Many Dimensions

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In connection with the subject of higher space there is a remark which is sometimes made, a question which is put--"If there are four dimensions, then there may be five and six, and so on up to any number?"

This question is one, I own, which it would never have occurred to me to ask. Still it often happens that a line of thought which is most foreign and unattractive does repay investigation. And so let us follow the ready algebraist, to whom it is as easy to write down five as four, and n as five. Let us see what it is reasonable to think on the subject.

If we take four-dimensional shapes and examine them, we find that there is in them a peculiarity of the same kind which led us to be sure of the reality of a four-dimensional existence from the inspection of these dimensional shapes. In four dimensions we can have two figures which are precisely similar in all their parts, and which yet will not move so that one shall occupy the place of the other.

And the same observation can be made with regard to five-dimensional figures.

Hence it would seem that there is an indication of a higher and higher reality. And if we suppose that the same fact of absolute similarity, without the possibility of superposition, were found again and a gain, then we should be compelled to recognize the existence of higher and still higher space, and we should have to admit the existence of an indefinite number of dimensions.

But let us turn away from this direct inquiry. Let us ask what the phrase an infinite number of dimensions" denotes.

The question reminds me so forcibly of an Eastern story that I must digress fur a moment.

For it is said that once, in the cool of the morning, beneath the spreading branches of a great palm the master stood. And round him were gathered three or four with whom he spent the hours of his quiet life.

And not for long had they gathered together.

One was a warrior, and long ago he had come to the master, asking him what he should do, and had received for answer--"Go back and serve your commander. The day will come when you will have fulfilled your life, and the voice within you will speak clearly."

And the soldier had returned to the life of camps and marches and combats, till at length, at the close of a hard-fought day, he threw down his weapons, and passing through the enemy's land, came to where the master taught.

And his comrades, seeking long for their leader, at last buried with honor a corpse unrecognizable for wounds.

He now sat on a bare stone listening. Beside him stood a younger man. He had been a merchant, travelling over the whole earth in search of gain, and in restlessness of curiosity. And when in wonder he had begged the master what he should do, he had been told--"Wander over the earth, and visit every part; when thy eagerness for change is satisfied, an inward voice will lead thee."

And he had travelled far, till, even, in the course of his wanderings, he had come to the most distant lands, and gained great riches by what he bought and sold.

But when his stores were full, and his possessions had increased beyond his dreams, he left them all, and, seeking that hillside, lived obediently to the master's words.

Half lying upon the ground was one whose countenance hardly bespoke him--fitting companion for the others. And, indeed, he had been that one, whose life had afforded the master the most interest of all of them.

For he had not, like the others, been immersed in an active and adventurous life, but had been a slave to the wants of his own body. And seeing amidst his vices that the master had words for others, he had besought him to tell him too what to do.

And the master had told him first one thing and then another, but always he fell back, unable to withdraw himself, even for a short while, from his bodily cravings, hut, gratifying them with drink and Sloth, he passed his days in brutishness.

Then at length the master, hailing him as a friend, had said to him--I will not seek to withdraw you any longer, for is not your body like the rain-clouds, and the sky a part of the changing show that hangs before our faces? Gaze, therefore, earnestly on your body, attend to it the more intently, for this is your vocation; and when you see the flimsy veil it is, come to me.

And this man had sat for ten years contemplating the middle portion of his body, till his frame had grown so cramped that he could not rise. At last he had bidden his fellows carry him to the master; and now he too listened to the words that fell on welcome ears.

And many days they had spoken together, and retiring each to his hut of reeds at nightfall, had pondered over the master's words. And on each of them had come a change.

Into the soldier's face, hard and stern set, had come the dawn of gentleness. The quick, observant gaze of the traveller now at times changed almost into such an expression as one would wear who looks at the wide fields that lie above the countries of the earth. And

in the dull, inexpressive countenance of him who had sat absorbed in the contemplation of his body, had come the kindling light of intelligence.

And on this day the master opened his lips, and began to instruct them about the universe.

He told them much that made them wonder. He told them of the mysterious currents of life that passed away from the bodies and frames which they could see, and that, spreading into the minutest particles of the earth, collected again, and eddying back through seed and leaf and fruit, participated anew with the soul, which also in its turn had gone through many vicissitudes, in that mingling ground of various principles which we call a human life.

And seeing their wonder and interest, and feeling that they were desirous to know, and since, moreover, he saw no harm in gratifying their wish, he began to explain to them the deepest facts of their physical being. And talking of the universe, which contained all that they saw and knew, from the beneficent stars to the humblest blade of grass, he said--"The world rests upon an elephant." And then he paused.

The warrior did not speak. He who had been absorbed in the contemplation of his body did not open his lips--or if he had it would not have mattered; for with the instinctive and right attitude of the half-cultured mind to the proximate object which is the last to come before its intelligence, he would have said if he had spoken, "worship the elephant;" and the master would have greeted this remark with a kindly smile, and proceeded with his discourse.

But just as he was about to take up the thread of his speech, there came from the traveller, who had been listening eagerly, a hurried question.

For, alas, in his wanderings, this one had traversed the greater part of the globe, and in the course of them had come to the West, where even at this early period a habit of mind reigned, very unlike that which characterized the calm, deep, contemplative souls of the East.

Moved by this restless and questioning spirit, he cried out--"And on what does the elephant rest?"

"Upon a tortoise," the holy man replied. And had he not been beyond all human passions, his tone would have been one of mockery.

He taught them no more. Why should he tell them of these things? Was it not better rather to dwell in the daily perfectionment of brotherly love, and in the ministering offices of devoted lives?

And yet one cannot help wishing that unlucky question had not been put. If only the unfortunate disciple had but said, "Let us investigate the elephant," or, better still, had said nothing--what should we not have known now!

And if then such a question sealed the fount of sacred wisdom at that remote epoch, what

must not the effect of our modern mind be?

For now such a disciple would not simply ask, "Upon what does the elephant rest?" but he would have glibly asked, all in one breath--"Upon what does the elephant rest, and upon what does the support of the elephant rest, and on what the support of that? and so on, ad infinitum; do tell me."

And so too, even on the rivulet from the fount of wisdom that trickles sparingly through our own minds, is there not a checking effect coming from this mental attitude of ever asking what is behind and behind and behind, seeking formal causes always, instead of living apprehension of the proximate?

Indeed, that question was a misfortune if the possession of fact knowledge is a boon. For what could have been a more apt description of this all-supporting elastic solid ether than the broad arching back of the largest animal known on earth--the created being that could bear the most, and of all not-human creatures, the most intelligent and responsive?

The master knew how all the worlds were held together--and how much more!

And, indeed, does not this feeling come upon us strongly with regard to those of the Eastern world, with whom we have the privilege of talking?

For my own part, however much I have learnt in the intervals of my speaking with them, there they still hover on the weather-bow of my knowledge--they, or those from whom they learn, are in the possession of knowledge of which all my powers are but secondary instances or applications.

What it is I know not, nor do they ever approach to tell me. Yet with them I feel an inward sympathy, for I too, as they, have an inward communion and delight, with a source lying above all points and turns and proofs--an inward companion, whose presence in my mind for one half-hour is worth more to me than all the cosmogonies that I have ever read of, and of which all the thoughts I have ever thought are but minutest fragments, mixed up with ignorance and error. What their secret is I know not, mine is humble enough--the inward apprehension of space.

And I have often thought, travelling by railway, when between the dark underground stations the lads and errand boys bend over the scraps of badly printed paper, reading fearful tales--I have often thought how much better it would be if they were doing that which I may call "communing with space." 'Twould be of infinite delight, romance, and interest; far more than are those creased tawdry papers, with no form in themselves or in their contents.

And yet, looking at the same printed papers, being curious, and looking deeper and deeper into them with a microscope, I have seen that in splodgy ink stroke and dull fibrous texture, each part was definite, exact, absolutely so far and no farther, punctiliously correct; and deeper and deeper lying a wealth of form, a rich variety and amplitude of shapes, that in a moment leapt higher than my wildest dreams could conceive.

And then I have felt as one would do if the dark waters of a manufacturing town were suddenly to part, and from them, in them, and through them, were to uprise Aphrodite, radiant, undimmed, flashing her way to the blue beyond the smoke; for there, in these crabbed marks and crumpled paper, there, if you but look, is space herself, in all her infinite determinations of form.

Thus the reverent and true attitude is, not to put formal questions, but to press that which we know of into living contact with our minds.

And so the next step, when we would pass beyond the knowledge of the things about us in the world, is to acquire a sense and living apprehension of four-dimensional space.

But the question does come to many minds. "What lies beyond?" And, although our knowledge is not ripe enough to answer this question, still, hurrying on before, we may ask--not what does lie beyond, but what is it natural for us in our present state of knowledge to think about the many dimensions of space?

Let us drop for a moment into the most common sense mode of looking at it. Why do we think of space at all? To explain what goes on. If everything followed uniformly, we should not need to think of three, or even two dimensions--one would do. But problems come up, practical problems, which need to be reconciled. Things get "behind" one another, are hidden, and disappear. So we find that one variable will not suffice. If we were in a line looking at only one thing, its gradual changes of distance from us would be all our experience. We should not call this "distance"; it would be the one fact of our experience; and if we treated it mathematically, we should express it as the *variation of one variable.* So we may consider as identical, one-dimensional space, and the variation of one variable. Now plane space requires two variables. May not plane space then be defined as our knowledge of the variation of two variables? The being in plane space requires two variables to account for his experience. He lives, we say, in a space of two dimensions.

Now why should we not identify these, and say that that which he calls space is the organized mass of knowledge of the relations of two variables that has grown up in his mind?

We talk of distance and size as if each were something known in itself. But suppose a percipient soul subjected to a series of changes depending on two independent causes, which always operated together, and which were each of them continuous in their increase and diminution, would not this percipient soul form an idea of space of two dimensions? Would he not say that he lived in a space of two dimensions? His apprehension of the number of variables by which he was able to account for his experience would project itself into a feeling of being in space; and the kind of space would depend on the number of variables he habitually worked with.

Now we have become habituated to use, for practical thought, three variables; these explain the greater part of our daily life. Is that which we call space simply the organized knowledge of the relations of these variables? Without pledging ourselves to this view, let us adopt it and note its consequences.

Then it is evident that as we come into the presence of more and more independent causes--I mean, as we find that these are in nature working independently of one or more in number than three--we shall have to study the general aspect of events which turn up from the combinations in varying intensity of these four or more principles, or causes of our sensation. Then we shall get a mental organization capable of dealing readily and rapidly with the combinations of these causes. And this mental organization will be indicated in our consciousness by the feeling of being in four-dimensional (or more-dimensional) space.

It seems strange to talk of there being three independent causes, or of some such limited number, for in the events that happen around us we see a vast variety of causes. There is the tendency to fall, there is the motion of the wind, there are the actions of human beings, each of them producing effects, and besides these many other causes.

But if we look at them, we find that they are not all independent one of the other, but may be different forms of the same cause.

Indeed, if we suppose that we live in three-dimensional space, and that every change and occurrence is the result of the movements of the small particles of matter, there would ultimately be only three independent causes--the three independent movements, namely, which a particle could go through.

Thus it would appear that, since no one would deny that there are an infinite number of perfectly independent causes in nature, the formation of a sense of higher and higher kinds of space was simply necessary as, our knowledge becoming deeper, we came into contact with more and more of these causes.

It might be said that these causes might be very diverse from each other; one might be apprehended as love, another as color, another as distance. But this view is hardly tenable, for to apprehend a cause it must be congruent with the others which we already apprehend. If it is known at all it must work uniformly in with the rest of our experience. No doubt there are an infinite number of causes, which give that richness to experience of which the intellect can take hold only by a small part. But when the intellect does take hold of a part, it takes hold of it by seeing how it comes in, modifying each of the already existing possibilities and producing a new variety, out of which the actual experience is a selection. Thus, if a being having an experience derived from two causes, and so living in a space of two dimensions, were to be affected by a third cause, he would first of all find that there were many things which he would say could not be explained by space relations. Then he would gradually arrive at the idea of a three-dimensional space. Space being due then not to anything in the nature of the causes themselves, but to the number of them.

Then, to us, when mentally we come into the comprehension of any new independent cause, we must acquire the sense of a new dimension, and the question of space and space relation is altogether independent of the nature of these causes--the real and systematic apprehension of them necessitating an enlargement of our sense of space. Now the unknown comes to us generally in the properties of the minute particles of matter which make the different "kinds." Hence as we study matter closer and closer we

shall find that we need more and more dimensions. And the molecular forces in one kind of space will be the physical forces of the next higher.

That is to say, when in our space we have explained all that we can explain by the supposition of particles moving in our space, we shall find that there is a residuum, and this residuum will be explained by the four-dimensional movement of the minutest particles. The large movements are simply movements in three-dimensional space, but to explain the residual phenomenon a higher kind of space will be requisite.

Still, this all seems to me a barren view, and I am convinced that it is far truer to think of space, as indeed we can hardly help doing, as a beneficent being, supporting us all looking at us in every lovely leafy bough, and bending towards us in the forms of those we know.

And, moreover, there is one very valid objection to the conclusion that we have explained anything, or made any step by using the word "variable."

It will be found that such a notion as a continuously varying quantity is a mere verbal expression. All that we can conceive or understand are definite steps, definite units. We can conceive a great many definite magnitudes, but not continuous magnitude. The idea of continuity is one which we use and apply; but to think men have explained anything by speaking of continuous variables, is really to lose ourselves in words.

But, although we dismiss the previous supposition, still we see that, even if it were true, the practical thing to do is to acquire the sense of a higher dimensional space.

And, indeed, what a field is here! Take a single example. The idea of magnitude is one dimensional simply adding and adding on in a straight line.

The idea of rotation, or twisting, in its very nature involves the idea of two dimensions--for it is the passage from one dimension to another--it is an idea which, in its essence, has two dimensions.

If we think of a twist, it is the change from one direction to another. It cannot be thought without the two directions being present to the mind--the direction from which and the direction to which the change takes place.

In our space we have nothing more than this rotation. If a ball is twisting, and a blow is given to it, which tends to set up a twist in a new direction, the old twist and the new one combine together into a single twist about a new axis.

But in four-dimensional space there is such a thing as a twist of a twist--a rotation of a rotation--bearing to a simple rotation the same relation that an area does to a line. Perfectly independent rotations may exist in a four-dimensional body.

And again, evidently if there is an idea which in its essence involves two dimensions, may there not be an idea which, of its very nature, includes three dimensions?

What that idea is, we do not know now; but some time, when the knowledge of space is more highly developed, that idea will become as familiar to us as the idea of a twist is

now.

And, indeed, space is wonderful. We all know that space is infinite in magnitude--stretching on endlessly.

And when we look quietly at space, she shows us at once that she has infinite dimensions.

And yet, both in magnitudes and dimensions there is something artificial.

To measure, we must begin somewhere, but in space there is no "somewhere" marked out for us to begin at. This measuring is something, after all, foreign to space, introduced by us for our convenience.

And as to dimensions, in order to enumerate and realize the different dimensions, we must fix on a particular line to begin with, and then draw other lines at right angles to this one.

But the first straight line we take can be drawn in an infinite number of directions. Why should we take any particular one?

If we take any particular line, we do something arbitrary, of our own will and decision, not given to us naturally by space.

No wonder then that if we take such a course we are committed to an endless task.

We feel that all these efforts, necessary as they are to us to apprehend space, have nothing to do with space herself. We introduce something of our own, and are lost in the complexities which this brings about.

May we not compare ourselves to those Egyptian priests who, worshipping a veiled divinity, laid on her and wrapped her about ever with richer garments, and decked her with fairer raiment.

So we wrap round space our garments of magnitude and vesture of many dimensions.

Till suddenly, to us as to them, as with a forward tilt of the shoulders, the divinity moves, and the raiment and robes fall to the ground, leaving the divinity herself, revealed, but invisible; not seen, but somehow felt to be there.

And these are not empty words. For the one space which is not this form or that form, not this figure or that figure, but which is to be known by us whenever we regard the least details of the visible world--this space can be apprehended. It is not the shapes and things we know, but space is to be apprehended in them.

The true apprehension and worship of space lies in the grasp of varied details of shape and form, all of which, in their exactness and precision, pass into the one great apprehension.

And we must remember that this apprehension does not lie in the talking about it. It cannot be conveyed in description.

We must beware of the attitude of standing open-mouthed just because there is so much mechanics which we do not understand. Surely there is no mechanics which we do not understand, but geometry and mathematics only spring up there where we, in our imperfect way, introducing our own limitations, tend towards the knowledge of inscrutable nature.

If we want to pass on and on till magnitude and dimensions disappear, is it not done for us already? That reality, where magnitudes and dimensions are not, is simple and about us. For passing thus on and on we lose ourselves, but find the clue again in the apprehension of the simplest acts of human goodness, in the most rudimentary recognition of another human soul wherein is neither magnitude nor dimension, and yet all is real.

The answer to this is twofold. In order to live, self knowledge is necessary. That knowledge of self which is distinctly a matter of ethical inquiry, is altogether foreign to these pages.

But there is a no less important branch of self knowledge which !1seems altogether like a research into the external world. In this we pass into a closer and closer contemplation of material things and relations, till suddenly we find that what we thought was certain and solid thought is really a vast and over-arching crust, whose limitlessness to us was but our conformity to its limits a shell out of which and beyond which we may at any time pass.

But if we do so pass, we do not leave behind us the idea of matter. All that we thus attain is a different material conception of ourselves.

In ancient times there was no well-defined line between physics and metaphysics. And our present physical notions are derived from amongst the mass of metaphysical notions. Metaphysics is so uncertain, because when any one of its doctrines becomes certain, it takes a place in physics.

And the exploration of the facts of higher space is the practical execution of the great vision of Kant. He turned thought in an entirely new direction. And where he turned, all seemed blank--all positive assertions fell away, as he looked into the blackness of pure thought.

But out of this absence can come any amount of physical knowledge. It is like an invisible stuff out of which visible garments can be woven.

But, indeed, many would say: What is the use of these speculations?

Does not the contemplation of space leave the mind cold, the heart untouched? Not altogether.

Is not our life very much a matter of fact, concerned with events? All our feelings are bound up with things which we do or suffer.

And thus a right conception of the possibilities of action in our world, and in i higher world, must have some influence on ourselves.

Then also there is a path through which we can pass, leading from the most complete materialism to something very different from the first form in which it presents itself.

Any one, who will try, can find that, by passing deeper and deeper into absolute observation of matter, and familiarity with it, that which he first felt as real passes away--though still there, it passes away, and becomes but the outward sign of realities infinitely greater.

Thus there springs before the mind an idealism which is more real than matter; a glimpse of a higher world, which is no abstraction, or fancy, or thought, but of which our realities are the appearances.

And with this there comes overpoweringly upon the mind of one, who thinks on higher space, the certainty that all we think, or do, or imagine, lies open.

In that large world our secrets lie as clear as the secrets of a plane being lie to an eye above the plane. For howsoever closely a being living on a plane may hide from his fellows, he has nothing secret from an eye that gazes down upon his plane.

The very idea that he can put forward to such a one any false pretenses, is absurd.

And so we lie palpable, open. There is no such thing as secrecy.

And as I have said before, the difference between the moral life and the animal life, in a world of any dimensions, lies in this--that the animal life consists of actions which are those natural to the possibilities of space of that world; the moral life (viewed as exhibited in physical arrangements) lies in the striving, by modification and restraint of the natural actions, towards those actions and modes of existence which are natural in a higher space world.

It has been shown how plane beings could only pass each other by courtesy and mutual forbearance. And the great effort wherein the higher spirit most plainly shows itself, apart from convenience, or profit, or any obvious physical good, is in one very simple and obvious tendency towards a higher-dimensional existence. For, as to a higher space being no secrets of ours are hidden--nothing is unknown, so, in making towards one another our limited lives open and manifest, we treat each other in the service of truth, as if we were each members of that higher world.

It is often said and felt, that all our actions do in the course of time impress their effect on the world. Nothing is lost. And if we, being limited, know that this is so, how much the more apparent is it when we realize our higher being. We know that, as animal frames moving and acting in the world, the effect of every movement passes on and on.

And with this effort corruption and evil fall. Space is so large that no interior can be hidden from the vivifying breath of the universe; no part can be cut off, however foul, from direct contact with the purifying winds which traverse space higher than itself.

As conscious minds, we realize the oneness of past and future in our open communication one with another. We attain a mental consciousness of the higher fact.

Whether we represent it to ourselves as a day wherein all that ever has been done will be told, or as an omnipresent and all-knowing mind, it is the same.

Truth is nothing but an aspiration to our higher being. And the first sign of love towards individuals, as towards the world as distinguished from the easy and yielding good nature which always tries to please that which is nearest at the moment--is veracity. This is the secret of the mysterious effect of science on our emotions--the simple description of fact, apart from our own conditions and prejudices. And also in the material world around us, this is the secret of the beauty of the crystal and of still water. For in them the near and the far are brought together; in their translucency they give an emblem of the one vision wherein a higher being grasps every part of the solid matter, of which we can only see outside and surface.

The acceptance of the rule of the great master of empiric religion, Comte--"Live openly"--is really to imitate in our world, and make ourselves conscious of our true existence in a higher world.

There are two sides of religion--the inductive and the deductive. To the realm of deduction belongs theology, with its central assertion and its manifold consequences. But inductive religion consists in grasping, amidst the puzzling facts of life, those greater existences in which the individual organizations are bound up, and which they serve, passing, as in every science, from the details to the whole. And the connecting link between materialism and the conduct of life, lies in the doctrine of the limited nature of our present space perceptions. For, with the elevation of our notion of space to its true place, the antagonism between our present materialistic and our present idealistic views of life falls away.