It only remains to mention a possible reason for the long continuance of the misunderstanding. Attention to the asymmetry of comfort due to the extremely 'high-$g$' take-off of Traveller, which all parties agree takes a negligible period in either time, has diverted attention from a more important asymmetry. This is that both goal and origin are in Stayathome's inertial frame, and we can record events at either of them in Stayathome's time without ambiguity. To give complete symmetry, we need to suppose a second space ship, presumably a Flying Saucer, coming from the side away from Alpha Centauri. It must be moving at the same velocity as Traveller and at such a distance that Traveller sees it to be four light-years behind him. Then to Stayathome, for whom the Traveller–Saucer frame has suffered a Fitzgerald–Lorentz contraction, Traveller and Saucer appear to be just under seven light-months apart. Accordingly, Stayathome observes Saucer's invasion of Earth seven months after Traveller's departure, when Traveller is only one-seventh of his way to Alpha Centauri. Traveller, however, considers that the Flying Saucer invasion occurs after four years of his (and Saucer's) time (by which time, having changed his mind about return, he has left Alpha Centauri far behind).

Thus we see that the conceptual problem underlying the controversy is the same as that involved in any of the standard paradoxes concerning the apparent simultaneity of separated events in different inertial frames.

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I have received several calculations similar to Dr. J. H. Fremlin's. To follow them through in detail is subtle and tedious, but it is unnecessary because it is at once obvious that since all the effects concerned are effects only of the relative motion of Stayathome and Traveller, and the motion of one is the mirror image of that of the other (for every stage of Traveller's motion, whether uniform or accelerated, there is an exactly corresponding stage of Stayathome's motion), there cannot possibly be any difference in the numbers of oscillations received.

Dr. Fremlin is right in ascribing many of the false conclusions which have been reached in this matter to the unconscious introduction of an asymmetry into what is essentially a symmetrical situation, but I do not think he has correctly identified that asymmetry. In saying that "both goal and origin are in Stayathome's inertial frame", he shows that he shares a common misunderstanding of the essential principle of relativity theory. Phenomena are not in any frame: we can place them in whatever frame we find convenient. What he means is that goal and origin (presumably goal means Alpha Centauri and origin the Earth) are relatively at rest: that is a fact which is quite independent of frames of reference.

Nevertheless, he comes near the essence of the asymmetry, which is that the halfway stage of the journey is, in the ordinary presentation of the problem, marked by an event (Traveller's arrival at Alpha Centauri) at which Traveller is present, and can, therefore, *observe* the time in his rest-system, while Stayathome is absent, and can only *calculate*, by the conventional definition, the time in his rest-system. Dr. Fremlin has himself shown how this artificial asymmetry can be reversed by marking the half-way stage by the arrival of the Earth at a Flying Saucer instead of the arrival of Traveller at Alpha Centauri. He spoils it, however, by saying that "Traveller . . . considers that the Flying Saucer invasion . . . (by which time, having changed his mind . . .)". Traveller considers the invasion to be an Earth invasion of Flying Saucer, and he does not change his mind at all: he sees the Earth immediately leave Flying Saucer and return to him. All Dr. Fremlin's previous reasoning then requires that the returning Stayathome will have aged seven months, and Traveller four years. I have shown this in a paper which will appear in the *Australian Journal of Physics* of September. To give the problem greater verisimilitude, instead of the Earth and stars I have considered an engine, $M$, travelling between two stations, $A$ and $B$. The engine has a train attached, of rest-length equal to $AB$. When the turning-point is marked by $M$'s arrival at $B$, $M$'s clock is behind the time calculated according to the clock in $A$. When, however, it is marked by the arrival of the last truck, $G$, at $A$, the clock in $A$ is behind the time calculated according to the clock in $M$.

If Dr. Fremlin will reconsider his statement that "both goal and origin are in Stayathome's inertial frame, and we can record events at either of them in Stayathome's time without ambiguity", I think he will see that he is unconsciously supposing that Stayathome's time is somehow superior to Traveller's. You can record events in *any* given time system without ambiguity. Ambiguity comes in when you have to choose between different systems, and you cannot resolve it by arbitrarily deciding for one of them.

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## Rocket Observation of X-Ray Emission in a Solar Flare

The report[1] of normal Lyman alpha- and enhanced X-ray emissions from the Sun during a solar flare on July 20, 1956, presents several problems in connexion with observations of ionospheric absorption as well as the physics of the solar corona.

As is well known, during many flares the cosmic noise received on 18 Mc./s. drops sharply in intensity. The magnitude of the decrease can be used to derive information on the corresponding fractional increase in electron density through the absorbing layers of the ionosphere. On July 20, 1956, at 1905 U.T., our cosmic noise records showed a slight decrease in flux level, which fell at 1912 U.T. to its lowest value, about 93 per cent of the average over the preceding and following hours. The normal flux level was re-established by 1920 U.T. If we assume that the fractional increase in electron density was constant through the $D$-region, the maximum increase therefore amounted to about 7 per cent. On the other hand, the maximum increase during a typical cosmic noise absorption can be several hundred per cent. Chubb *et al.* state that the observed X-ray increase should have doubled the electron density between heights of 75 and 95 km. Such an increase is far greater than the increase consistent with our records. If we allow the possibility that the fractional change