

# Einstein's Real Universe

*Mathematics*

BEVERLY L. CLARKE, in *The Romance of Reality* (Macmillan):

What was Einstein after, anyway? What did he mean when he said that Relativity describes the "real" world, and that our previously held ideas had to do with things which were "unreal"? What does he mean by the term "real"?

Consider, with Einstein, a straight line drawn on a sheet of paper. Is it "real"? Einstein says no, because it is possible to crumple up the sheet of paper so that the line now exhibits many curves and bends and kinks; it is no longer a straight line. The same thing will clearly be true if we start with a curved line, or with any sort of line whatever. If the space through which the line is drawn happens to be "crumpled up" for some observer, this observer will see the line altogether differently from the one who drew it in his uncrumpled space.

This is a rather disturbing thing to learn. For all the material objects in the universe—as we see them—are bounded by curved or straight lines. But, according to Einstein, such objects have no reality! Are we living in a dream-world after all?

It will be easy to show, however, to our own satisfaction that Einstein's reasoning has sense to it. There is before me as I write a long table. If one should ask me the shape of this table, I should ordinarily reply without hesitation that its top is rectangular. But have I any right to say this? From where I am sitting I see the top of the table from a slanting position; an angle at one of the corners is nearest my eye and I am compelled to admit that, from where I am sitting, that corner is much the largest portion of the table, and the top looks far more like a figure with different angles at every corner than a rectangle with four right angles. If my eye were immediately over the center of the table it would indeed appear rectangular. But what right have I to consider that this observation post is any more justified by "reality" than the one in which I am now sitting?

The Theory of Relativity says I have no justification at all. It says that one observation post is no more correct than another. From this we are bound to conclude that the shape of the table top is no more rectangular than it is trapezoidal. In fact

we are compelled to admit that, from Einstein's point of view, the table top has no "reality"; that is, no shape.

What then is "real"? According to Einstein nothing is real except what appears the same to every possible observer, wherever and however situated in space and in time. Plainly our table top looks different from every place we view it; it is therefore unreal, as far as shape goes.

Coming back to our illustration of the line on the sheet of paper, which we said was not "real", let us draw several other lines on the same sheet, in such directions that the lines cross each other. Now if we try crumpling up the paper we find that while we can alter the distances between the points where the lines cross, no amount of crumpling can change the order in which the intersections occur. If when the sheet was flat we numbered the crossing points 1, 2, 3, etc., we find that the order is never changed by crumpling the paper. The order never becomes 2-1-3-4, or anything other than 1-2-3-4 as it was in the beginning.

This is equivalent to saying that no matter from what point we view the intersecting lines, although the shapes of the lines and the distances between the intersections may change, the ordering of the intersections is always the same.

Here at last we have something that even Einstein will admit to be "real"—not the lines nor even the places where they cross—but the ordering of the crossings.

Now in four-dimensional space-time, crossings of lines represent events or happenings. So, carrying this illustration from the two-dimensional sheet of paper over to the space-time continuum, we reach the conclusion that the order in which things occur in space-time is real, and that nothing else is.

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FRANCIS BACON, in *Wisdom of the Ancients* (1619):

The Life of Man is much behold- ing to the use of the Mechanical Arts, seeing many things (conducing to the Ornament of Religion, to the Grace of Civil Discipline, and to the beautifying of all Human Kind) are extracted out of their Treasuries.

ARTHUR H. COMPTON says:

And so we now have proton, electron and photon—these three units—out of which are made all things.

# Honest Anti-Vivisectionists

*Abnormal Psychology*

J. B. S. HALDANE in *Possible Worlds* (Harpers):

There are a few honest anti-vivisectionists. They are, of course, vegetarians; for the painless killing of animals for physiology is no more reprehensible than their killing for meat. They wear canvas shoes, cotton or woolen gloves, and artificial pearls, if any. They refuse to sit on leather-covered chairs, or to wear horn-rimmed spectacles. They do not spray their roses, nor employ Keating's (insect) powder even under the gravest provocation. I have not met any of them, but I am quite prepared to believe that they exist. No one who does not come up to this rather exacting standard can logically demand the total abolition of vivisection. But logic is not the strongest point of the enemies of science.

*Science News-Letter, June 9, 1928*

# Ideas Have Pedigrees

*General Science*

T. L. W. BISCHOFF in *Beweis der von der Begattung unabhängigen periodischen Reifung und Loslösung der Eier* (Translated by Carl Hartman):

It is well-known that in the field of reproduction one can think of scarcely a line of investigation which is not already represented in the form of speculation and theory. Indeed, every conceivable method must be tried in a matter of such importance. Hence, it is but natural that here and there are found suggestions which point more or less directly to natural laws, later established by observation and experiment. It has thus often happened that thinking minds, led by ideas and analysis, have given expression to truths which received the final proof and gained final recognition only after a great lapse of time. An important and comprehensive discovery has almost never seen the light of day suddenly; generally the elements of the discovery are contributed from various directions, making the unfolding of the truth possible. It is, therefore, clear that all of the numberless investigations and experiences which have been made and gathered in the field of reproduction must be regarded as precursors to discoveries which have furnished the final insight into the matter.

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An attempt to plant scallops on a commercial scale, as oysters are planted, is to be made in North Carolina.