Paradox, what paradox?

by A.C.Sturt

Summary

Resolution of Olbers' Paradox points to a Universe which must be infinite. The same methodology applied to interpretation of the Wilkinson map of the cosmic microwave background radiation also supports this conclusion. Thus, while the part of the Universe which we observe is much smaller than we thought, the Universe itself is infinite in time and space.

A. Introduction

The preceding paper in this series (1) proposed a new way of interpreting redshift, starting from what we know rather than speculate. We know that the electromagnetic frequency of light produced on a star must be the same as light from the same element on Earth, because the colour of light depends on the energy levels of the electronic structure. We know that the atoms which produce the light are the same element as on Earth because of the patterns of spectral lines observed. We know that the chemistry of elements is the same on the star as on Earth; chemistry is Universal. Anything else would be unthinkable because it would mean that chemical reactions depended on location and velocity in the Universe (polar chemistry, equatorial chemistry etc). We also know that the spectrum of emissions is shifted when observed on Earth, usually towards the red end i.e. to lower electromagnetic frequencies.

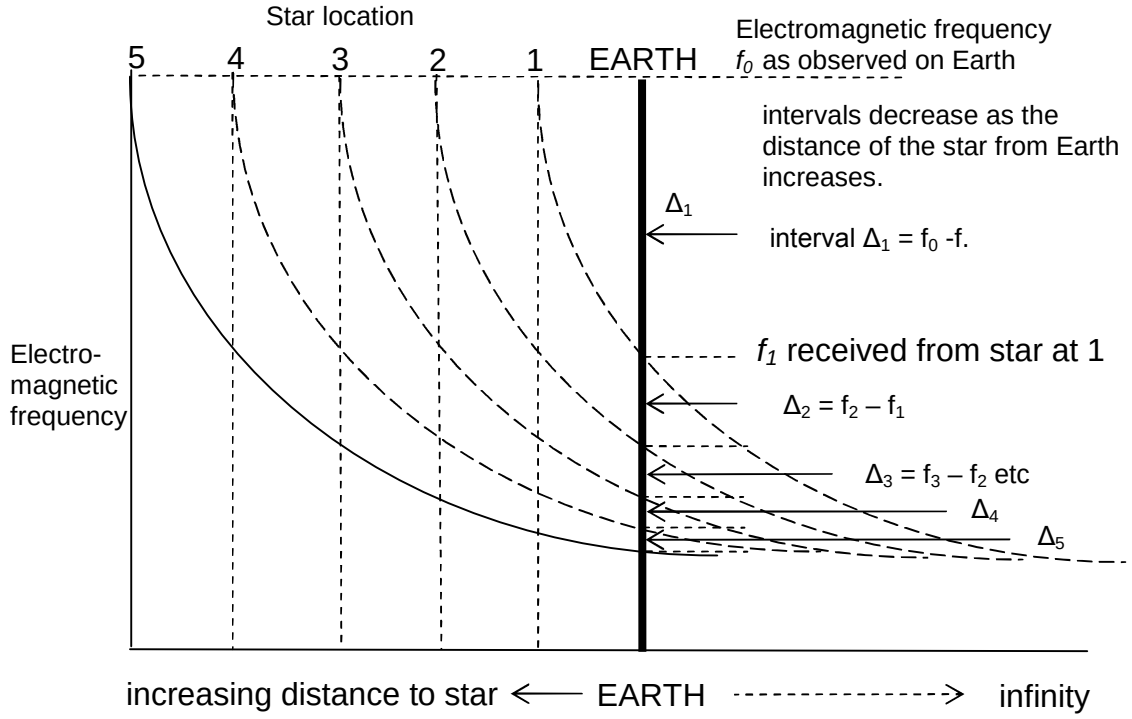
The conclusion can only be that the loss of frequency occurs in transit from the star to Earth. As soon as the particle of light is free from the atomic structure which generated it, it is in free space, and so its electromagnetic frequency is no longer influenced by the source from which it is departing at the speed of light. Such a loss must therefore result from the interaction of the particle of light with the medium of space through which it is travelling, reintroduced with electromagnetic properties by me as the basis of a new theory of light (2). The rate of loss of frequency is exponential because the greater the energy of the particle of light at any point of its travel, the more energy it will lose at that point. Energy is proportional to electromagnetic frequency by Planck's equation. Energy is not lost to the particulate system as a whole, because its loss by electromagnetic induction serves to generate a secondary particle by the same process.

As a star sends its particles of light towards Earth, their electromagnetic frequencies shift continuously towards the microwave end of the spectrum, and ultimately to radio frequencies. It must be a gradual, continuous process, because nothing is known which could bring about an abrupt change of electromagnetic frequency. The further particles of light have travelled, the more their electromagnetic frequencies converge because of the nature of the exponential, which gives the curve in the Figure that follows.

This analysis may explain Olbers' Paradox, which is one of astronomy's oldest anomalies, and it may shed new light on the meaning of the Wilkinson map of cosmic background microwave radiation.

B. Olbers' Paradox

Olbers' Paradox is that night time should be light, but it is dark. It should be light because, if the Universe is infinite, which was the accepted view at the time, there must be an infinite number of stars sending light to us in our line of sight. This would be enough to make it bright after the Sun had gone down. However, what we see is the opposite. The night is coal black, dotted with points of light which are stars and galaxies. Hence the paradox.



Figure

The decrease of electromagnetic frequency from stars at different distances

This apparent paradox has been taken up by proponents of the theory of the expanding Universe as proof that the Universe cannot be infinite. They claim that if it were infinite, the night would be bright.

However, the new analysis proposed above shows the complete opposite. The electromagnetic frequency of a particle of light degenerates exponentially to the microwave as it travels through space, and ultimately to the radio end of the spectrum. The majority of stars in an infinite Universe would be so far away that the

electromagnetic frequency of radiation from them would be in the microwave when it reached our detectors on Earth. For stars closer to Earth the electromagnetic frequency of their radiation might arrive still in the visible if they were ‘close’, and at progressively increasing wavelengths as they were further and further away, until they verged on the microwave and the radio.

By definition, as human beings our personal detectors see visible light but not the lower frequencies. Even with instrumentation we are looking at specific parts of the spectrum. However, it is the whole range that counts as ‘light’. Thus there is electromagnetic radiation coming at us all the time from every direction of space in line of sight of all the stars in the Universe. It is just that we are attuned quite naturally to light which is visible to us, an anthropocentric view.

If we could integrate all the electromagnetic radiation which reaches us across the spectrum day and night we would see that the sky is always bright. Our hubris is that we consider ourselves to be the arbiter of what is bright after the Sun has gone down. Even in the natural world we know that other creatures see a different range of frequencies, which we describe as ‘seeing in the dark’, because it is dark for us. It is not necessarily dark for a night owl, though it may be for its prey. So Olbers’ ‘Paradox’? In the context of life, the Universe and everything, what paradox?

The fact that it is dark at night suggests that all the stars in the black background of the sky must be a very long way away compared with the stars and galaxies which show up in the night sky. By definition this is much further than the furthest galaxies which we can see. In fact it may be considered to indicate a Universe which is infinite, a complete reversal of what expansionists assert.

Not all radiation will be at the same electromagnetic frequency when it leaves a star. Some will be at the highest frequency, some much lower, depending on the physical processes which generated it. The fact of radiation as a wide spectrum testifies to this. However, all frequencies will degenerate according to the same exponential curve. In effect they are starting at different points along the curve, and this needs to be taken into account when calculating which electromagnetic frequency is related to which process taking place at the star.

C. Cosmic Microwave Background Radiation

The question then is why is the background of the Wilkinson map of cosmic microwave radiation not black? The background is black for visible light, ultraviolet, infrared, X-rays etc or you would not be able to indentify bodies ‘lit up’ against it. Why not for microwaves?

The path taken by a particle of light is one-dimensional; you cannot detect it from the side, but only if you are looking along the line of sight. All detectors including those for microwaves make their measurements at points which are chosen to be representative of the whole. The same is true of an emitter. A particle of light is generated from a point on an emitting body, not the entire body. However, if a source is far removed from a detector, as with a star or galaxy, the light from all points on it may be integrated into a single observation.

Microwave radiation from distant stars must follow the same pattern. To repeat the analysis set out above, chemistry on the stars must be the same as on Earth. Chemistry is determined by the energy levels of atomic structures. Electromagnetic frequencies of radiation emitted by stars are determined by these same energy levels. Electromagnetic radiation emitted by atoms on the stars must be the same as on Earth. When we observe them on Earth, the frequencies of the electronic radiation which they emit is shifted towards the microwave, simply because the stars are so far away.

By the logic of Olbers, an infinite Universe must be 'light' in the microwave because there is an infinite number of stars in the line of 'sight' of our detectors. If our instrumentation were good enough, it would resolve the separate emissions of individual stars at their different distances. Beyond the limits of such resolution it would be a blur of microwave emissions, in fact a 'background'.

Thus the CMB radiation is consistent with an infinite Universe. It is not necessary to postulate an origin from an explosion which left the microwave radiation rattling around the Universe as an after-effect. That does not mean that explosions have not occurred or do not occur. In an infinite Universe they would not occur systematically, because that would imply some overarching organisation. Instead they would occur stochastically in different locations and at different times, whenever the conditions created by gravitational aggregation of matter in the ceaseless motion of the Universe were right.

Electromagnetic radiation seems to be a specific case for analysis, because it relates directly to atomic structure, and the spectrum can be resolved into patterns of lines which are the signatures of every element. Patterns are homogeneous through time and space, even if they shift, and so they are absolute. By contrast, intensity of illumination, which is the concentration of electromagnetic particles, must decrease with distance travelled because they spread out from the origin. The observation within the limits that we can test by measurement is that intensity diminishes according to an inverse-square law with distance. This relationship is not absolute but comparative. For instance, it does not apply at zero distance as the previous paper shows. It is not clear why it should apply to a single particle.

There are other phenomena which follow inverse-square laws, namely electric and magnetic fields. These relate to forces rather than light, a different form of interaction with the medium of space. They send us no atomic signatures. For stars they are observed by their effects on electromagnetic frequencies of radiation which reach us, such as separation of spectral lines. Since inverse-square laws have no cut-off distance, there seems to be no reason why the entire Universe should not be flooded by electric and magnetic effects or 'fields'. The Universe should always be 'bright' according to receptors of electric and magnetic phenomena. However, we have no way of knowing, since we cannot step outside to make the comparison. Our instruments measure differences not absolutes, but of course that is also true of light intensity. There seems to be some underlying unifying phenomenon, perhaps the medium of space with electromagnetic properties.

However we look at it, the confirmation of the microwave background should come as no surprise. Its apparently regular granularity may need a little more thought.

D. Conclusions

The previous paper (op. cit.) showed that the part of the Universe which we observe is much smaller than we thought. Its boundary may be no further away in time than the age of the Earth. The Universe is not contained in what we observe. Together with this paper the analyses suggest three methods of observation and measurement to support the conclusion that the valid model of the Universe is in fact infinite.

i. Measurement of reductions of the electromagnetic frequencies of radiation from stars whose distances from Earth have been established by trigonometry, as set out in the previous paper and illustrated in the Figure.

ii. Olbers' 'paradoxical' observation of the night sky, which is common to everyone's experience.

iii. The map of background microwave radiation.

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References

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