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THE FORMS OF LIQUIDS.

A POPULAR SCIENTIFIC LECTURE.*

BY PROF. ERNST MACH.

What think you, dear Euthyphron, that the holy is, and the just, and the good? Is the holy holy because the gods love it, or are the gods holy because they love the holy? By such easy questions did the wise Socrates make the market-place of Athens unsafe and relieve presumptuous young statesmen of the burdens of imaginary knowledge, by showing them how confused, unclear, and self-contradictory their ideas were.

You know the fate of the importunate questioner. So called good society avoided him on the promenade. Only the ignorant accompanied him. And finally he drank the cup of hemlock, which to-day even we often wish might be the lot of many a critic of his stamp.

What we have learned from Socrates, however,—our inheritance from him,—is scientific criticism. Every one who busies himself with science recognises how unsettled and indefinite the notions are which he has brought with him from common life, and how, on a minute examination of things, old differences are effaced and new ones introduced. The history of science is full of examples of this constant change, development, and clarification of ideas.

But we will not linger at this general consideration of the fluctuating character of ideas, which becomes a source of real uncomfortableness, when we reflect that it applies to almost every notion of life. Rather shall we observe by the study of a physical example how much a thing changes when it is closely examined, and how it assumes, when thus considered, increasing definiteness of form.

The majority of you think, perhaps, you know quite well the distinction between a liquid and a solid. And precisely persons who have never busied themselves with physics will consider this question one of the easiest that can be put. But the physicist knows that it is one of the most difficult. I shall mention here only the experiments of Tresca, which show that solids subjected to high pressures behave exactly as liquids do; for example, may be made to flow out in the form of jets from orifices in the bottoms of vessels. The supposed difference of kind between liquids and solids is thus plainly exhibited as a simple difference of degree.

The common inference that because the earth is oblate in form, it was originally fluid, is an error, in the light of these facts. A rotating sphere, a few inches in diameter, of course, will assume an oblate form only if it is very soft, for example, is composed of freshly kneaded clay or some viscous stuff. But the earth, even if it consisted of the rigidest stone, could not help being crushed by its tremendous weight, and must perforce behave as a fluid. Even our mountains could not extend beyond a certain height without crumbling. The earth *may* once have been fluid, but this by no means follows from its oblateness.

The particles of a liquid are displaced on the application of the slightest pressure; a liquid conforms exactly to the shapes of the vessels in which it is contained; it possesses no form of its own, as you have all learned in the schools. Accommodating itself in the most trifling respects to the conditions of the vessel in which it is placed, and showing, even on its surface, where one would suppose it had the freest play, nothing but a polished, smiling, expressionless countenance, it is the courtier *par excellence* of the natural bodies.

Liquids have no form of their own! No, not for the superficial observer. But persons who have observed that a raindrop is round and never angular, will not be disposed to accept this dogma so unconditionally.

It is fair to suppose that every man, even the weakest, would possess a character, if it were not too difficult in this world to keep it. So, too, we must suppose that liquids would possess forms of their own, if the pressure of circumstances permitted it,—if they were not crushed by their own weights.

An astronomer once calculated that human beings could not exist on the sun, apart from its great heat, because they would be crushed to pieces there by their own weight. The greater mass of this body would also make the weight of the human body there much greater. But on the moon, because there we should be much lighter, we could jump as high as the church-steeples without any difficulty, with the same muscular

* Delivered before the German Casino of Prague, in the winter of 1868. Translated from the German by μκρκ.

power which we now possess.* Statues and "plaster" casts of syrup are undoubtedly things of fancy, even on the moon, but maple-syrup would flow so slowly there that we could easily build a maple-syrup man on the moon, for the fun of the thing, just as our children here build snow-men.

Accordingly, if liquids have no form of their own with us on earth, they have, perhaps, a form of their own on the moon, or on some smaller and lighter heavenly body. The problem simply is, then, to get rid of the effects of gravity; and, this done, we shall be able to find out what the peculiar forms of liquids are.

The problem was solved by Plateau of Ghent, whose method was to immerse one liquid in another of the same specific gravity. He employed for his experiments oil and a mixture of alcohol and water. By Archimedes's well-known principle, the oil in this mixture loses its entire weight. It no longer sinks beneath its own weight; its formative forces, be they ever so weak, have now full play.

As a fact, we now see, to our surprise, that the oil, instead of spreading out into a layer, or lying in a formless mass, assumes the shape of a beautiful and perfect sphere, freely suspended in the mixture, as the moon is in space. We can construct in this way a sphere of oil several inches in diameter.

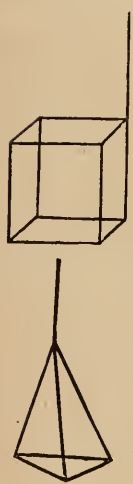

Fig. 1.

If, now, we affix a thin plate to a wire and insert the plate in the oil sphere, we can, by twisting the wire between our fingers, set the whole ball in rotation. Doing this, the ball assumes an oblate shape, and we can, if we are skilful enough, separate by such rotation a ring from the ball, like that which surrounds Saturn. This ring is finally rent asunder, and, breaking up into a number of smaller balls, exhibits to us a kind of model of the origin of the planetary system according to the hypothesis of Kant and Laplace.

Still more curious are the phenomena exhibited when the formative forces of the liquid are partly disturbed by putting in contact with the liquid's surface some rigid body. If we immerse, for example, the wire framework of a cube in our mass of oil, the oil will everywhere stick to the wire framework. If the quantity of oil is exactly sufficient we shall obtain an oil cube with perfectly smooth walls. If there is too much or too little oil, the walls of the cube will bulge out or cave in. In this manner we can produce all kinds of geometrical figures of oil, for example, a three-sided pyramid, a cylinder (by bringing the oil between two wire rings), and so on. Interesting is the change of form that occurs when we gradually suck out the oil by means of a glass tube from the cube or pyramid. The wire holds the oil fast. The figure grows smaller and smaller, until it is at last quite thin. Ultimately it consists simply of a

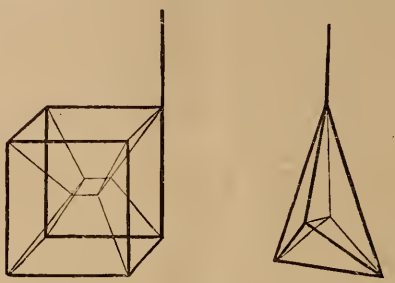

Fig. 2.

number of thin, smooth plates of oil, which extend from the edges of the cube to the centre, where they meet in a small drop. The same is true of the pyramid.

The idea now suggests itself that liquid figures as thin as this, and possessing, therefore, so slight a weight, cannot be crushed or deformed by their weight; just as a small, soft ball of clay is not affected in this respect by its weight. This being the case, we no longer need our mixture of alcohol and water for the production of figures, but can construct them in free space. And Plateau, in fact, found that these thin figures, or at least very similar ones, could be produced in the air, by dipping the wire nets described in a solution of soap and water and quickly drawing them out again. The experiment is not difficult. The figure is formed of itself. The preceding drawing represents to the eye the forms obtained with cubical and pyramidal nets. In the cube, thin, smooth films of soap-suds proceed from the edges to a small, quadratic film in the centre. In the pyramid, a film proceeds from each edge to the centre.

These figures are so beautiful that they hardly admit of a description which does them justice. Their great regularity and geometrical exactness elicits surprise from all who see them for the first time. Unfortunately, they are of only short duration. They burst, on the drying of the solution in the air, but only after exhibiting to us the most brilliant play of colors, such as is often seen in soap-bubbles. Partly their beauty of form and partly our desire to examine them more minutely induces us to conceive of methods of endowing them with permanent form. This is very simply done.* Instead of dipping the wire nets in so-

* See, for some interesting developments of this fact, Prof. J. Delbœuf's article on physical and geometric space in *The Monist* for January, 1894.

* Compare Mach, *Ueber die Molecularwirkung der Flüssigkeiten*, Repor of the Vienna Academy, 1862.

lutions of soap, we dip them in pure melted colophonium. When drawn out the figure at once forms and solidifies by contact with the air.

It is to be remarked that also solid fluid-figures can be constructed in the open air, if their weight be light enough, or the wire nets of very small proportions. If we make, for example, of very fine wire a cubical net whose sides measure about one-eighth of an inch in length, we need simply to dip this net in water to obtain a small solid cube of water. With a piece of blotting paper the superfluous water can be easily removed and the sides of the cube made smooth.

Yet another simple method may be devised for observing these figures. A drop of water on a greased glass plate will not run if it is small enough, but will be flattened by its weight, which presses it against its support. The smaller the drop the less the flattening. The smaller the drop the nearer it approaches in form to a sphere. On the other hand, a drop suspended from a stick is elongated by its weight. The undermost parts of a drop of water on a support are pressed against the support, and the upper parts are pressed against the lower parts because the latter cannot yield. But when a drop falls freely downward all its parts move equally fast; no part is impeded by another; no part presses against another. A freely falling drop, accordingly, is not affected by its weight; it acts as if it were weightless; it assumes a spherical form.

A moment's glance at the soap-film figures produced by our various wire models, reveals to us a great multiplicity of form. But great as this multiplicity is, the common features of the figures also are easily discernible.

> "All forms of Nature are allied, though none is the same as the other;
> Thus, their common chorus points to a hidden law."

This hidden law Plateau discovered. It may be expressed, somewhat prosily, as follows:

1) If several plane liquid films meet in a figure they are always three in number, and, taken in pairs, form, each with another, nearly equal angles.

2) If several liquid edges meet in a figure they are always four in number, and, taken in pairs, form, each with another, nearly equal angles.

This is a strange law, and its reason is not evident. But we might apply this criticism to almost all laws. It is not always that the motives of a law-maker are discernible in the form of the law he constructs. But law admits of analysis into very simple elements or reasons. If we closely examine the paragraphs which state it, we shall find that their meaning is simply this, that the surface of the liquid assumes the shape of smallest area that under the circumstances it possibly can assume.

If, therefore, some extraordinarily intelligent tailor, possessing a knowledge of all the artifices of the higher mathematics, should set himself the task of so covering the wire frame of a cube with cloth that every piece of cloth should be connected with the wire and joined with the remaining cloth, and should seek to accomplish this feat with the greatest saving of material, he would construct no other figure than that which is here formed on the wire frame in our solution of soap and water. Nature acts in the construction of liquid figures on the principle of a covetous tailor, and gives no thought in her work to the fashions. But, strange to say, in this work, the most beautiful fashions are formed.

The two paragraphs which state our law apply primarily only to soap-film figures, and are not applicable, of course, to solid oil-figures. But the principle that the superficial area of the liquid shall be the least possible under the circumstances, is applicable to all fluid figures. He who understands not only the letter but also the reason of the law will not be at a loss when confronted with cases to which the letter does not accurately apply. And this is the case with the principle of least superficial area. It is a sure guide for us even in cases in which the above-stated paragraphs are not applicable.

Our first task will now be, to show by a palpable illustration the mode of formation of liquid figures by the principle of least superficial area. The oil on the wire pyramid in our mixture of alcohol and water, being unable to leave the wire edges, clings to them, and the given mass of oil strives so to shape itself that its surface shall have the least possible area. Suppose we attempt to imitate this phenomenon. We take a wire pyramid, draw over it a stout film of rubber, and in place of the wire handle insert a small tube which leads into the interior of the space enclosed by the rubber. Through this tube we can blow in or suck out air. The quantity of air in the enclosure represents the quantity of oil. The stretched rubber film, which, clinging to the wire edges, does its utmost to contract, represents the surface of the oil endeavoring to decrease its area. By blowing in and drawing out the air, now, we actually obtain all the oil pyramidal figures, from those bulged out to those hollowed in. Finally, when all the air is pumped or sucked out, the soap-film figure is exhibited. The rubber films strike together, assume the form of planes, and meet at four sharp edges in the centre of the pyramid.

Fig. 3.

The tendency of soap-films to assume smaller forms may be directly demonstrated by a method of Van der

Mensbrugghe. If we dip a square wire frame to which a handle is attached into a solution of soap and water, we shall obtain on the frame a beautiful, plane film of soap-suds. On this we lay a thread whose two ends have been tied together. If, now, we puncture the part enclosed by the thread, we shall obtain a soap-film having a circular hole in it, whose circumference is the thread. The remainder of the film decreasing in

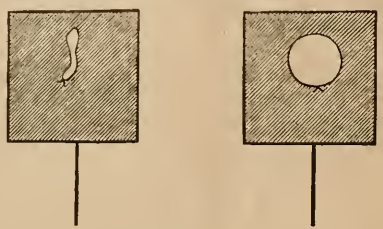

Fig. 4.

area as much as it can, the hole assumes the largest area that it can. But the figure of largest area, with a given periphery, is the circle.

Similarly, according to the principle of least superficial area, a freely suspended mass of oil assumes the shape of a sphere. The sphere is the form of least surface for a given content. This is evident. The more we put into a travelling-bag, the nearer its shape approaches the spherical form.

The connexion of the two above-mentioned paragraphs with the principle of least superficial area may

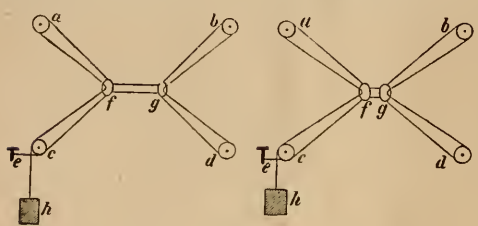

Fig. 5.

be shown by a yet simpler example. Picture to yourselves four fixed pulleys, *a*, *b*, *c*, *d*, and two movable rings *f*, *g* (Fig 5); about the pulleys and through the rings imagine a smooth cord passed, fastened at one extremity to a nail *e*, and loaded at the other with a weight *h*. Now this weight always tends to sink, or, what is the same thing, always tends to make the portion of the string *e h* as long as possible, and consequently the remainder of the string, wound round the pulleys, as short as possible. The strings must remain connected with the pulleys, and on account of the rings also with each other. The conditions of the case, accordingly, are similar to those of the liquid figures discussed. The result also is a similar one. When, as in the right hand figure of the cut, four pairs of strings meet, a different configuration must be established. The consequence of the endeavor of the string to shorten itself is that the rings separate from each other, and that now at all points only three pairs of strings meet, every two at equal angles of one hundred and twenty degrees. As a fact, by this arrangement the greatest possible shortening of the string is attained; as can be easily demonstrated by geometry.

This will help us to some extent to understand the creation of beautiful and complicated figures by the simple tendency of liquids to assume surfaces of least superficial area. But the question arises, *Why* do liquids seek surfaces of least superficial area?

The particles of a liquid cling together. Drops brought into contact coalesce. We can say, liquid particles attract each other. If so, they seek to come as close as they can to each other. The particles at the surface will endeavor to penetrate as far as they can into the interior. This process will not stop, cannot stop, until the surface has become as small as under the circumstances it possibly can become, until as few particles as possible remain at the surface, until as many particles as possible have penetrated into the interior, until the forces of attraction have no more work to perform.*

The root of the principle of least surface is to be sought, accordingly, in another and much simpler principle, which may be illustrated by some such analogy as this. We can *conceive* of the natural forces of attraction and repulsion as purposes or intentions of nature. As a matter of fact, that interior pressure which we feel before an act and which we call an intention or purpose, is not, in a final analysis, so essentially different from the pressure of a stone on its support, or the pressure of a magnet on another, that it is necessarily unallowable to use for both the same term —at least for well-defined purposes.† It is the purpose of nature, accordingly, to bring the iron nearer the magnet, the stone nearer the centre of the earth, and so forth. If such a purpose can be realised, it is carried out. But where she cannot realise her purposes, nature does nothing. In this respect she acts exactly as a good man of business does.

It is a constant purpose of nature to bring weights lower. We can raise a weight by causing another, larger weight to sink; that is, by satisfying another, more powerful, purpose of nature. If we fancy we are making nature serve our purposes in this, it will be found, upon closer examination, that the contrary is true, and that nature has employed us to attain her purposes.

* In almost all branches of physics that are well worked out such maximal and minimal problems play an important part.

† Compare Mach, *Vorträge über Psychophysik*, Vienna, 1863, page 41; also, *Compendium der Physik für Mediciner*, Vienna, 1863, page 234.

Equilibrium, rest, exists only, but then always, when nature is brought to a halt in her purposes, when the forces of nature are as fully satisfied as, under the circumstances, they can be. Thus, for example, heavy bodies are in equilibrium, when their so-called centre of gravity lies as low as it possibly can, or when as much weight as the circumstances admit of has sunk as low as it possibly can.

The idea forcibly suggests itself that perhaps this principle may also find application outside the realm of so-called inanimate nature. Equilibrium exists also in the state when the purposes of the parties are as fully satisfied as for the time being they can be, or, as we may say, jestingly, in the language of physics, when the social potential is a maximum.*

You see, our miserly mercantile principle is replete with consequences. The result of sober research, it has become as fruitful for physics as the dry questions of Socrates for science generally. If the principle seems to lack in ideality, the more ideal are the fruits which it bears.

But why, tell me, should science be ashamed of such a principle? Is science† itself anything more than—a business? Is not its task to acquire with the least possible work, in the least possible time, with the least possible thought, the greatest possible part of eternal truth?

GOETHE AND SCHILLER'S XENIONS.

The appearance of the Xenions in the "Musen-Almanach" of 1797 is a memorable event in the literature of Germany and in that of the world. With the end of the eighteenth century a new era had commenced. New ideals, philosophical, religious, and social, had dawned upon mankind.

The two great apostles of this movement were Goethe and Schiller; yet great as they were, they found not sufficient support among those who should have been their first followers and disciples. The men of literary callings, who should be the priests of the holiest interests of humanity, were too envious to fully recognise and acknowledge the merit of these two great poet-thinkers. Moreover, the men of letters were chiefly enamoured of their own traditional methods of literary production and could not appreciate the purity, the grandeur, and the holiness of the new taste. They misunderstood the progress-promising spirit of the time, and to their puny minds the rise of the new era appeared as a mere disturbance of their traditional habits. They looked upon the twin-giants of the world of thought as usurpers, who from personal vanity and ambition tyrannised all others, and whose impositions had either to be resisted, or silenced by shrugs. The irritation of the literary dwarfs showed itself in malevolent reviews of Schiller's literary enterprise, "Die Horen."

Schiller wrote to Goethe June 15, 1795:

"I have thought for some time that it would be well to open a critical arena in 'Die Horen.' Yet we should not give away our rights by formally inviting the public and the authors. The public would certainly be represented by the most miserable voices, and the authors, as we know from experience, would become very importunate. My proposition is that we make the attack ourselves. In case the authors wish to defend themselves in 'Die Horen,' they must submit to our conditions. And my advice is, not to begin with propositions, but to begin with deeds. There is no harm if we are denounced as ill-bred."

Several letters were exchanged on this subject, and Goethe wrote in a letter of December 23, 1795, to Schiller:

"We must cultivate the idea of making epigrams upon all journals; one distich for each magazine, in the manner of Martial's Xenia; and we must publish a collection of them in the 'Musen-Almanach' of next year. Enclosed are some Xenions as a specimen."

Schiller answered at once, December 23, 1795:

"The idea of the Xenions is splendid and must be executed... What a wealth of material is offered by the Stolbergs, by Racknitz, Ramdohr, the metaphysical world with its *Me's* and *Not-Me's*, friend Nicolai, our sworn enemy, the Leipsic taste-mongers, Thümmel, Göschen as his horse-groom, and others."

Goethe and Schiller agreed to publish all their Xenions together, and regard them as common property.

It happened now and then that the authors of the Xenions hit the wrong man; but this, although we may be sorry for it, was more excusable than the dirt which their adversaries threw back.

The Xenions, as was to be expected, raised a storm of indignation, and Anti-Xenions were written by many who had been attacked. But while the tenor of the Xenions, in spite of their personal character, is lofty, and while we feel the high aims of Goethe and Schiller in their attempts at a purification of literature, the Anti-Xenions are *wholly* personal. They are rude, malicious, and mean. They insinuate that the Xenions were prompted by vile motives; that Goethe and Schiller wanted more praise and flattery; that they were envious of the laurels of others, and wanted to be the sole usurpers of Mount Parnassus. Schiller was called Kant's ape, and Goethe was reproached with his family relations.

The history of the Xenions is their justification. The Anti-Xenions are in themselves alone a wholesale condemnation of the opposition made to Goethe and Schiller.

Goethe wrote to Schiller concerning the reception which the Xenions found, on December 5, 1796:

* Like reflexions are found in Quételet, *Du système sociale*.

† Science may be regarded as a maximum or minimum problem exactly as the business of the merchant. In fact, the intellectual activity of natural inquiry is not so greatly different from that exercised in ordinary life as is usually supposed.

"It is real fun to observe what has been offensive to this kind of people, and also what, they think, has been offensive to us How trivial, empty, and mean they consider the life of others, and how they direct their arrows against the outside of a work. How little do they know that a man who takes matters seriously lives in an impregnable castle."

Goethe and Schiller had wielded a vigorous and a two-edged weapon in the Xenions. They had severely chastised their antagonists for incompetency; but now it devolved upon themselves to prove the right of their censorship. And they were conscious of this duty. Goethe wrote, November 15, 1796:

"After the bold venture of the Xenions, we must confine our labors strictly to great and worthy works of art. We must shame our adversaries by changing our Protean nature henceforth into noble and good forms."

Deeds proved that Goethe, as well as Schiller, were not only willing, but also able, to fulfil these intentions. Their antagonists have disappeared. Some of them would be entirely forgotten, if the two poets had not immortalised them in the Xenia.

Many Xenions are of mere transitory importance, especially such as contain allusions and criticisms that are lost to those who are not thoroughly versed in the history of the times. Yet, many others are gems of permanent value; they reflect in a few words flashes of the deepest wisdom.

Only a few of the Xenions have been translated into English, and as they are little known, we have extracted and translated those which we deem worthy of being preserved for all time.*

INTRODUCTORY.

OUR PURPOSE.

These brisk verses, revering the good, will annoy the Philistines,
Ridicule bigots, and smite hypocrites, as they deserve.

THE LAST MARTYR.

That you may roast me like Huss, is possible; but it is certain,
After me cometh the swan who will my mission complete.

[It will be remembered that Huss, whose name means "goose," said when condemned to die at the stake, "After me will come a swan whom they will not roast."]

OUR COMMON FATE.

Oh, how we struggle and hate! Inclinations, opinions, divide us.
Yet in the meantime your locks turn into silver like mine.

TO INCOMPETENT REVIEWERS.

Difficult 'tis to achieve; criticism is easy, O critics!
Shrink not, when finding a flaw, freely from praising the good.

TO SOME CRITICS.

Wretches! Speak evil of me, but oblige me by truthfully adding:
Serious is he! For the rest— wretches speak evil of me.

* The schedule of the distich is as follows:

$$-\breve{\cup}\breve{\cup}-\breve{\cup}\breve{\cup}-\breve{\cup}\breve{\cup}-\breve{\cup}\breve{\cup}-\cup\cup-\bar{\cup}$$
$$-\bar{\cup}\breve{\cup}-\bar{\cup}\breve{\cup}- \parallel -\cup\cup-\cup\cup-$$

For further reference we refer the reader to a previous article of ours published in No. 12 of *The Open Court* (*Goethe and Schiller's Xenions*).

PARTISAN SPIRIT.

Where there are parties, the people are siding with zeal on each issue.
Years must elapse before both join in a middle their hands.

THE POET ADDRESSES HIS MUSE.

How I could live without thee, I know not. But horror o'ertakes me
Seeing these thousands and more who without thee can exist.

THE DISTICH.

In the hexameter rises the jet of a wonderful fountain,
Which then graciously back in the pentameter falls.

SOUL AND WORLD.

OUR OWN.

Common possessions are thoughts, and sentiment only is private.
Shall He your property be, feel Him—the God whom you think.

THE KEY.

Wilt thou know thyself, observe how the others are acting.
If thou the others wilt know, look in the heart of thyself.

WORTH AND VALUE.

Have you something? O give it to me, and I'll pay you its value.
Are you something, my friend? Let us exchange, then, our souls!

MYSTICS.

That is the very mysterious secret that openly lieth,
Always surrounding your minds, but from your sight 'tis concealed.

THE HIGHEST.

Do you desire the highest and greatest? A plant can instruct you.
What it unconsciously is, will it! 'Tis all you can do.

VARIOUS DESTINIES.

Millions of people are busy, the race of mankind propagating,
But in the minds of a few, only, humanity grows.

THE VINCULUM.

How has Nature in man united the high and the vulgar?
Vanity she has placed right in the middle of them.

PRESENT GENERATION.

Has it been always as now? How strange this to-day's generation!
Only the old ones are young, only the young ones are old.

ZEUS TO HERACLES.

Thou hast divinity, son, not acquired by drinking my nectar;
But thy divinity t'was, which gained the nectar for thee.

THE IMMUTABLE.

Time, unimpeded, is hastening on. It seeketh the Constant.
He who is faithful will bind time with eternity's ties.

GOD, WORLD, AND MAN.

'Tis not a mystery great, what God, what the world, and what man is!
But as none fancy the truth, always the secret remains.

IMMORTALITY.

Art thou afraid of death? Thou wishest for life everlasting.
Live as a part of the whole, when thou art gone it remains.

HARMONY.

Reason, what is it? The voice of the whole; thy heart is thy selfhood.
Happy thou art, if for aye reason will dwell in thy heart.

HUMAN LIFE.

When we are starting in life, an eternity opens before us.
Yet will even the wise narrowly limited end.

TEMPTATION.

Ev'ry fanatic be nailed to the cross when he reaches the thirties,
For if he knows but the world, surely the dupe will turn rogue.

SALVATION.

Out of life there are two roads for every one open:
To the Ideal the one, th' other will lead unto death.
Try to escape in freedom, as long as you live, on the former,
Ere on the latter you are doomed to destruction and death.

LIGHT AND COLOR.

Live, thou Eternally-One, in the realm of immutable oneness,
Color, in changes so rich, kindly descend upon earth!

OUR FATHER.

Though you aspire and work, you will never escape isolation,
Till with her might to the All Nature has knitted your soul.

[TO BE CONTINUED.]

CURRENT TOPICS.

ANOTHER "League" has been organised for work in the field of American politics, and in that field there is always work for everybody. Industry is forever active there, and business is never dull. This new disturber of ancient privileges is called "The Anti-Spoils League," and the President of it is Gen. Carl Schurz. It has a "platform," a purpose, and all the other machinery of a "league." It calls for "the complete abolition of the Spoils System from the public service," and, like every other league, it hopes for "a general uprising of the people" to enforce its demand, believing the Spoils System to be "unjust, undemocratic, injurious to political parties, fruitful of corruption, a burden to legislative and executive officers, and in every way opposed to the principle of good government." The description is well enough as a bit of literary composition, but where does the League find authority for calling the Spoils System "undemocratic"? We have a habit of putting our thoughts into a sort of ironical disguise, and with admirable impudence we condemn certain customs peculiar to our own country as "un-American," and certain practices characteristic of democracies as "undemocratic," until those ill-used adjectives have become cant words, almost idiomatic in American speech. The Spoils System, if entitled to any political epithets at all, is "democratic" and "republican." It is extinct in Germany, England, and in the other "effete monarchies," but it is the obedient servant of both parties in the United States. It has flourished here for seventy years, and it is in a state of healthy preservation still.

* * *

The debate on the proposed new tariff is just begun in Congress, and I hope the Republicans will be lenient in their censure, considering that the majority report of the Committee on Ways and Means is a rather courteous apology for "tinkering" the tariff at all. I notice that whenever a change is proposed in the direction of lower taxes it is described as "tinkering," but if in the direction of higher taxes, it is called "amending" the tariff. A temperance lecturer detected in the act of drinking whiskey, excused himself by saying that although he was in favor of prohibiting the liquor-traffic, he was not bigoted. This excuse will avail the Committee on Ways and Means. Their eloquent "report" shows that although they condemn the protective tariff, they are not bigoted. "In dealing with the tariff question," says the report, "the legislator must always remember that in the beginning temperate reform is safest, having in itself the principle of growth." The patient having a serious case of measles, the doctors propose a course of "temperate reform," and heroically devote themselves to the cure of six measles a year, hoping that in the course of a hundred years or so all the measles will be gone. The report of the committee ought to be satisfactory to both sides, for it blends together, in a very skilful way, free-trade ethics and protection politics. Free trade gets the sentiment, but protection gets the taxes.

* * *

Conservative and tender of the tariff as it is, perhaps, the Wilson Bill goes as far on the free-trade road as any bill could go with any prospect of success; and at all events it will test the wisdom of a protective tariff. For instance, if the abolition of the tariff on wool gives the people more clothes, cheaper clothes, and better clothes, it will make more work for weavers and tailors, and temper the northern winters to the poor. In the torrid zone there can be no serious objection to a tariff on wool, but in the realms of ice and snow it lowers the temperature on an average ten degrees, and it raises the death rate more than twenty degrees. It is not very high moral statesmanship that forbids to any portion of the people the use of wool. Free wool is opposed, not so much on its own account, as from a fear that it will make other things free. It is dangerous because it may set a good example.

* * *

Why should a man, because he happens to be governor, usurp the right of "spellbinding" his defenceless people by hysterical declamation whenever he gets them at his mercy? This is becoming a burning question because "Governor's rhetoric," from the Rocky mountains to the Blue ridge, menaces the grammar and the grace of our venerable mother tongue. Mr. Charles O'Ferrall has just been sworn in as Governor of Virginia, and his "inaugural" was inflated with Governor's rhetoric to the size of the monster balloon. In a spasm of loyalty to Virginia, he said: "She has never swerved from the lighted way of the Constitution; the song of the siren has never tempted her; the tongue of the flatterer has never seduced her; the voice of the hyena has never frightened her; the menace of tyranny has never terrified her; the howlings of the wolf have never disturbed her; the threats of malice have never alarmed her. Firm and immovable she has stood through all the years that have run their cycles," and so on, in Governor's rhetoric to the end. Serene she stands, defying the whole mythological and zoölogical menagerie, sirens, hyenas, wolves, and all the rest. Considering that the old commonwealth is of the feminine gender, it was easy for her to resist "the song of the siren," but for that reason it is more to her credit that the "voice of the hyena" has never frightened her, nor the "howlings of the wolf" disturbed her. Bravely she has resisted those dangers and temptations, but greater trials are before her, and she must yet prove by greater heroism that she is able to endure for two years, and perhaps four, the oratorical gymnastics of the Governor.

* * *

The champion soporific sermon for 1893 was preached last Sunday evening by the Rev. C. E. Wilkinson of Evanston. During its delivery, Frank Wilson, a member of the congregation, fell asleep, and in spite of the tin-horn salutation to New Year's day, and many other noises, he slept continuously for sixty hours. The case is exciting some psychological and physiological curiosity, but up to the present moment, the preacher has not been arrested, nor has any warrant been sworn out against him; and this reminds n of Israel Jacobs of Marbletown, in 1855. A queer combination o names is Israel Jacobs, but I have to tell the story truthfully or not at all, and one hot Sunday he fell asleep and snored, lulle d

into oblivion by a monotonous, drowsy sermon preached by the Rev. Thomas Thompson, D. D., affectionately remembered by the old settlers of Marbletown to this day, as "Little Tommy Thompson." Under that provision of the Iowa code which punishes any person who disturbs a worshipping congregation, Mr. Jacobs was carried before old Squire Vinton, who fined him one dollar. Israel paid the money, exclaiming as he did so, "Wall, thar's the dollar, but ain't nothin' goin' to be done with Tommy Thompson?"

* * *

Although two men may have equal chances, only one of them can "get there first," and this bit of luck may depend upon an accident. Commenting yesterday on the feat of Mr. Wilkinson, who preached a man into a sleep that lasted sixty hours, I was conceited enough to think I had succeeded very well, but looking at this morning's paper, I saw, to my consternation, an article there on the same topic, expressing my own thoughts in almost my own words. The editor of that paper had "got there first," and I was compelled to change the phraseology of my own essay, in order to escape the charge of plagiarism. That we should both have used the word "soporific" was natural enough, and it was not surprising that we should have referred to Mr. Wilkinson as the champion in his line, but it is astonishing that from sheer poverty of ideas, we borrowed from our election-literature the tattered and worn out substitutes for wit, which appear under such phrases as the "latest returns," "with several counties yet to hear from," and other venerable "chestnuts" of the same kind. Showing the parallels to a counselor and friend, I was told to be original hereafter, as if "to be original" was easily within the scope of every man's ability. A few years ago, I saw in England, a rowing-match between two men, called Higgins and Elliott, and a north country man who stood near me, gave this advice to Elliott, who was a hundred yards behind, "Gang past him, lad, gang past him." It is well "to be original," and in a race with a competitor it is advisable to "gang past him," but neither feat is quite so easy as it seems to be.

M. M. TRUMBULL.

NOTES.

Count Leo Tolstoï writes to us, "*Posrednik* has the intention of reviewing and publishing, under my supervision, some of the articles which have appeared in your periodical."

BOOK NOTICES.

We have not yet noticed in the columns of *The Open Court* an important scientific work recently published by our Company, which is in every respect deserving of the attention of our readers. This work is the authorised English translation of Professor Mach's well-known *Science of Mechanics*—a book which is now in its second edition in Germany, and which has taken a pre-eminent place in the scientific and philosophical literature of the times. Words of commendation, on our part, would be superfluous; we need only refer here to the aim and character of the work, which, briefly stated, is to free the notions of science from metaphysical and historical obscurities, and to present the principles of mechanics in the form and light of their development. The book is, first, a history of mechanics and an exposition of its abstract principles, and, secondly, a critical analysis of the origin of science and of the methods by which it is built up. A more interesting and profitable method of studying the theory of knowledge is not conceivable; in fact it is contended by eminent philosophers that this is the only correct method. The book, thus, will be of great value, not only to the scientist who wishes more than a mere routine-knowledge of his subject, but also to the philosophical student and general reader. It is impossible in a short notice to enumerate all the points of excellency of the book, but mention may be made of one interesting feature. This is the reproduction of the clear and beautiful thoughts of the original inquirers, augmented by fac-simile reproductions of the illustrations of their works. This feature has a very stimulating and refreshing effect upon the mind, is a great impulse to investigation, and, as it shows us that the heroes of thought had to overcome the very same obstacles in their work which we encounter, will inspire us with additional confidence in our own intellectual powers. (Chicago: The Open Court Publishing Company. Pages, xiv, 534. Price, $2.50.)

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