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LDEs, Hoaxes, and the Cosmic Repeater Hypothesis

by

O. G. Villard, Jr., A. C. Fraser-Smith, and R. P. Cassam

May 1971

Technical Report No. 2

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13. ABSTRACT

Thirty-eight additional radio amateur reports of the long-delayed echo (LDE) effect are listed, bringing the grand total to 90 in our reported series. ("Long" in this connection means an 'echo' lasting for more than two seconds.) Although detection of an LDE is apparently a rare event, they do occur and determination of the causative mechanism may prove of value in future communication techniques.

A new manifestation of the effect is reported here for the first time. It is a situation in which the only communication path between a given transmitter and a certain receiver behaved as if it contained a delay of several seconds. (There was no "echo", as such, to attract attention.) If confirmed by similar observations, this report represents an important clue as to the causative mechanism. As further evidence of the reality of the LDE effect, the article reproduces an original log entry describing a typical LDE observed in Australia in 1937. Hoaxes, and their recognition, are discussed. In the authors' view, the extra-terrestrial-origin hypothesis in explanation of the very long delays is at the moment as plausible as any other.

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SUMMARY

Thirty-eight additional radio amateur reports of the long-delayed echo (LDE) effect are listed, bringing the grand total to 90 in our reported series. ("Long" in this connection means an 'echo' lasting for more than two seconds.) Although detection of an LDE is apparently a rare event, they do occur and determination of the causative mechanism may prove of value in future communication techniques.

A new manifestation of the effect is reported here for the first time. It is a situation in which the only communication path between a given transmitter and a certain receiver behaved as if it contained a delay of several seconds. (There was no "echo", as such, to attract attention.) If confirmed by similar observations, this report represents an important clue as to the causative mechanism. As further evidence of the reality of the LDE effect, the article reproduces an original log entry describing a typical LDE observed in Australia in 1937. Hoaxes, and their recognition, are discussed. In the authors' view, the extra-terrestrial-origin hypothesis in explanation of the very long delays is at the moment as plausible as any other.

LDEs, Hoaxes, and the Cosmic Repeater Hypothesis

BY O. G. VILLARD, JR.,* A. C. FRASER-SMITH,** AND R. P. CASSAM***

IN LISTENING to a two-station QSO, have you ever encountered the situation where one operator persistently begins his transmission before the other has completed his remarks and turned it over to him? If so, you may be hearing the interfered-with station via a delayed channel, similar to channels apparently used by some long-delayed echoes, whereas the breaking station is presumably propagating normally. This remarkable state of affairs was reported by K7TUO on the signals of K7ICW (Las Vegas, Nevada) as received by K7BDU at Phoenix, Arizona, during a recent West Coast sporadic-*E* opening on six meters. If confirmed, this would appear to be another interesting manifestation of the LDE effect (refs. 1 and 2), and as such, very possibly represents an important clue.

The grand total of usable reports is now in the 90s, and the picture which is building up is fascinating in its complexity. The problem of explaining it all is complicated by the fact that there may well be at least three different kinds of LDEs, just as there were different but related diseases called "polio." It seems certain that one kind of LDE is associated with vertical reflection at 3.5 or 7 MHz at night. Another, reported at the higher frequencies and involving delays of 1 to 3 seconds, is suspected of being associated with around-the-world propagation. But the third kind, involving high frequencies and delays in excess of 3 seconds, is the real puzzler. We have no good leads whatever at the moment.

Imagined effects or hallucinations can pretty well be ruled out in general, we believe. There are too many cases where the effect was heard by more than one person, and at more than one station. The psychologists are dubious about 'echoes' lasting more than a few seconds, too.

Fig. 1 shows an original log entry describing an LDE observed in Australia in 1937!

Hoaxes and Practical Jokes

This leaves practical jokes and hoaxes as the principal source of uncertainty in interpreting some of the reports. The hoax possibility is a major headache to the analyst. One needs only recall the cleverly-fabricated jawbone of the supposed Piltdown man to realize how vulnerable researchers are to this sort of thing. There is also the case of the archaeology professor in Germany whose students nearly ruined his professional reputation by planting interesting human traces in plausible spots in the professor's favorite diggings, thus causing publication of exciting but wholly erroneous research reports! To show the limits to which some people will go, consider the fascinating and ironical episode involving a pseudo-Sputnik in the branches of a tree in the Angeles National Forest. There is little doubt that if anyone has a mind to generate some truly wondrous electronic marvels, the technology to accomplish this is ready and waiting. (See Fig. 2.)

In the face of these depressing facts of life, how does the data analyzer fight back? Unfortunately, the countermeasures available to him are by no means infallible. The problem is reminiscent of nabbing would-be airplane hijackers. If the metal-detector jangles, the concealed object might be a gun - but then it might also prove to be a package of bobby pins.

W7DI very kindly drew to our attention the fact that one of the items in the summary printed in the February, 1970, article (ref. 2), was the result of a hoax. Apparently the reporter was never let in on the spoof. But he sent in a careful, complete, and accurate account of his observations. On re-reading the correspondence carefully, it was both a source of chagrin and of satisfaction to discover that while the fact of the report's being a hoax was completely missed at the time of its addition to the collection, nevertheless its spurious nature could be established with a high degree of confidence once the tipoff had been received.

Thank you, W7DI. Are there any others like you standing in the wings, who can be induced to step forward? It would be the greatest possible service to our study to receive additional clues of this sort, and, if it will help, we hereby offer our most solemn promise never to reveal the hoaxer or hoaxee, or the source of information, if that is desired.

By and large, we feel the reports are not to be seriously diluted by hoaxes, and we have evidence bearing on this point that we prefer not to divulge at present lest we trigger some cantankerous soul

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[1]Address reports to W6QYT, Radioscience Laboratory, Stanford University, Stanford, CA 94305. All reports will be acknowledged and credit given. Please be sure that when time is given in GMT, the GMT date is used.

The mystery of the long-delayed echo effect – or effects – has not yet been solved, but the insights afforded by the 90-odd reports received thus far are clearly of very great value. To broaden the base for statistical analysis, the authors earnestly solicit additional reports of signal echoes having delays greater than one or two seconds.[1]

TABLE 1

Name	Call	Date	GMT	Band MHz	Emission	Delay, Secs.	Duration	Own/ Other	Location	Interval Audible	What Was Heard
Berman, L.	K6BW	5-28-70	1800	14.0	SSB	5	5	Both	Burlingame, California	1 min.	Weak replica
Bertolino, D.	WN6IEA	9-22-69	2245	7.1	CW	30	≈ 30	Own	Fresno, California	Once	WN61EA (3 timea) 30 seconds after calling other atation. Sounded "distant".
Bieber, W.	W2UGZ	11-3-69	0019	21.3	SSB	2	2	Other	North Woodmere, New York	Once (?)	"W2XXX this is W6XXX atanding by, Come in OM, etc." Echo heard prior to standby.
Blair, B.	WN6OWL	3-4-70	0430	21.0	SSB	5-12	≈ 20	Other	San Jose, California	Several minutes	Heard last few words of QSO and call signs repeated.
Bloom, R.	WA2APO	Late July 1969	0500	21.0	CW	2	2	Other	Woodmere, New York	10 mins.	Last two letters of call repeated.
Bryant, J. A.	W4UX	1-3-70	0655-0705	3.5	CW	---	---	Own	Owensboro, Kentucky	10 mins.	Could hear a complete "V" if sent at high speed
Buxton, K. F.	W7PUL	Spring, 1952	---	28.7	Phone	30	2 mins.	Own	Spokane, Washington	---	Own voice saying "this is W7PUL, etc." Qusvery DX sound Band dead.
Childers, C. E.	W6YKQ	Approx. 9-23-69	1900-2200	21.0	SSB	35	35	Own	San Rafael, Calsifornia	Once	Heard repeat of test tone modulation and open mike interval.
Connelly, P.	VE2BLY	3-27-70	0010	14.0	CW	2 mins.	20?	Other	Sherbrooke, Quebec, CANADA	Once	"VF5BU, VE5BU, VE5BU/6 de VE2DFI, VE2DFI, K" at 15 wpm.
Cook, L. W.	WA7WNK	February, 1970	---	7.0 and 14.0	---	10	---	Own	Selma, Alabama	---	Few details avsilable.
Cotton, L. S.	VK5LG	4-13-37	2250	14.0	A1	Same	Guess: 3-4 secs.	Own	AUSTRALIA	---	"VA, BOB".
Cummings, 1. W.	WA6ABP	1-2-70	1540	7.0	CW	6-7	6-7	Own	Palos Verdes, Calsifornia	Once	"De WA6ABP...KN". DX sound.

(TABLE 1 Continued)

Name	Call	Date	GMT	Band MHz	Emis-sion	Delay, Secs.	Duration	Own/ Other	Location	Interval Audible	What Was Heard
Denham, J. S.	KV4BO	1937	Evening, Local	12.4	CW	30	6-10	Other	San Diego, Harbor-- USS Holland	Once	Heard USS Bushnell's last transmission repeated (swap of signal reports).
Dietrich, T.	WA2ZEZ	1-9-63	0300	7.0	CW	30	30	Own	West Long Branch, New Jersey	Once	"CQ, CQ, CQ, de WA2ZEZ, WA2ZEZ".
Dorson, D.	K8PKY/1	5-27-69	0845	14.0	CW	3	3	Other	Gulf of Mexico, (MM)	Once	"CQ de UWØIJ K".
Dougherty, W.	WB4JFK	9-2-70	0001	28.0	SSB	3	5-7	Own	Sarasota, Florida	Once	"WA7PFA and the group from WB4JFK".
Dreyer, H. W.	K4HEN	11-13-69	1735	7.0	SSB	1 min.	---	Other	Key West, Florida	Once	Heard whole transmission repeated.
Duff, Wm. A.	W3AMF	8-16-69	0247-0355	7.0	CW	3	3	Other	Holland, Penna.	Once	Heard superposed replica on other signal
Elaen, H. E.	K7JAC	7-27-70	0523	14.0	CW	13	13	Other	Portland, Oregon	1 min	Repeat of W6JR call to G6 station.
Fisher, C.	WB4HXE	2-21-70	0304	3.5	CW	5	15	Own	Albany, Georgia	30 mins.	"QRZ de WB4HXE"--heard twice.
Fitzpatrick, T.	KP4DJI	5-10-70	0037	21.0	SSB	15	5	Own	Ramey AFB, Puerto Rico	Once	"WB4HAW this is KP4DJI do you copy Dick"?
Grady, M. E.	WN8DYY	2-7-70	1206	7.0	CW	1 min.	long	Own	Flint, Michigan	3 min	Other station call 4 times x 3 (own) heard after 1-second delay
Griggs, J.	W6KW	10-19-38	Approx. 0600	14.0	AM	8-10	8-10	Own	San Diego, California	Few mins.	CW DX call repeated, complete. "DX wavery".
Holowaty, M.	W8LRZ	1-22-70	1640	21.0	SSB	3-4 mins.	1½-2 mins	Own	Chardon, Ohio	Once	Heard repeat of previous transmission. "DX sound".
Liming, J. S.	G3XNH	12-27-69	1340	14.0	SSB	4	3	Own	Horsley, Surrey, ENGLAND	2 mins.	Sound of blowing into microphone (for test purposes) repeated

(TABLE 1 Continued)

Name	Call	Date	GMT	Band MHz	Emis-sion	Delay, Secs.	Duration	Own/ Other	Location	Interval Audible	What Was Heard
Minter, M. K.	G3YKM	11-6-69	1420	3.5	CW	6	(-)	Other	Horsham, Sussex, ENGLAND	Once	Heard CW call with superposed repeat--"band quiet".
Muench, M. W.	W9ZYD/ VE3	1960 or 1961	Winter	14.0	CW	30	10-15	Own	Chicago, Illinois	Once	"W9ZYD, W9ZYD dx de W9ZUD K".
Olsen, I.	LU?DMW	5-20-70	2050	21.0	CW	5-6	5-6	Other	Necochea, ARGENTINA	10 mins.	Previous word of QSO repeated.
Patrie, R. W.	W4RUC	11-3-69	1630-1700	14.0	SSB	25	25	Other	Atlanta, Georgia	Once	WØCK's transmission repeated. Heard by two others.
Pendl, C. B.	W9IHN	2-20-61	1230	14.0	CW	11	11	Own	Suring, Wiaconsin	Once	"W9IHN, W9IHN K" beam east; no flutter.
Pope, W. T.	W2KS	1-21-70	0136	14.0	CW	2½	2½	Own	Rome, New York	3 mins	"KS K".
Seymour, G. C.	WA2HVH/ VO2	7-9-70	2120	14.0	CW	5	½ min.	Other	Goose Bay, LABRADOR	Brief	Heard repeat of K4VQT call.
Stange, D. A.	W9NTE	12-7-69	0400	7.0	SSB	2	2	Own	Racine, Wisconsin	~ 5 mins.	"W9NTE standing by":"NTE standing by".
Stines, B.	WA7IER	4-15-70	0344	50.0	SSB	1	3	Other	Las Vegas, Nevada	20 secs.	WA7IER hesrd K7ICW say "1½ kc from the edge", and "report to the ARRL".
Tillery, B.	K7TUO	9-7-70	0334	50.0	SSB	2-3	2-3	Other	Phoenix, Arizona (K7BDU)	10-12 mins.	K7BDU hesrd delayed signal from K7ICW
Trefftz, W. H.	K4UDP	Summer, 1969	1000	8.1	CW	3	3	Other	North of Guam (Shipboard)	---	Transmission from KPN Guam blurred by echo. Definitely longer than RTW.
Van Arman, C. G.	W3DBQ	October, 1933?	2400	14.0	CW	22-25	10	Own	Chicago, Illinois	Once	"W9LWD, W9LWD. W9LWD K" repeated.
Williams, K. W.	W6DTY	4-3-51	0600-0700	3.5	CW	1	1	Own	Oxnard, California	1 hour	Letters repeated.

into a tedious game of measures, countermeasures, and counter-countermeasures. However, in case anyone is seriously interested, and is willing to pledge discretion, he can drop us a postcard and we'll be glad to share our thoughts.

The Cosmic-Repeater Possibility

When a physical phenomenon is encountered which appears to depart from previous experience as much as this one does, it is certainly wise in seeking explanations to be flexible and to investigate every possibility no matter how remote. One of these is "far out" - to borrow a contemporary phrase -- perhaps in more ways than one. But it might as well be mentioned here, because it must be considered along with the rest, and observers or potential observers ought to be aware that it may exist.

Consideration of the very large number of stars in the sky has led to a belief among astronomers that conscious life of the general type which has originated on earth is probably not unique in the universe, and may well have also evolved elsewhere. However, consideration of distance and probabilities leads to the view that if another "earth" exists somewhere, it is so far away that unless there are

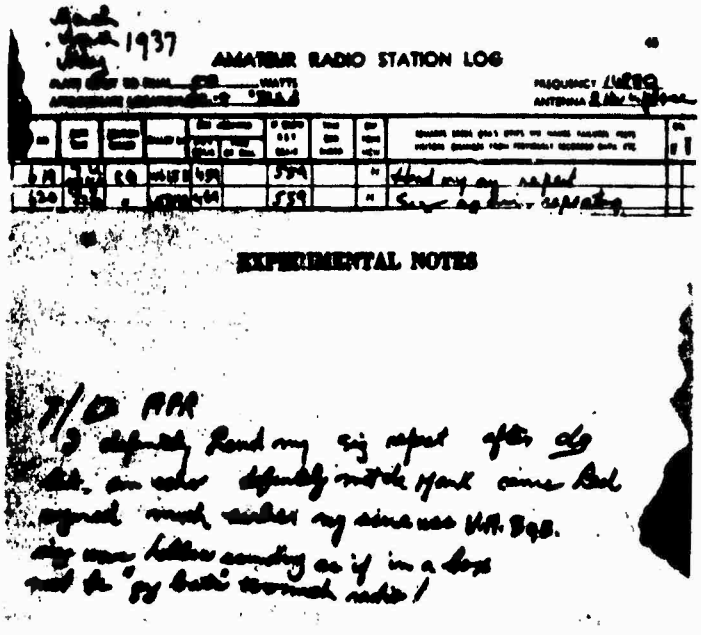

Fig. 1 — There is too such a thing as a long-delayed echo! Reproduced here are two original log entries concerning this phenomenon, made in 1937 by VK5LG, along with a comment written under the "remarks" heading. It reads, "I definitely heard my sig repeat after clg, like an echo, definitely not the Yank, cause he'd signed much earlier my sine was V.A.B.O.B., signal was hollow sounding as if in a box — must be 'gg bats' too much radio!" Many others since, in experiencing this effect, have felt that they too, were "going bats!"

physical laws which we don't now understand personal visits would require so much transit time as to be out of the question.

On the other hand, "visiting" by probes seems to be a possibility. Assuming that other civilizations share the same curiosity and the same willingness to support scientific research that we do, they could in principle, at least send out spacecraft which would be put into orbit around likely stars or preferably planets, to await some sign of civilized activity. Having found same in the form of Hertzian waves, the probe would presumably report that fact back to its senders, while at the same time attempting to alert the discoverees to its presence. (See Fig. 3.) The probe, it may be assumed, will not know in advance exactly what form of electromagnetic communications to expect. Therefore, what more effective way to perform the alerting function, than to repeat back to whomever might be listening, some fraction of a transmission that had just been sent?

The alternative of sending – blind – some kind of an attention-attracting transmission is clearly inefficient; consider the amazingly strong static-like signals from Jupiter. Our high-frequency receiver technology had progressed to the point where these signals *could* have been heard, say, as early as 1925. But their nature and Jovian origin was not established until roughly 35 years later.

The suggestion was accordingly made in 1961, by radio astronomy Professor R. N. Bracewell of Stanford University, that interrogations by cosmic probes might have the appearance of LDEs (ref. 3).

Those who have seen the movie or read the novel, *2001*, will recognize an analogous theme; instead of a repeater, the "probe" in that case was a radio transmitter.

It is reasonable to point out in this connection that there seems to be a powerful human impulse to explain *anything* unknown, as a manifestation of something "out there." Hams in their bifocal years will recall that early short-wave listeners often tuned in mysterious unstable buzzing sounds whose origin initially defied explanation. The less inhibited press of the day lost no time in proposing that these signals were transmitted by Martians seeking to attract our attention. The matter was not laid to rest until a clever engineer armed with an oscillograph showed that the frequency and phase of at least one buzz agreed well with that of the Greater Boston power system; the "Martian" communications were in reality signal leakage from early diathermy machines. (The mystery had been compounded by the skip-distance effect, since the leakage was often heard thousands of miles away from its point of origin.)

Frankly, the chances seem very good that the eventual explanation for LDEs will prove quite unspectacular. But at the moment it must be admitted that the cosmic probe hypothesis, although it has some drawbacks, is about as good

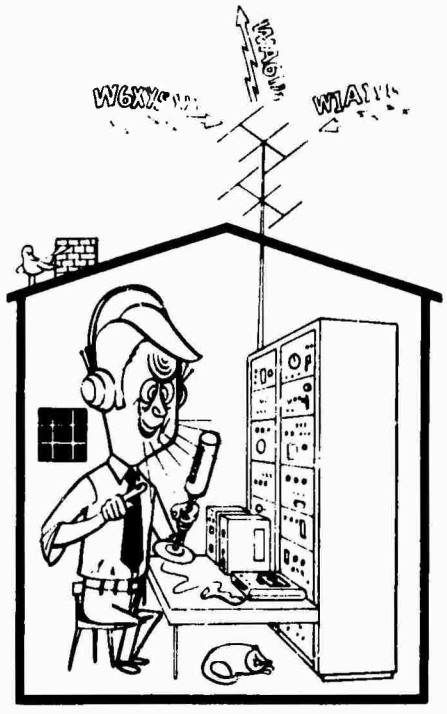

Fig. 2 – Behold, a hoaxer in the act of hoaxing. Weteh out for this pertieular form of electromagnetie pollutionl

an explanation for the reelly long-delayed echoes (provided, of course, that they aren't hoaxes) as anything else which has been postulated. Perhaps all this says is that we haven't been very ingenious thus far.

A New Finding

A new development of interest in this general connection is a peper which has appeared in the *Journal of Geophysical Research* by Professor F. W. Crawford and Mr. D. M. Sears of Stanford University (ref. 4). They describe four apperent LDEs obtained during the deylight hours with a sounder which directs its signal vertically upward, and offer a theory in explanation of their observations. LDE buffs will undoubtedly find this

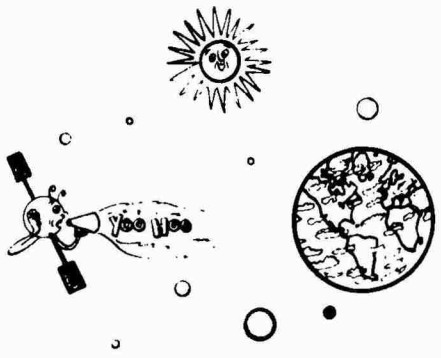

Fig. 3 – The eosmic probe hypothesis: Is someone out there trying to tell us something?

paper required reading, although it, too, says that lots more work needs to be done.

New Reports Since February, 1970

Table 1 can be thought of as an extension of the corresponding table in Ref. 2, up to a cutoff date of October 5, 1970. The same assumptions and procedures have been used in preparing it; please refer to the earlier article if questions arise.

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References

1) Villard, Graf, and Lomasney, "Long-Delayed Echoes . . . Radio's 'Flying Saucer' Effect," *QST*, May, 1969.

2) Villard, Graf, and Lomasney, "There Is No Such Thing as a Long-Delayed Echo AR long-delayed echo AR. . .," *QST*, February, 1970.

3) Bracewell, "Communications from Superior Galactic Communities," *Nature*, Vol. 186, No. 4726, pp. 670-671, May 28, 1960.

4) Crawford, Sears, and Bruce, "Possible Observation and Mechanism of Very-Long-Delayed Radio Echoes," *J. Geophys. Res.*, (Letter), Vol. 75, No. 34, pp. 7326-7332. QST