THE OPEN COURT.

A WEEKLY JOURNAL

DEVOTED TO THE RELIGION OF SCIENCE.

No. 363. (VOL. VIII.—32) CHICAGO, AUGUST 9, 1894. { Two Dollars per Year. Single Copies, 5 Cents.

WHY HAS MAN TWO EYES?

A POPULAR SCIENTIFIC LECTURE.[1]

BY PROF. ERNST MACH.

Why has man two eyes?

That the pretty symmetry of his face may not be disturbed, the artist answers. That his second eye may furnish a substitute for his first if that be lost, says the far-sighted economist. That we may weep with two eyes at the sins of the world, replies the religious enthusiast.

Odd opinions! Yet if you should approach a modern scientist with this question you might consider yourself fortunate if you escaped with less than a rebuff. "Pardon me, madam, or my dear sir," he would say, with stern expression, "man fulfils no purpose in the possession of his eyes; nature is not a person, and consequently not so vulgar as to pursue purposes of any kind."

Still an unsatisfactory answer! I once knew a professor who would shut with horror the mouths of his pupils if they put to him such an unscientific question.

But ask a more tolerant person, ask me. I, I candidly confess, do not know exactly why man has two eyes, but the reason partly is, I think, that I may see you here before me to-night and talk with you upon this delightful subject.

Again you smile incredulously. Now this is one of those questions that a hundred wise men together could not answer. You have heard, so far only, five of these wise men. You will certainly want to be spared the opinions of the other ninety-five. To the first you will reply that we should look just as pretty if we were born with only one eye, like the Cyclops; to the second we should be much better off, according to his principle, if we had four or eight eyes, and that in this respect we are vastly inferior to spiders; to the third, that you are not just in the mood to weep; to the fourth, that the unqualified interdiction of the question excites rather than satisfies your curiosity; while of me you will dispose by saying that my pleasure is not as intense as I think, and certainly not great enough to justify the existence of a double eye in man since the fall of Adam.

[1] Graz, 1867. Translated by μκρκ.

But since you are not satisfied with my brief and obvious answer, you have only yourselves to blame for the consequences. You must now listen to a longer and more learned explanation, such as it is in my power to give.

As the church of science, however, debars the question "Why?" let us put the matter in a purely orthodox way: Man has two eyes, what *more* can he see with two than with one?

I will invite you to take a walk with me? We see before us a wood. What is it that makes this real wood contrast so favorably with a painted wood, no matter how perfect the painting may be? What makes the one so much more lovely than the other? Is it the vividness of the coloring, the distribution of the lights and the shadows? I think not. On the contrary, it seems to me that in this respect painting can accomplish very much.

The cunning hand of the painter can conjure up with a few strokes of his brush forms of wonderful plasticity. By the help of other means even more can be attained. Photographs of reliefs are so plastic that we often imagine we can actually lay hold of the elevations and depressions.

But one thing the painter never can give with the vividness that nature does—the difference of near and far. In the real woods you see plainly that you can lay hold of some trees, but that others are inaccessibly far. The picture of the painter is rigid. The picture of the real woods changes on the slightest movement. Now this branch is hidden behind that; now that behind this. The trees are alternately visible and invisible.

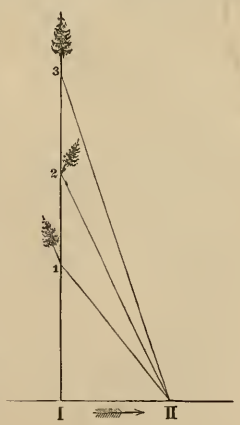
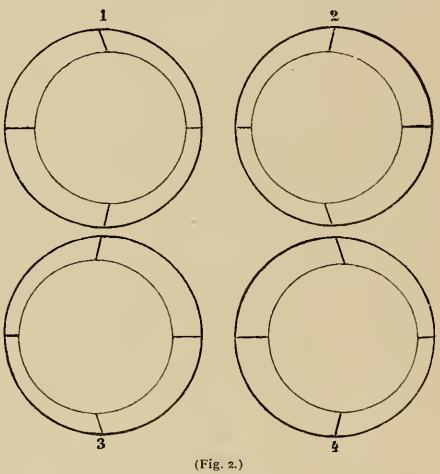


Fig. 1.

Let us look at this matter a little more closely. For convenience sake we shall remain upon the highway, I, II. (Fig. 1.) To the right and the left lies the

forest. Standing at I, we see, let us say, three trees (1, 2, 3) in a line, so that the two remote ones are covered by the nearest. Moving further along, this changes. At II we shall not have to look round so far to see the remotest tree 3 as to see the nearer tree 2, nor so far to see this as to see 1. *Hence, as we move onward, objects that are near to us seem to lag behind as compared with objects that are remote from us, the lagging increasing with the proximity of the objects.* Very remote objects, towards which we must always look in the same direction as we proceed, appear to travel along with us.

If we should see, therefore, jutting above the brow of yonder hill the tops of two trees whose distance from us we were in doubt about, we should have in our hands a very easy means of deciding the question. We should take a few steps forward, say to the right,



(Fig. 2.)

and the tree-top which receded most to the left would be the one nearer to us. In truth, from the amount of the recession a geometer could actually determine the distance of the trees from us without ever going near them. It is simply the scientific development of this perception that enables us to measure the distances of the stars.

Hence, from change of view in forward motion the distances of objects in our field of vision can be measured.

Rigorously, however, even forward motion is not necessary. For every observer is composed really of *two* observers. Man has *two* eyes. The right eye is a short step ahead of the left eye in the right-hand direction. Hence, the two eyes receive *different* pictures of the same woods. The right eye will see the near trees displaced to the left, and the left eye will see them displaced to the right, the displacement being greater, the greater the proximity. This difference is sufficient for forming ideas of distance.

We may now readily convince ourselves of the following facts:

1. With one eye, the other being shut, you have a very uncertain judgment of distances. You will find it, for example, no easy task, with one eye shut, to thrust a stick through a ring hung up before you; you will miss the ring in almost every instance.

2. You see the same object differently with the right eye from what you do with the left.

Place a lamp-shade on the table in front of you with its broad opening turned downwards, and look at it from above. (Fig. 2.) You will see with your right eye the image 2, with your left eye the image 1. Again, place the shade with its wide opening turned upwards; you will receive with your right eye the image 4, with your left eye the image 3. Euclid mentions phenomena of this character.

3. Finally, you know that it is easy to judge of distances with both eyes. Accordingly your judgment must spring in some way from a co-operation of the two eyes. In the preceding example the openings in the different images received by the two eyes seem displaced with respect to one another, and this displacement is sufficient for the inference that the one opening is nearer than the other.

I have no doubt that you, ladies, have frequently received delicate compliments upon your eyes, but I feel sure that no one has ever told you, and I know not whether it will flatter you, that you have in your eyes, be they blue or black, little geometricians. You say you know nothing of them? Well, for that matter, neither do I. But the facts are as I tell you.

You understand little of geometry? I shall accept that confession. Yet with the help of your two eyes you judge of distances? Surely that is a geometrical problem. And what is more, you know the solution of this problem: for you estimate distances correctly. If, then, *you* do not solve the problem, the little geometricians in your eyes must do it clandestinely and whisper the solution to you. I doubt not they are fleet little fellows.

What amazes me most here is, that you know nothing about these little geometricians. But perhaps they also know nothing about you. Perhaps they are models of punctuality, routine clerks who bother about nothing but their fixed work. In that case we may be able to deceive the gentlemen.

If we present to our right eye an image which looks exactly like the lamp-shade for the right eye, and to our left eye an image which looks exactly like a lamp-shade for the left eye, we shall imagine that we see the whole lamp-shade bodily before us.

You know the experiment. If you are practised in

squinting, you can perform it directly with the figure, looking with your right eye at the right image, and with your left eye at the left image. In this way the experiment was first performed by Elliott. Improved and perfected, its form is Wheatstone's stereoscope, made so popular and useful by Brewster.

By taking two photographs of the same object from two different points, corresponding to the two eyes, a very clear three-dimensional picture of distant places or buildings can be produced by the stereoscope.

But the stereoscope accomplishes still more than this. It can visualise things for us which we never see with equal clearness in real objects. You know that if you move much while your photograph is being taken, your picture will come out like that of a Hindu deity, with several heads or several arms, which, at the spaces where they overlap, show forth with equal distinctness, so that we seem to see the one picture *through* the other. If a person moves quickly away from the camera before the impression is completed, the objects behind him will also be imprinted upon the photograph; the person will look transparent. Photographic ghosts are made in this way.

Some very useful applications may be made of this discovery. For example, if we photograph a machine stereoscopically, successively removing during the operation the single parts (where of course the impression suffers interruptions), we obtain a transparent view, endowed with all the marks of spatial solidity, in which is distinctly visualised the interaction of parts normally concealed.[1]

You see, photography is making stupendous advances, and there is great danger that in time some malicious artist will photograph his innocent patrons with internal views of their most secret thoughts and emotions. How tranquil politics will then be! What rich harvests our detective force will reap!

* * *

By the joint action of the two eyes, therefore, we arrive at our judgments of distances, as also of the forms of bodies.

Permit me to mention here a few additional facts connected with this subject, which will assist us in the comprehension of certain phenomena in the history of civilisation.

You have often heard, and know from personal experience, that remote objects appear perspectively dwarfed. In fact, it is easy to satisfy yourself that you can cover the image of a man a few feet away from you simply by holding up your finger a short distance in front of your eye. Still, as a general rule, you do not notice this shrinkage of objects. On the contrary, you imagine you see a man at the end of a large hall, as large as you see him near by you. For your eye, in its measurement of the distances, makes remote objects correspondingly larger. The eye, so to speak, is aware of this perspective contraction and is not deceived by it, although its possessor is unconscious of the fact. All persons who have attempted to draw from nature have vividly felt the difficulty which this superior dexterity of the eye causes the perspective conception. Not until one's judgment of distances is made uncertain, by their size, or from lack of points of reference, or from being too quickly changed, is the perspective rendered very prominent.

On sweeping round a curve on a rapidly moving railway train, where a wide prospect is suddenly opened up, the men upon distant hills appear like dolls.[1] You have at the moment, here, no known references for the measurement of distances. The stones at the entrance of a tunnel grow visibly larger as we ride towards it; they shrink visibly in size as we ride from it.

Usually both eyes work together. As certain views are frequently repeated, and lead always to substantially the same judgments of distances, the eyes in time must acquire a special skill in geometrical constructions. In the end, undoubtedly, this skill is so increased that a single eye alone is often tempted to exercise that office.

Permit me to elucidate this point by an example. Is any sight more familiar to you than that of a vista down a long street? Who has not looked with hopeful eyes time and again into a street and measured its depth. I will take you now into an art-gallery where I will suppose you to see a picture representing a vista into a street. The artist has not spared his rulers to get his perspective perfect. The geometrician in your left eye thinks, "Ah ha! I have computed that case a hundred times or more. I know it by heart. It is a vista into a street," he continues; "where the houses are lower is the remote end." The geometrician in the right eye, too much at his ease to question his possibly peevish comrade in the matter, answers the same. But the sense of duty of these punctual little fellows is at once rearoused. They set to work at their calculations and immediately find that all the points of the picture are equally distant from them, that is, lie all upon a plane surface.

What opinion will you now accept, the first or the second? If you accept the first you will see distinctly the vista. If you accept the second you will see nothing but a painted sheet of distorted images.

It seems to you a trifling matter to look at a pic-

1 I have employed this method for obtaining transparent stereoscopic views of anatomical structures.

1 This effect is particularly noticed in the size of men on high chimneys and church-steeples—"steeple Jacks." When the cables were slung from the towers of the Brooklyn bridge (277 feet high), the men sent out in baskets to paint them, appeared, against the broad background of heaven and water, like flies.—*Trans.*

ture and understand its perspective. Yet centuries elapsed before humanity came fully to appreciate this trifle, and even the majority of you first learned it from education.

I can remember very distinctly that at three years of age all perspective drawings appeared to me as gross caricatures of objects. I could not understand why artists made tables so broad at one end and so narrow at the other. Real tables seemed to me just as broad at one end as at the other, because my eye made and interpreted its calculations without my intervention. But that the picture of the table on the plane surface was not to be conceived as a plane painted surface but stood for a table and so was to be imaged with all the attributes of extension was a joke that I did not understand. But I have the consolation that whole nations have not understood it.

Ingenuous people there are who take the mock murders of the stage for real murders, the dissembled actions of the players for real actions, and who can scarcely restrain themselves, when the characters of the play are sorely pressed, from running in deep indignation to their assistance. Others, again, can never forget that the beautiful landscapes of the stage are painted, that Richard III. is only the actor, Mr. Booth, whom they have met time and again at the clubs.

Both points of view are equally mistaken. To look at a drama or a picture properly one must understand that both are *shows*, simply *denoting* something real. A certain preponderance of the intellectual life over the sensuous life is requisite for such an achievement, where the intellectual elements are safe from destruction by the direct sensuous impressions. A certain liberty in choosing one's point of view is necessary, a sort of humor, I might say, which is strongly wanting in children and in childlike peoples.

Let us look at a few historical facts. I shall not take you as far back as the stone age, although we possess sketches from this epoch which show very original ideas of perspective. But let us begin our sightseeing in the tombs and ruined temples of ancient Egypt, where the numberless reliefs and gorgeous colorings have defied the ravages of thousands of years.

A rich and motley life is here opened to us. We find the Egyptians represented in all conditions of life. What at once strikes our attention in these pictures is the delicacy of their technical execution. The contours are extremely exact and distinct. But on the other hand only a few bright colors are found, unblended and without trace of transition. Shadows are totally wanting. The paint is laid on the surfaces in equal thicknesses.

Shocking for the modern eye is the perspective. All the figures are equally large, with the exception of the king, whose form is unduly exaggerated. Near and far appear equally large. Perspective contraction is nowhere employed. A pond with water-fowl is represented flat, as if its surface were vertical.

Human figures are portrayed as they are never seen, the legs from the side, the face in profile. The breast lies in its full breadth across the plane of representation. The heads of cattle appear in profile, while the horns lie in the plane of the drawing. The principle which the Egyptians followed might be best expressed by saying that their figures are pressed in the plane of the drawing as plants are pressed in a herbarium.

The matter is simply explained. If the Egyptians were accustomed to looking at things ingenuously with both eyes at once, the construction of perspective pictures in space could not be familiar to them. They saw all arms, all legs on real men in their natural lengths. The figures pressed into the planes resembled more closely, of course, in their eyes the originals than perspective pictures could.

This will be better understood if we reflect that painting was developed from relief. The minor dissimilarities between the pressed figures and the originals must gradually have compelled men to the adoption of perspective drawing. But physiologically the painting of the Egyptions is just as much justified as the drawings of our children are.

A slight advance beyond the Egyptians is shown by the Assyrians. The reliefs rescued from the ruined mounds of Nimrod at Mossul are, upon the whole, similar to the Egyptian reliefs. They were made known to us principally by Layard.

Painting enters on a new phase among the Chinese. This people have a marked feeling for perspective and correct shading, yet without being very logical in the application of their principles. Here, too, it seems, they took the first step but did not go far. In harmony with this immobility is their constitution, in which the muzzle and the bamboo-rod play significant functions. In accord with it, too, is their language, which like the language of children has not yet developed into a grammar, or, rather, according to the modern conception, has not yet degenerated into a grammar. It is the same also with their music which is satisfied with the five-toned scale.

The mural paintings at Herculaneum and Pompeii are distinguished by grace of representation, as also by a pronounced sense for perspective and correct illumination, yet they are not at all scrupulous in construction. Here still we find abbreviations avoided. But to offset this defect, the members of the body are brought into unnatural positions, in which they appear in their full lengths. Abridgements are more frequently observed in clothed than in unclothed figures.

A satisfactory explanation of these phenomena first

occurred to me on the making of a few simple experiments which show how differently one may see the same object, after some mastery of one's senses has been attained, simply by the arbitrary movement of the attention.


Fig. 3.

Look at the annexed drawing (Fig. 3). It represents a folded sheet of paper with either its depressed or its elevated side turned towards you, as you wish. You can conceive the drawing in either sense, and in either case it will appear to you differently.

If, now, you have a real folded sheet of paper on the table before you, with its sharp edges turned towards you, you can, on looking at it with one eye, see the sheet alternately elevated, as it really is, or depressed. Here, however, a remarkable phenomenon is presented. When you see the sheet properly, neither illumination nor form presents anything conspicuous. When you see it bent back you see it perspectively distorted. Light and shadow appear much brighter or darker, or as if overlaid thickly with bright colors. Light and shadow now appear devoid of all cause. They no longer harmonise with the body's form, and are thus rendered much more prominent.

In common life we employ the perspective and illumination of objects to determine their forms and position. Hence we do not notice the lights, the shadows, and the distortions. They first powerfully enter consciousness when we employ a different construction from the usual spatial one. In looking at the planar image of a camera obscura we are amazed at the plenitude of the light and the profundity of the shadows, both of which we do not notice in real objects.

In my earliest youth the shadows and lights on pictures appeared to me as spots void of meaning. When I began to draw I regarded shading as a mere custom of artists. I once drew the portrait of our pastor, a friend of the family, and shaded, from no necessity, but simply from having seen something similar in other pictures, the whole half of his face black. I was subjected for this to a severe criticism on the part of my mother, and my deeply offended artist's pride is probably the reason that these facts remained so strongly impressed upon my memory.

You see, then, that many strange things, not only in the life of individuals, but also in that of humanity, and in the history of general civilisation, may be explained from the simple fact that man has two eyes.

Change man's eye and you change his conception of the world. We have observed the truth of this fact among our nearest kin, the Egyptians, the Chinese, and the lake-dwellers; how must it be among some of our remoter relatives,—with monkeys and other animals? Nature must appear totally different to animals equipped with substantially different eyes from those of men, as, for example, to insects. But for the present science must forego the pleasure of portraying this appearance, as we know very little as yet of the mode of operation of these organs.

It is an enigma even how nature appears to animals closely related to man; as to birds, who see scarcely anything with two eyes at once, but since their eyes are placed on opposite sides of their heads, have a separate field of vision for each.[1]

The soul of man is pent up in the prison-house of his head; it looks at nature through its two windows, the eyes. It would also fain know how nature looks through other windows. A desire apparently never to be fulfilled. But our love for nature is inventive, and here, too, much has been accomplished.

Placing before me an angular mirror, consisting of two plane mirrors slightly inclined to each other, I see my face twice reflected. In the right hand mirror I obtain a view of the right side, and in the left-hand mirror a view of the left side, of my face. Also I shall see the face of a person standing in front of me, more to the right with my right eye, more to the left with my left. But in order to obtain such widely different views of a face as those shown in the angular mirror, my two eyes would have to be set much further apart from each other than they actually are.

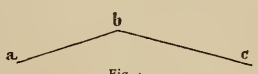


Fig. 4.

Squinting with my right eye at the image in the right hand mirror, with my left eye at the image in the left-hand mirror, my vision will be the vision of a giant having an enormous head with his two eyes set far apart. This, also, is the impression which my own face makes upon me. I see it now, single and solid. Fixing my gaze, the relief from second to second is magnified, the eyebrows start forth prominently from above the eyes, the nose seems to grow a foot in length, my mustache shoots forth like a fountain from my lip, the teeth seem to retreat immeasurably. But by far the most horrible aspect of the phenomenon is the nose.

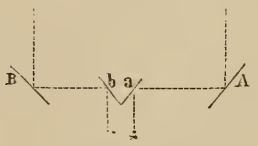


Fig. 5.

Interesting in this connexion is the telestereoscope of Helmholtz. In the telestereoscope we view a landscape by looking with our right eye (Fig. 5) through the mirror *a* into the mirror *A*, and with our left eye through the mirror *b* into the mirror *B*. The mirrors *A* and *B* stand far apart. Again we see with the widely separated eyes of a giant. Everything appears

[1] See Joh. Müller, *Vergleichende Physiologie des Gesichtssinnes*, Leipsic, 1826.

dwarfed and near us. The distant mountains look like moss-covered stones at our feet. Between, you see the reduced model of a city, a veritable Liliput. You are tempted almost to stroke with your hand the soft forest and city, did you not fear that you might prick your fingers on the sharp, needle-shaped steeples, or that they might crackle and break off.

Liliput is no fable. We need only Swift's eyes, the telestereoscope, to see it.

Picture to yourself the reverse case. Let us suppose ourselves so small that we could take long walks in a forest of moss, and that our eyes were correspondingly near each other. The moss-fibres would appear like trees. On them we should see strange, unshapely monsters creeping about. Branches of the oak-tree, at whose base our moss-forest lay, would seem to us dark, immovable, myriad-branched clouds, painted high on the vault of heaven; just as the inhabitants of Saturn, forsooth, might see their enormous ring. On the tree-trunks of our mossy woodland we should find colossal globes several feet in diameter, brilliantly transparent, swayed by the winds with slow, peculiar motions. We should approach inquisitively and should find that these globes, in which here and there animals were gaily sporting, were liquid globes, in fact that they were water. A short, incautious step, the slightest contact, and woe betide us, our arm is drawn by an invisible power irresistibly into the interior of the sphere and held there unrelentingly fast! A drop of dew has engulfed in its capillary maw a manikin, in revenge for the thousands of drops that its big human counterparts have quaffed at breakfast. Thou shouldst have known, thou pygmy natural scientist, that with thy present puny bulk thou shouldst not joke with capillarity.

My terror at the accident brings me back to my senses. I see I have turned idyllic. You must pardon me. A patch of greensward, a moss or heather forest with its tiny inhabitants have incomparably more charms for me than many a bit of literature with its apotheosis of human character. If I had the gift of writing novels I should certainly not make John and Mary my characters. Nor should I transfer my loving pair to the Nile, nor to the age of the old Egyptian Pharoahs, although perhaps I should choose this time in preference to the present. For I must candidly confess that I hate the rubbish of history, interesting though it may be as a mere phenomenon, because we cannot simply observe it but must also *feel* it, because it comes to us mostly with supercilious arrogance, mostly unvanquished. The hero of my novel would be a cockchafer, venturing forth in his fifth year for the first time with his newly grown wings into the light, free air. Truly it could do no harm if man would thus throw off his inherited and acquired narrowness of mind by making himself acquainted with the world-view of allied creatures. He could not help gaining incomparably more in this way than the inhabitant of a small town would in circumnavigating the globe and getting acquainted with the views of strange peoples.

* * *

I have now conducted you, by many paths and by-ways, rapidly over hedge and ditch, to show you what wide vistas we may reach in every field by the rigorous pursuit of a single scientific fact. A close examination of the two eyes of man has conducted us not only into the dim recesses of humanity's childhood, but has also carried us far beyond the bourne of human life.

It has surely often struck you as strange that the sciences are divided into two great groups; that the so-called humanistic sciences, belonging to the so-called "higher education," are placed in almost a hostile attitude to the natural sciences.

I must confess I do not overmuch believe in this partition of the sciences. I believe that this view will appear as childlike and ingenuous to a matured age as the want of perspective in the old paintings of Egypt do to us. Can it really be that "higher culture" is only to be obtained from a few old pots and palimpsests, which are at best mere scraps of nature, or that more is to be learned from them alone than from all the rest of nature? I believe that both these sciences are simply parts of the same science, which have begun at different ends. If these two ends still act towards each other as the Montagues and Capulets, if their retainers still indulge in lively tilts, I believe that after all they are not in earnest. On the one side there is surely a Romeo, and on the other a Juliet, who, some day, it is hoped, will unite the two houses with a less tragic sequel than that of the play.

Philology began with the unqualified reverence and apotheosis of the Greeks. Now it has begun to draw other languages, other peoples and their histories, into its sphere; it has, through the mediation of comparative linguistics, already struck up, though as yet somewhat cautiously, a friendship with physiology.

Physical science began in the witch's kitchen. It now embraces the organic and inorganic worlds, and with the physiology of articulation and the theory of the senses, has even pushed its researches, at times impertinently, into the province of mental phenomena.

In short, we come to the understanding of much within us solely by directing our glance without, and *vice versa*. Every object belongs to both sciences. You, ladies, are very interesting and difficult problems for the psychologist, but you are also extremely pretty phenomena of nature. Church and State are objects of the historian's research, but not less phenomena of nature, and in part, indeed, very curious phenomena.

If the historical sciences have inaugurated wide extensions of view by presenting to us the thoughts of new and strange peoples, the physical sciences in a certain sense do this in a still greater degree. In making man disappear in the All, in annihilating him, so to speak, they force him to take an unprejudiced position without himself, and to form his judgments by a different standard than that of the petty human.

But if you should now ask me why man has two eyes, I should answer:

That he may look at nature rightly and accurately; that he may come to understand that he himself, with all his views, correct and incorrect, with all his *haute politique*, is simply an evanescent shred of nature; that, to speak with Mephistopheles, he is a part of the part, and that it is absolutely unjustified,

> "For man, the microcosmic fool, to see
> Himself a whole so frequently."

CORRESPONDENCE.

UNIVERSAL RELIGION.

To the Editor of The Open Court:

In your editorial remarks upon my plea for pure unsectarianism, kindly published in the issue for July 26th, you make the powerful declaration that

> "There is but one catholic or universal religion: the religion of truth, which not only allows, but demands, a free investigation of its tenets, rejecting any and all personal authority, and accepting that which according to the strictest methods of science can be proved to be true, There is but one institution on earth which is truly catholic in principle: it is science, and we shall have no catholic religion until we have a religion of science."

But what *Christian* church from the Roman Catholic to the Unitarian can claim to have "broadened into a church universal"? Does not the very name *Christian* indicate that the Christian confession of the *lordship of Jesus* constitutes the ultimate authority to which appeal must be made? To be sure, Christianity, like all the other ethnic faiths, contains a *universal* element and a *special* element. But it is the latter and not the former that gives it its name and character. Christianity is a religion in virtue of its universal element, it is the *Christian* religion by reason of its special *distinctive* claim, namely that Jesus is the Christ, the Lord and Master of mankind. Here then we have the very antithesis of the method of science in determining truth, for Christianity makes the authority not of reason, but of the spiritual Lord, the Christ, ultimate and supreme.

If then a church retains its Christian name and connexions while it professes to stand for "scientifically provable truth as the *highest* authority," it simply occupies a contradictory position in the eyes of the world. It does no good to *talk* free trade if one *votes* protection. Our ideas should not be compromised by our practical connexions. This is what *consistency* demands and it was with a view to occupying such a *consistently un*sectarian position that the Tacoma Unitarian Church *changed its name* and *surrendered its Christian connexions* when it once decided to stand for universal and unsectarian, free religion. Not "numbers" nor "the name" nor even the "spirit" makes a religion unsectarian but the *quality of its principle*, its aim to work for *universal and not sectarian* ends. The little Tacoma Free Church is therefore not a sect at all, while Christianity with its millions is distinctly sectarian. When the churches of the ethnic religions *thoroughly* believe in brotherhood they will no longer wish to retain sectarian, excluding names, but give them up for the sake of love. The *special* element in all religions is their transient element, yet also the element which makes them *what they are* as distinguished from one another. The universal in them all is permanent. This we must cherish and it can be discovered by the scientific method, the only method whereby truth can be successfully obtained. ALFRED W. MARTIN.

[Mr. Alfred W. Martin pleads again for a universal religion not tainted by the sectarian dogmas of traditional Christianity, and from this standpoint rejects the name "Christian." Mr. Martin is right in rejecting the name Christian for himself and the members of his congregation who think like him. For him it would be wrong to call himself a Christian so long as he understands by Christianity the blind acceptance of the doctrines which Jesus Christ, according to the belief of the Christian churches, is supposed to have taught. So far we agree with Mr. Martin, and at the same time we heartily support his demand for discussing the basic principle of our convictions, which alone can give character to our religion. But we object to his request for others to drop the names "Unitarian" or "Christian" because to *him* it has ceased to be appropriate. There are people, and I have met many of them, to whom the word Christian does not mean what it means to Mr. Martin, and it appears to me that these people have a right to call themselves Christians and to define their understanding of Christianity as they think fit.

In my childhood I was taught that Christianity was the doctrine of Christ, and the doctrine of Christ that body of truths and ethical injunctions which is taught by the Church; it had been corrupted by the pagan influence of the Romish clergy, but Luther and other reformers had restored it to its primitive purity. Only he who accepts the Christianity thus warranted by appointed authority to be genuine, had a proper right to call himself a Christian; others had no right to adopt the name. This seemed to me very plausible, and as I could not accept the Christianity of any of the churches, I saw fit to drop the name and to denounce Christianity as a superstition that was to be discarded.

In the meantime I met many people who rejected the dogmas of the churches not less vigorously than myself, yet continued to call themselves Christians; and, saying that a Christian could only be one who held a view patented by at least one of the Christian churches, I attempted to convince them of their inconsistency and to prove to them that, even granting their sincerity, their position would be misunderstood. But by and by, in my attempts to convince liberal Christians of the impropriety of their calling themselves Christians, I came to the conclusion that they had as much right to interpret the name as any church, pope, or synod.

The question has often been raised, who is a Christian, and it has been answered in many different ways. One theologian says he who believes in the œcumenical symbols, especially the Apostle's creed. That sounds logical enough, but how few are the Christians of to-day who believe it still? Another one says, he who believes that Jesus Christ died on the cross for our sins and rose again from the dead. A third says, he who is an exemplification of Christian ethics, who loves his fellow-beings as himself and leads a life of righteousness. This last test of Christianity has found a strong supporter in Lessing, who with unanswerable criticism and rigorously logical acumen proves to his dogmatical antagonists that Christianity existed long before the creeds and even the gospels, and that no written document can be regarded as more than a special conception and interpretation of Christianity as held by its author and by those who adopt his views.

Lessing's Christianity, which he expounded so admirably in his grand religio-philosophical drama, "Nathan the Wise," cannot be accused of sectarianism; it is as broad as the universe and as catholic as truth, and when the Christian finds a Jew whose actions are what he is accustomed to call Christian, he exclaims: "Nathan, you are a Christian!" Whereupon Nathan replies: "That which makes me to you a Christian, makes you to me a Jew."

Mr. Martin must not say that Lessing "occupies a contradictory position" in the eyes of the world. Lessing considers "the universal element" as essential in Christianity, while Mr. Martin declares that "its special element gives it its name and character." There is a difference of definition, and what definition will in the long run be adopted by "the world" is not for us to say. The world may after all retain the name Christian and fill, as has been done over and over again, its old bottles with new wine.

Christianity and Judaism are so near to us that it is difficult to be impartial, especially if we have just succeeded in emancipating ourselves from the egg-shells of dogmatism. We may be fairer to other religions, the superstitions of which are not so strongly brought home to us.

It is now a year ago since I met the venerable representatives of several Buddhistic sects at the Parliament of Religions in Chicago, and I was astonished both at their earnest desire to preach to the Americans the good law of Buddha and at their broadness in standing solely upon scientifically provable truth. They revered Buddha as their teacher and worshipped him as the incarnation of the moral law of the world. They praised him as their saviour because by his pure example and impressive teaching he had shown them the way of salvation. He had explained that egotism was a disease and hatred a malicious fever, that love embracing all life with benevolence and goodwill was the healthy state of mind, and that the peace of Nirvâna is attainable here upon earth by all who would obey his noble exhortations. Now, it is an indubitable fact that the great mass of Buddhists are much more superstitious than the worst Roman Catholic saint-worshippers. But shall we on that account forbid those few Buddhists whose views are purified and elevated to call themselves Buddhists? It appears to me that they are at liberty to call themselves whatever they think best.

Buddhists recognise the lordship of Gautama Siddhârtha and call themselves after his title of honor without thereby renouncing the universality of truth or suppressing the duty of rational inquiry. Thus a follower of Kant may call himself a Kantian because he recognises in Kant his teacher who taught him the truth, but not because the *ipse dixit* of his master supersedes demonstrated truth itself.

Now my position is that we should be very crucial in stating the principles and the substance of our convictions, but that we should leave people unbounded liberty in retaining or rejecting names. The truth is one, but the names which the disciples of truth may choose to be known by are many.

It appears to us that the Liberal Religious Congress could not expect its members to cut themselves off from their connexions, fellowship, and historical traditions, but it should have proclaimed in a pithy and unmistakable way the principle of the views they hold in common and their conception of religious truth. And this, it seems to us, was the purport and esoteric meaning of Mr. Martin's proposition, which should have received more consideration and ample time for discussion.—ED.]

BOOK NOTICES.

Mr. Horace P. Biddle, of Logansport, Indiana, sends us two works entitled *The Musical Scale* and *Prose Miscellany*, together with several pamphlets on the subject of harmony. In these books Mr. Biddle impugns the theory of harmony generally accepted in the scientific world (see, for example, the lecture of Professor Mach published in No. 358). Mr. Biddle denies that every musical note contains certain of its harmonics; if this theory were true, he says, the harmonics of every concord would produce a mass of discord: results which he claims to prove by simple and easily repeated experiments. Curious readers of these subjects, who are disposed to examine all views with impartiality, must be referred for the full exposition of the theory to Mr. Biddle's own works, which are easily accessible.

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