THINKING ABOUT INFINITY *Alec Leggatt*

At my first school we were given an elementary reading book on the cover of which was the picture of a girl reading the same book. The book she was reading naturally showed a smaller version of the same scene and so on down in size. The printer's lack of definition soon lost the girl and the book into a muddy dot but the message was plain - Infinity, at least in a downwards or diminishing sense, was there to be seen if only the printer's technique and my eyesight were good enough. A little later a starlit night revealed the notion of infinity in the upward or expanding sense.

Trying to imagine Infinity.

Infinity is a difficult concept. We are so involved in our daily lives with events which have, or seem to have, a beginning and an end that the idea of something stretching on and on with no ending is unfamiliar and a little uncomfortable. The girl reading the book helps as does a starry night or looking into mirrors facing each other from opposite walls. To illustrate the enormity of the problem in contemplating infinity there is the infinity in which there is another group of people identical us sitting around listening to, perish the thought, another Alec Leggatt. Worse still there are an infinite number of Alec Leggatts doing the same thing

Infinity appears in mathematics as a convenient convention to explain away some of the anomalies of our arithmetic such as one divided by zero. (More on mathematics later) Artists accept that lines of perspective converge at infinity which they conveniently locate as a dot on their canvas. If they took an 'infinitely' powerful magnifying glass to that dot, they would begin to understand what infinity really means. Because infinity is so difficult to visualise we have tended to ignore it or to encapsulate it into a more easily acceptable image, such as the artists' dot and the belief that parallel lines *converge* at infinity.

Religions have been more open to the notion of infinity. Judaic-Christian creations of God the invisible, the inconceivable, the almighty, lead easily, as in Islamic beliefs, to thoughts of the everlasting (infinity), at least in a forward sense - an everlasting future. But what of the past? Religions fight shy of an infinite past - no beginning, and prefer to think of a point of creation, although God is implied to have existed always.

Can we prove infinity?

In one sense we cannot. As by definition nobody and no thing can ever get to infinity, infinity cannot be proved to "exist". But one can argue that if there is no infinity, there must be boundaries, at least to space. If the boundaries have a material presence how thick are they ? They cannot be infinitely thick nor infinitely thin, for then the argument falls at the first fence. So the boundaries must have a finite thickness. So what lies on the other side of the outer edge of the boundary? Nothing ? Well, it is possible to conceive a space with no matter, no movement and therefore no time. The fact that such a 'nothingness' is itself infinite does not prevent our concept of space and time from being finite.

The same applies if space has no material boundaries and instead it just stops on some defined line (an infinitely thin boundary ?) or just peters out over a defined transition border. One is still left with the nothingness beyond.

But to disprove infinity one would have to accept that somewhere in the nothingness there occurred a 'blob' of space and time neatly packaged in defined boundaries. And if one 'blob' why not others somewhere or perhaps an infinity of blobs ? It certainly seems more difficult to disprove infinity than to prove it.

Infinite smallness

We have to consider also diminishing infinity or infinite smallness both in space and in time. It is perhaps easier to start with the thought of infinitely small time. The mayfly lives for only one day, albeit a day of beauty and freedom. Although only a day to us, it is literally a lifetime to the mayfly. Perhaps, and let us hope, the mayfly looks upon its day as a long and fulfilled life. Certainly the appreciation of a period of time must be relative to the person or animal involved. Science has already required as to conceive of nano- and pico- seconds. There seems to be no reason why time cannot be split into ever smaller portions down to infinitely small portions. Those familiar with calculus and the concept of a very small (infinitely small) increment of time or dimension, as used in every- day mathematics, will take more readily to the notion of infinite smallness.

Turning to infinitely small dimension, scientists have constantly sought the fundamental particle -beyond which there is nothing smaller. For a long time it was thought to be the atom; the word comes from the Greek – "no cutting". Now hardly a year goes by without smaller and smaller particles being discovered or at least their presence being sensed. Scientists do not seem to think they have got to the end of the smallness trail yet or that they ever will.

Infinity and Mathematics.

The symbol '∞ ' denotes infinity and is widely used in mathematics. Of course we all know what '0' denotes. Both are used with gay abandon,

99 divided by 0 = ∞

0 divided by 99 = 0

etc

and all these expressions are true in a mathematical sense. But what do we really mean ? The mathematician will say that ∞ is a very large number but he will not say that 0 is a very small number, he will say that it is absolutely nothing. Mathematics might be more consistent if ∞ is defined as a number so large that a variation in its magnitude is of no consequence to the context of the calculation in hand and 0 as a number so small that it is of no consequence. Then both ∞ and 0 obtain a relationship with other real numbers and will fit more readily into the concepts of every-day maths.

This would leave us free to consider 'true' infinity without the conventions of mathematics.

Zero

Such freedom is particularly valuable in considering infinite smallness and the nature of zero. The point can be illustrated if we take a short diversion into elementary physics.

Physicists try to cool substances to "absolute zero" or as near to that as they can get. That temperature is defined as minus 273 degrees Celsius. The picture that figure brings to mind is that of a descending ladder of equal steps and that if one gets as far down as say, minus 272degrees then there is only one more step to take. This is very far from the truth. In fact temperatures within a small fraction of a degree above "absolute zero" have been reached with increasing difficulty but it is considered theoretically impossible to make that last tiny step as it would constitute cessation of all molecular motion. The situation is asymptotic, as with a curve that continually approaches a line but never meets it. So our ladder of equally descending steps is fallacious.

Instead we should be considering an 'asymptotic ladder ' where the steps get increasingly wider as we descend and the last step is infinitely wide. This leads us to consider that our concept of zero as a real and obtainable truth in all fields, is fallacious.

So What?

This article does not set out to prove absolutely that infinity is real. Such a proof may be unobtainable. But it hopes to draw attention to the question. Infinity deserves much more serious thought than it seems to be given by scientists and philosophers and indeed by all of us.

If we assume that everything is infinite, where does this lead us? For the philosopher in us, "infinitism" would favour an acceptance of existentialism in the face of the impossibility of searching for ever for some other truth. For the cosmologist, there should be less difficulty as he is more in contact with the mechanics of infinity than most of us

For us lesser mortals how does a realisation of infinity affect our daily lives ? It might lead to the thought that the human race is less significant in the total (infinite) order of things than we might have supposed and this in turn would affect some religious beliefs. Following the same line of thought there is the realisation that our particular sense of size is only one point in a continuous range from the infinitely small to the infinitely large. Thus the humble mayfly and even much smaller creatures have their worthy place in the order of things and perhaps we should pay more respect to their existence.

Thinking about infinity will probably and properly engender a sense of humility regarding the activities of the human race. We are just as specks of dust in relation to the hugeness – the infinity of everything. But I don't believe we should give up living our lives to the full and trying to make this minute world a bit better.

An acceptance of infinity would still leave unanswered many questions. Why are we here? At what point in infinite time did we come into existence ? How long have we got ? etc. But no doubt we shall continue to eat our breakfast at the beginning of the day and go up to bed at the end, but before doing so, take a look out of the window at the stars and think for a moment.

Questions:

If time is not infinite "when" did it begin.?

If space is not infinite "where" did it start ?