white or brown sugar; half an ounce to one pound of coffee is sufficient."

The sugar melts immediately, and by well shaking, or turning the roaster quickly, it spreads over all the berries, and gives each one a fine glaze, impervious to the atmosphere.

They have then a shining appearance, as though covered with varnish, and in consequence lose their odor entirely, which, however, returns in a high degree as soon as they are ground.

After this operation, they are to be shaken out rapidly from the roaster, and spread on a cool plate of iron, so that they may cool as soon as possible.

If the hot berries are allowed to remain heaped together, they begin to sweat, and when the quantity is large, the heating process, by the influence of the air, increases to such a degree that the coffee is permanently damaged.

In this city I have often observed that coffee is roasted to too high a color, and filled into sacks too quickly, before the process of cooling is complete.

The preparation of coffee as a beverage is accomplished by three processes: First, by *filtration*; second, by *infusion*; and third, by *boiling*.

Liebig states that filtration gives often, but not always, a good cup of coffee. When pouring the boiling water over the ground coffee, if done slowly, the drops in passing come in contact with too much air, whose oxygen works a change in the aromatic particles, and often destroys them entirely.

The extraction, moreover, is incomplete; instead of 20 to 21 per cent., the water dissolves only 11 to 15 per cent., and 7 to 10 per cent. is lost.

Infusion is accomplished by making the water boil and then putting in the ground coffee, the vessel being immediately taken off the fire and allowed to stand quietly for about ten minutes.

This method gives a very aromatic coffee, but one containing very little extract.

Boiling is the custom in the East, and yields excellent coffee. The powder is added to the water when cold, and then placed over the fire and merely allowed to boil a few seconds. The fine particles of coffee are drunk with the beverage. If boiled long, the aromatic parts are volatilized and the coffee is then rich in extract, but poor in aroma.

Further, Liebig gives what he calls the best method. This I produce, not because I think the plan will make a coffee acceptable to most palates, but because Liebig speaks highly in its praise, and states that it is without those heating properties common to most preparations, causing it to be rejected by many in delicate health.

"My method," said Liebig, "is the union of the second and third. The usual quantities of coffee and water are to be retained; a tin measure containing half an ounce of green berries, when filled with roasted ones, is generally sufficient for two small cups of moderate strength, or one so-called breakfast cup; one pound of green berries, equal to 16 ounces, yielding after roasting 24 tin measures (of  $\frac{1}{2}$  ounce each) for 48 small cups of coffee.

With three-fourths of the coffee to be employed (after being ground), the water is made to boil for 10 or 15 minutes.

The one-quarter of the coffee which has been kept back is then flung in, and the vessel immediately withdrawn from the fire, covered over, and allowed to stand from five to six minutes.

In order that the powder on the surface may fall to the bottom, it is stirred around, the deposit then takes place, and the coffee poured off ready for use. In order to separate the dregs more completely, the coffee may be passed through a clean cloth, but generally this is not necessary and often prejudicial to the pure flavor of the beverage.

The first boiling gives the strength, the second addition the flavor. The water does not dissolve more than the fourth part of the aromatic substances contained in the roasted coffee.

The beverage when ready ought to be of a brown black color, somewhat like chocolate thinned with water; this want of clearness in coffee thus prepared does not come from the fine grounds, but from a peculiar fat resembling butter, about 12 per cent. of the amount the berries contain, and which, if over-roasted, is partly destroyed.

In the other methods of making coffee, more than half of the valuable parts of the berries remains in the grounds, and is lost.

"Judging," said Liebig, "as favorably of my coffee as I do myself, its taste is not to be compared with that of the ordinary beverage, but the good effects which my coffee has on the organism should be taken into consideration.

"Many persons who connect the idea of strength or concentration with a dark color fancy my coffee to be thin and weak, but these were at once more favorably inclined when I gave it a dark color by means of burnt sugar."

Adulteration of coffee sold in a ground state is largely carried on, especially of that sold to the poorer classes; out of 34 samples purchased by an English analytical chemist in London, 31 contained chicory, chicory itself being adulterated with all manner of compounds.

There is no falling back, says Dr. Hopall, upon tea and chocolate, as these seem rather worse off than the coffee. Tea is not only adulterated here, but in China; while as to chocolate, the processes employed in corrupting the manufacture are described as "diabolical." It is often mixed with brick dust to the amount of 10 per cent., ocher 12 per cent., and peroxide of iron 22 per cent., and animal fat of the worst description, while the names "Flake," "Rock," "Granulated," "Soluble," "Dietetic," are merely employed as disguises to cover the fact that they are compounds of sugar, starch, and other substances.

The microscope is the most effective instrument in the work of detecting adulterations, the microscopic appearance of coffee and chicory being very distinctive, while the presence of starch granules discovers the particular cereal employed in adulterations.

The adulteration of coffee by the addition of chicory is fraudulent, but harmless, chicory containing little that is injurious to the system; coffee indeed is the more active substance of the two; its effects on some delicate constitutions being so strongly manifested, that without a violation of language it may almost be designated a weak poison.

Some persons positively like the flavor of chicory, others detest it; its presence, however, can be at once detected by its peculiar odor, and if thrown into cold water it imparts a deep tint, which coffee does not.

In conclusion, I offer a useful receipt of Liebig's for preparing coffee in a ground form for special cases, such as marches and journeys, where it is inconvenient to be burdened with the necessary machines for roasting and grinding; by this process its aromatic properties can be preserved.

One pound of the roasted berries is reduced to powder, and immediately wetted with a sirup of sugar, obtained by pouring on three ounces of sugar two ounces of water, and letting them stand a few minutes.

When the coffee powder is thoroughly wetted with the sirup, two ounces of finely powdered sugar are to be added, mixed well with it, and the whole is then to be spread out in the air to dry. The sugar locks up the volatile parts of the coffee, so that when it is dry they cannot escape.

Ground coffee prepared in this way, and which lay exposed to the air for one month, yielded, on being boiled, as good a beverage as one made from freshly roasted berries.

I have described the mental influence of tea and coffee; much could be written on their influence upon modern society and civilization.

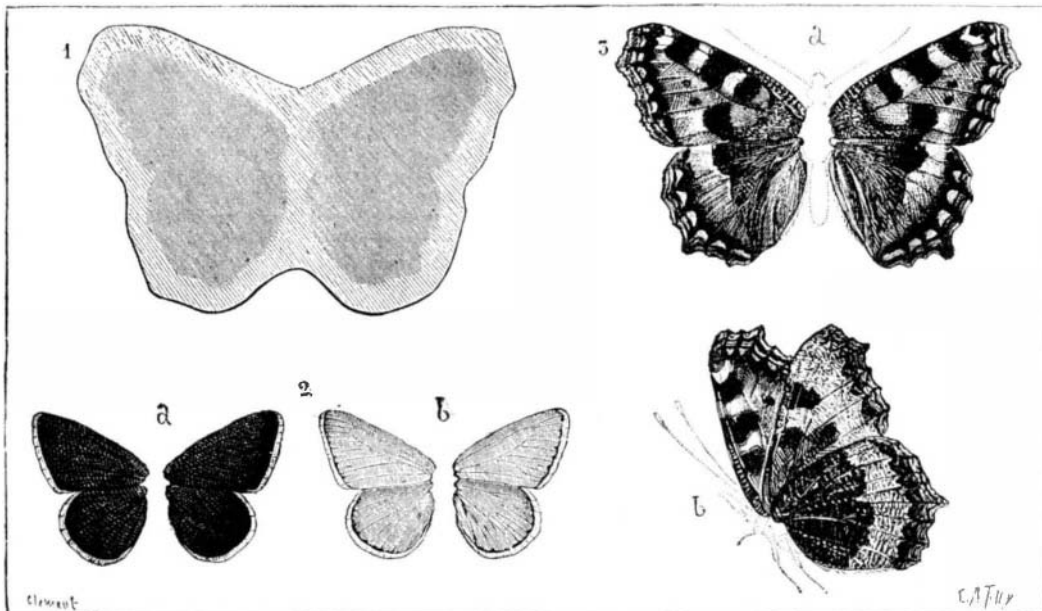
Anne Boleyn makes mention in one of her letters of having partaken of half a pound of bacon and a quart of beer for breakfast; now, after making due allowance for custom and habit, it must be confessed that modern ladies must rise from their morning meal of a cup of coffee with some bread and butter and an egg with many different sensations and sentiments to those experienced by the fair queen after her more masculine repast.—*Health*.

## LEPIDOCHROMY.

LEPIDOCHROMY, or the decalcomania of butterflies, consists in fixing the colors of the latter's wings upon paper. Impressions of the same can likewise be obtained upon porcelain and glass. The operation, about which there is nothing complicated, requires merely care, patience, and some skill. After a certain amount of practice has been acquired, it is possible to get up pretty albums of the various species of butterflies that one has been able to procure. Although such collections have not a great scientific value, they at least have the advantage of not being subject to the attack of insects and of not being as fragile as the delicate insects whose effigy they preserve.

It has not appeared to us to be without interest to give briefly a little practical advice upon the processes to be employed. The brilliant colors of butterflies' wings, as well known, are due to minute scales of various forms, the more or less imbricated assemblage of

completely changed, a brownish black butterfly, for example, appearing upon the paper of a beautiful changeable blue. This phenomenon is due to the nature of the wing scales, the color and structure of which are different according to the surface, and in such an impression, which is negative and provisional, there has been obtained only the aspect of the internal layer of scales placed upon the paper in a position reverse to the natural one that they occupied upon the wing membranes. A second operation therefore becomes necessary, and recourse must now be had to varnish in order to obtain the final image of the insect. The best material to use is the spirit varnish employed by photographers, and this must be so thick as not to soak into the paper. Dip a badger's hair brush into the varnish and lay a thin coat of it upon the impression which has been previously obtained, and which, by careful trimming, has been deprived of the margin above mentioned. Then place thereon a sheet of valium paper or Bristol board, in such a way that the



FIGS. 1, 2, AND 3.—LEPIDOCHROMY.

No. 1. The light parts of the figure show the surface of the paper covered with gum; the shaded parts show the contour of the wings. No. 2a. Wings of a blue butterfly blackened by gum. b. The same restored to their original color. No. 3a. Impression of a small *Vanessa*, with outlines of body to be filled in with paint. b. Three-quarter view of the same butterfly.

which forms the velvety and sometimes changeable shades that many exhibit.

It is these scales that it is a question of fixing upon paper by means of some substance that will hold them.

To obtain an impression of a butterfly, we begin by preparing a solution of very pure gum arabic with the addition of a little rock candy, salt and alum. This solution should have the consistency of a very thin sirup. An excellent fixing material is obtained from the mucilage furnished by the plantain seed, to which is added sugar and gum arabic.

The mucilage (whatever be the kind adopted) is spread with a brush over white paper (foolscap, for example), and upon this are laid the four wings that have been detached with the greatest care by means of sharp scissors (Fig. 1).

Between the wings a space the exact size of the body is preserved, and any position desired is given them. *a* or *b* for example (Fig. 3). Upon covering the whole with a second sheet of gummed paper, we shall obtain in one operation both the upper and under surfaces of the insect.

Then the whole is placed between several folds of blotting paper, and put under pressure. Weights, large books, etc., may be used as a press. A copying press or small joiner's press (Fig. 4) gives good results.

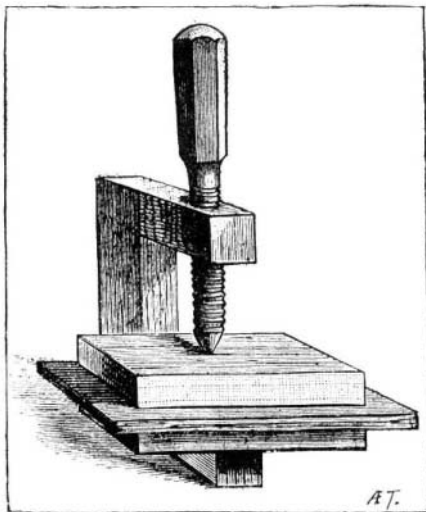


FIG. 4.—SMALL PRESS FOR BUTTERFLIES' WINGS.

The pressure should be continued for a long time (twenty-four hours, for example). After this the two sheets, which are now firmly adherent, are to be taken out and cut in such a way as to leave but a narrow margin around the wings, the relief of which is quite visible. Here, if necessary, the outline of the wings may be traced with a sharp pencil, the paper being placed against a window pane, so that the light may shine through it. The margin thus formed is wet with the greatest care by means of a brush, and the sheets will then separate very easily, each bearing a perfect imprint of the wings. It now only remains to remove, with a needle, the adhering membranes and veins.

The operator will often be surprised to see the colors

two sheets shall be firmly adherent to each other throughout the entire surface of the impression. Then place under pressure, and wait until the varnish is so hard that no blisters will form. This takes but a short time.

Next, take the two adhering sheets from the press and place them in a basin of water, and leave them therein until the paper is thoroughly soaked. Then take them from the bath, and with the point of a needle or the blade of a penknife gently lift the paper, which, through the dissolving of the gum, will easily become detached from the Bristol board. As the varnish is insoluble in water, the scales will adhere to the Bristol board. Now carefully wash the impression with a very soft camel's hair pencil, and then dry it and put it under slight pressure, along with blotting paper, until all the humidity has disappeared. There will thus be obtained upon the sheet of Bristol board a faithful and unchangeable image of the butterfly.

It is now necessary to draw and paint the body and antennæ in water colors or water body colors. With some little patience and care, we shall, in the end, obtain in this way a sufficiently exact reproduction. If the butterfly has a thick, hairy body, such as is found in the sphinxes, noctuella and bombyces, an effort may be made, by means of varnish, to fix along the outline of the body the hairs that have been shaved off with a very sharp penknife. If the insect is still fresh and soft, the skin may even be removed from the back and fixed to the Bristol board; but nothing here is as good as water colors. By the same process, the blank spaces that may exist upon the surface can be filled in.

The reproduction thus obtained may be preserved in an album; it is well, however, to interpose a protecting sheet of tissue paper between them. If it is desired to protect the images still better, a thin coat of spirit varnish may be passed over them.

This method is applicable to all butterflies except those that have white wings. After getting an imprint of these, the wing scales become blackish and produce a bad effect. The reason of this is that every scale is formed of three plates, the last of which, resting upon the membrane, alone possesses the property of reflecting colors. In the first impression obtained with gum water, reproducing the scales in inverse order, the reflecting plate is uppermost. It is therefore only in the counter impression that the blue color will appear, but, in order to obtain such a result, it is necessary that the upper plates shall be perfectly intact. Now, these are always more or less charged with the gum that served to obtain the second impression, and it is therefore necessary to remove this by allowing the Bristol board impression to remain in water for several hours, and afterward by thorough washing. The color, which is greenish on coming from the bath, resumes its blue tint in drying (Fig. 2). The more delicate the blue is, the longer the paper should remain in the bath.

Impressions of blue butterflies must not be varnished, as the application of varnish would give them that dull blackish shade that so much trouble has been taken to get rid of.

ADVICE TO LOVERS OF NATURAL HISTORY ON COLLECTING BUTTERFLIES, PROCURING AND PRESERVING CATERPILLARS, ETC.

Although the use of a net enables a collector to form a collection quickly, it must be admitted that the specimens often become damaged; the wings of the butterflies, with their minute scales, which produce such a beautiful variation of color, are very easily injured