THE LINEAR DREAM

DO LEYS EXIST? An unnecessary question one might think, considering the current flood of words on the subject. In fact, though, the existence of leys is, to say the least, 'not proven'. Robert Forrest, **one of the new breed of tough-minded mathematical leyhunters, has been running his slide rule over some of the classic leys. He is not impressed by what he's found.**

Leys are alignments of ancient sites. To prove that they 'exist' the leyhunter must show that there are more alignments between the set of sites he is considering than would occur by chance. Each case must be compared with its own chance score, as the number of chance alignments to be expected depends on the number of sites, the width allowed and the size and shape of the area considered.

There is no agreement among leyhunters as to what counts as a ley point.

Some only include *bona fide* ancient sites and standing stones but others accept crossroads, milestones, treeclumps, moats and placenames that have 'leigh' or 'dod' or 'cole' in them. Most only count churches that were built on pagan sites but if a modern church is found to lie on a ley some leyhunters will talk of 'subconscious siting' and include it.

Nor is there agreement about the width to be allowed. Clearly, for the purpose of statistical comparison, it cannot be less than the width of the largest site considered. Some sites, such as camps and moats, are several hundred yards across, so that they are much more likely to align by chance than the single standing stones of Land's End described in *Undercurrents 17.*

The cases that follow are selected from fifteen that I have studied.

Mysterious Britain

On page 192 of their book *Mysterious Britain* (Paladin) Janet and Colin Bord describe four leys, of orders 9, 8, 7 and 5, in the Bedford area. A survey of the relevant map (sheet 147 of the 1" edition) yielded 600 sites (468 churches, 97 moats and 35 earthworks). Taking a width of 35 yards the ley parameter k (see the box Statistical Theory for the formula for k) is 0.52. This means that every other line drawn between two sites will have at least one other site on it by chance! The expected scores are: 0.1 9-pointers, 1 8-pointer, 15 7-pointers and 1144 5-pointers.

The 9-pointer includes two large sites: Drays Ditches and a moat. Both are skirted. Also, Chicksands Priory is in none too good alignment with the other sites. If we limit the width to 35 yards this ley is probably only a 6 or 7-pointer. The 8-pointer is rather better: it is a good 7-pointer and the doubtful eighth point (Arlesey Church) may just lie within the limit. The 7-pointer contains two large points (Drays Ditches and Waulud's Bank). Lastly the 5-pointer is a good alignment but it also includes a large site and two hills (not counted in my analysis). The 5-pointer is a good line but it also includes a large site (a moat). The kindest thing one can say about these 'leys' is that they are less significant than the Bords think they are.

STATISTICAL LEYHUNTING

If the sites are scattered at random over the map, then the number of alignments with three, four, five, etc. sites on them will (approximately) follow a Poisson Distribution with parameter k, where k is the expected number of sites on a line drawn between any two sites.

Definitions

n	total number of sites
x	width of ley
L	average length of ley (see below)
A	area of map
k	Ley parameter
$P(r)$	probability that a ley is of order r
W	total number of leys
$N(r)$	number of leys of order r

Formulae

$$k = n.x.L/A$$

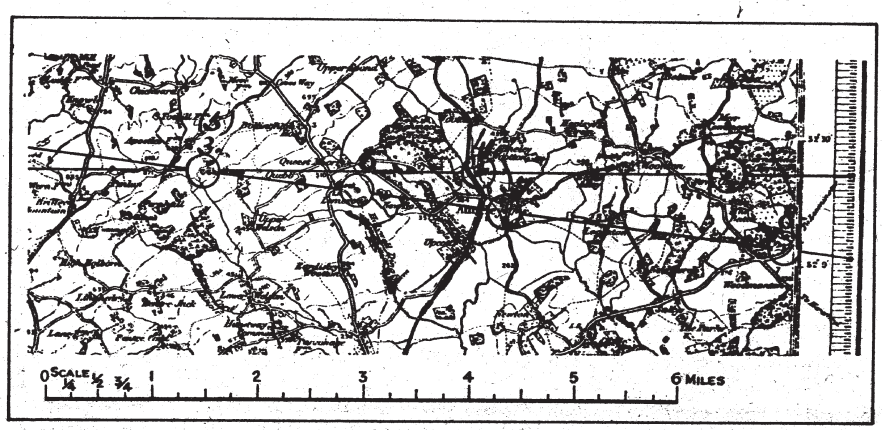
$$P(r) = k^{r-2}.\exp(-k)/(r-2)!$$

$$W = \tfrac{1}{2}n(n-1)/(1+2k+\tfrac{1}{2}k^2)$$

$$N(r) = W.P(r)$$

NOTE ON *L*. THE AVERAGE LENGTH OF A LEY

The length used in these studies is an estimate of the average length of a line joining two random points, extended to the edges of the map. This length is proportional to the width of the map in a ratio which depends on its shape. The simplest case is a square sheet like the 1:50,000 O.S. maps. L is then about 1.08 times the width of the map. Obviously the more rectangular a sheet is a map is the more necessary it is to make a good estimate of L by simulation.



View over Atlantis

On page xxi of John Michell's *View Over Atlantis* (Abacus) there is a map of alignments between moats in East Anglia, two allegedly of order 6. The map (an extract from sheet 155) contains 38 sites; their mean width is about 80 yards, giving k a value of 0.27.

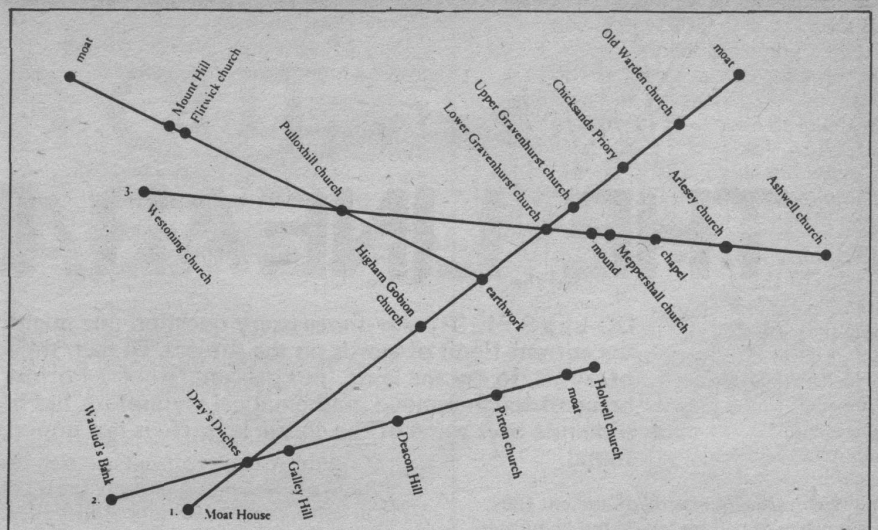
The expected number of 6-pointers is only 0.08 and the odds against two 6-pointers occurring by chance are 300 to 1, so *prima facie* this is good evidence of leys. Looking at the map, however, we see that though line A is a good alignment, line B includes a large site (Hessett Moat) and to this level of accuracy can only be counted a 'possible'. If it is only a 5-pointer then this map is not 'significant' in the statistical sense as we would expect to find one 6-pointer by chance in twelve such maps.

Sheet 155 contains a total of 126 moats; if we take a width of 70 yards the number of 6-pointers expected is 0.4 and the odds against finding two fall to 20 to 1.

The Old Straight Track

Alfred Watkins describes a 7-point (A) and an 8-point ley (B) in South Radnor (*The Old Straight Track*, Garnstone, pp 7-10). The relevant map is the bottom half of sheet 148; on it I counted 115 churches, 50 tumuli and 13 moats, making a total of 178. Allowing a width of 35 yards gives us a *k* of 0.23. The number of 7 and 8-pointers expected are 0.04 and 0.001 respectively. Once again we appear to have good evidence for leys but inspection of the map reveals the following details: line A includes two hill peaks (Wylfie and Glascwm Hill), both of which should be classed as 'large sites', and only skirts the moat (labelled 'the Camp' in the diagram); at best, therefore, it is a 5-pointer; line B includes another camp, which again is a large site, and only skirts 'the Camp'; worse, it misses one of the mounds at Hundred House by 50 yards which is more than the 35 yards we have assumed; so it is no more than a 6-pointer.

By chance we would expect 16 15-pointers and 0.9 6-pointers so these two lines are not significant.



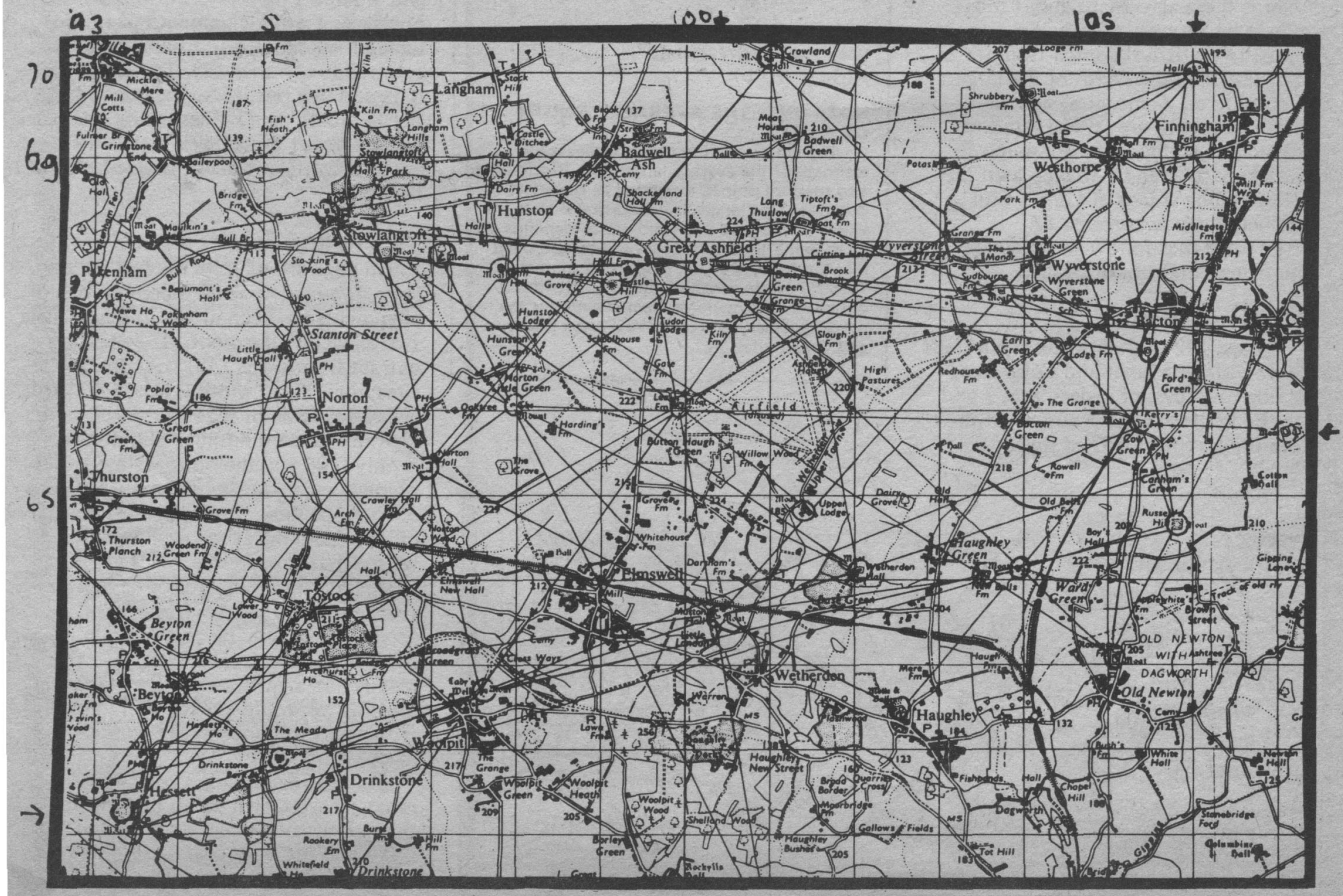
Some typical examples of leys in an area of England not famed for its prehistoric sites

The UFO Connection

Among the phenomena which imaginative leyhunters have linked to their lines are ghosts, UFOs, crimes of violence, and car accidents. The 'chance' explanation of these links is that in many areas there are enough ley lines about to make it likely that more or less any phenomenon we study will occur on or close to a ley line.

To test this hypothesis I did two experiments. First, I scattered 50 random points on a sheet of paper and drew in all the 'leys' between them I could find. Then I plotted a further 20 random 'UFO sightings' and counted the number that fell on or close to a 'ley'. I repeated this experiment three times; the average score was 50%. Second, I scattered 50 random points on a sheet of graph paper and joined up all the pairs, continuing the line to the edges of the paper. About 1100 distinct lines are obtained, splicing the paper into minute regions. Only a few of these regions are large enough for a random 'phenomenon' to avoid being attached to a line. It is true that most of the lines are of order 2 or 3 and do not count as leys. But a map containing 330 ley points would yield about 1100 leys (i.e. lines of order 4 or more), taking a width of 35 yards. So it would look quite like my piece of graph paper if they were all drawn in.

Of course the UFO leyhunter looks at things rather differently; he is more likely to plot his sightings first and then look for a ley for them to fall on. So I did another experiment: I took the 1" map of the Chilterns and ringed



all the sites on it (560 in all). Then I used random numbers to fix six 'UFOs' on the map; each was represented by a circle 0.1" in diameter, corresponding to an uncertainty in the sighting in 200 yards. Taking this as the ley width I found that all six 'UFOs' could be placed on at least three leys!

The Bournemouth Pumas

One of the chief proponents of the UFO link is Phil Grant of Bournemouth, who uses the six maps of his area in conjunction. He does not seem to have realised the arithmetical consequences of this. If we assume 500 sites per map and a width of 35 yards as before, we can expect no less than 352,000 leys, including 20 of order 10 or more. How many of these leys has he checked out, I wonder? Calculation also shows that any UFO sighting on this composite map will be at the junction of 126 200 yard wide leys!

Grant has claimed (*The Ley Hunter*, No 50) that 90% of ghosts and UFOs in this region occur on leys; that all the local 'puma' sightings occur on leys; and that 'schools, cemeteries and public buildings of all kinds (including, crazy as it may sound, post offices) fall on leys too often for pure coincidence'.

I, for one, am not surprised.

Other Case Studies

Space does not permit me to detail all the studies I have done. They include:

1. four others from Michell's *View Over Atlantis:* the Dorchester area (p.40); the Gare Hill leys (p.145); the Norfolk castle and moats on p. xvi; and the moat alignments on p.xx.
2. the South Durham leys described by Paul Screeton in his standard work on leyhunting *Quicksilver Heritage* (p.43) (Turnstone).
3. Salisbury Plain and Warminister.
4. The leys and circles in *Geometrical Arrangement of Ancient Sites* by Major T.C. Tyler (out of print).
5. The right-angled triangles described by F.W. Holiday in his book *The Dragon and the Disc.*
6. The equilateral triangles described by Sir Norman Lockyer in his book *Stonehenge and Other British Stone Monuments Astronomically Considered* (Chapter XL).

I will be pleased to provide details of these studies to serious students writing to me c/o *Undercurrents.*

It should be clear from this, I hope even to the most dedicated leyhunter, that I have taken as wide and fair a sample of the published literature as I could. If anyone knows of other sets of alignments that they consider to be good evidence I will be interested to hear from them.

Not Proven

There are two ways in which the ley hypothesis might be proved. The leyhunter must either find a profusion of medium order leys or a smaller number of high order ones.

None of the cases described here have come near to doing either. Nor have the others I have looked at. It must be remembered that one 'significant' result is not enough, if it is obtained by inspecting and rejecting a larger number of maps. Just as a gambler does not refute the laws of statistics by winning against the odds from time to time, so a leyhunter must do more than find a ley significant at the 5% level on one out of twenty maps he studies. What we need are several '1000 to 1 against' maps if we want the scientific world to take notice. Have such maps been found? If so, their discoverers are keeping very quiet about them.

My own view, on the basis of the studies presented here, and the ten others I have done, is that the ley hypothesis is false. Leys are no more than a chance effect.

Robert Forrest

HOW TO MAKE A LEY DETECTOR

MANY LEYHUNTERS are less interested in proving that leys 'exist: than in the 'earth current' that they think runs along them. Richard Elen outlines the evidence for what he calls the 'ley energy hypothesis' and describes two instruments that can be used to detect it . . . if it exists!

A question that has puzzled a number of prehistorians interested in megalithic alignments is: 'Why go to so much trouble?' The research of such workers as Thom, Michell, the Undercurrents Alternative Science Research Unit, and others, has tended to indicate that a great deal of mathematical and engineering expertise went into the construction of stone circles, the location of standing stones, and the manufacture of Stone-Age earthworks. Thom has shown[1] that stone circles were constructed with a high degree of precision to make possible the calculation of important dates in the solar and lunar calendars. They were laid out in a standard unit, the Megalithic Yard (2.72 ft); Pythagoras' Theorem was used a thousand years before it was put in writing by Euclid. The work involved was tremendous; for example it has been estimated that the construction of Silbury Hill would have taken over eighteen million man-hours. Stones in structures like Stonehenge, were frequently transported hundreds of miles to their final locations. Why, when local stone was available? Why was it necessary to predict eclipses to such accuracy, using the Moon's 'wobble', which was not rediscovered until the sixteenth century? Why align great stones in near-straight lines across the countryside? Why take trouble in some cases to ensure that some sites *did not* align?[2]

The system of megalithic structures is far too complex to be explained merely as a number of solar/lunar observatories. If communication was good enough to distribute flint tools over a distance of several hundred miles from the same 'factory', and to transport stones for Stonehenge from the Prescelly Mountains, why build so many observatories? My hypothesis is that megalithic man used a form of energy which flows between the sites for healing, communication, signalling and the revitalisation of both land and people. This energy can be felt by sensitive people, traced by dowsers and registered on scientific instruments. Eventually it may be possible to use 'Ley Energy' for its original purposes and even convert it into electricity.

What is ley energy?

Ley-Hunters and dowsers have often

reported 'tingles' or 'buzzing in the head' when approaching or touching certain stones, or standing on a ley line or 'power centre'. One such instance is recorded in Paul Screeton's interview in *Undercurrents 11*. Tom Graves, in the final section of his book, *Dowsing*[3] records the results of several surveys of stone circles such as Rollright, in Oxfordshire. He describes 'energy bands' inside the circles, and energy lines both within and without the circles, sometimes connecting sites some distance apart. Graves also mentions the discovery by Bill Lewis and John Williams of 'nodes' or 'wavebands'. They are seven in number: counting from the bottom, the first three are related to Guy Underwood's geodetic patterns,[4] the fourth relates to the stone's 'local communications', whilst the sixth handles 'long-distance communication'. The fifth waveband is strange, in that it can give the impression, if the hands are rested on this point on the stone, that the stone is 'rocking' back and forth. This is only subjective phenomenon but very apparent. The seventh waveband is capable of giving a severe 'electric' shock to an experienced dowser.

The strength of these reactions appears to vary with the Moon. They are weakest on the sixth day after the new and full moon, when the polarity of the charge seems to reverse. Underwood notes that several of his patterns change at this time; this is also the time of the start of the month in the old Celtic calendar. This alteration would be an ideal point upon which to base a calendar, as it could be registered even when the moon was unobservable. That ancient man was sensitive to these effects is also suggested by the legends and names associated with the stones (e.g. the Tingle Stone and the Twizzle Stone in Gloucestershire).

This energy has also been recorded with instruments. Professor John Taylor and Eduardo Balanovski recorded the results of investigations at a standing stone near Crickhowell, pointed out to them by Bill Lewis. Bill indicated the wavebands by dowsing and marked them with chalk. Taylor and Balanovski then measured the magnetic field of the stone at 10 cm intervals from the base. They found magnetic anomalies which corresponded to Lewis' marks. The instrument used was a sensitive gaussmeter, capable of reading changes of about 0:001 Gauss. However, it need not be so sensitive as Taylor and Balanovski recorded changes of up to 0.1 Gauss.

Jim Goddard, a Surrey leyhunter, suggests a hypothesis that can also be tested by the construction of suitable instrumentation. He has found that the piezo-electric effect (a potential difference appears across materials such as quartz when they are stressed) is magnified by ley energy so that the voltage produced is increased. He has been able to detect the change using simple instruments containing natural quartz. Instruments to measure this effect are described below, as Goddard's design is sensitive to subjective interference.

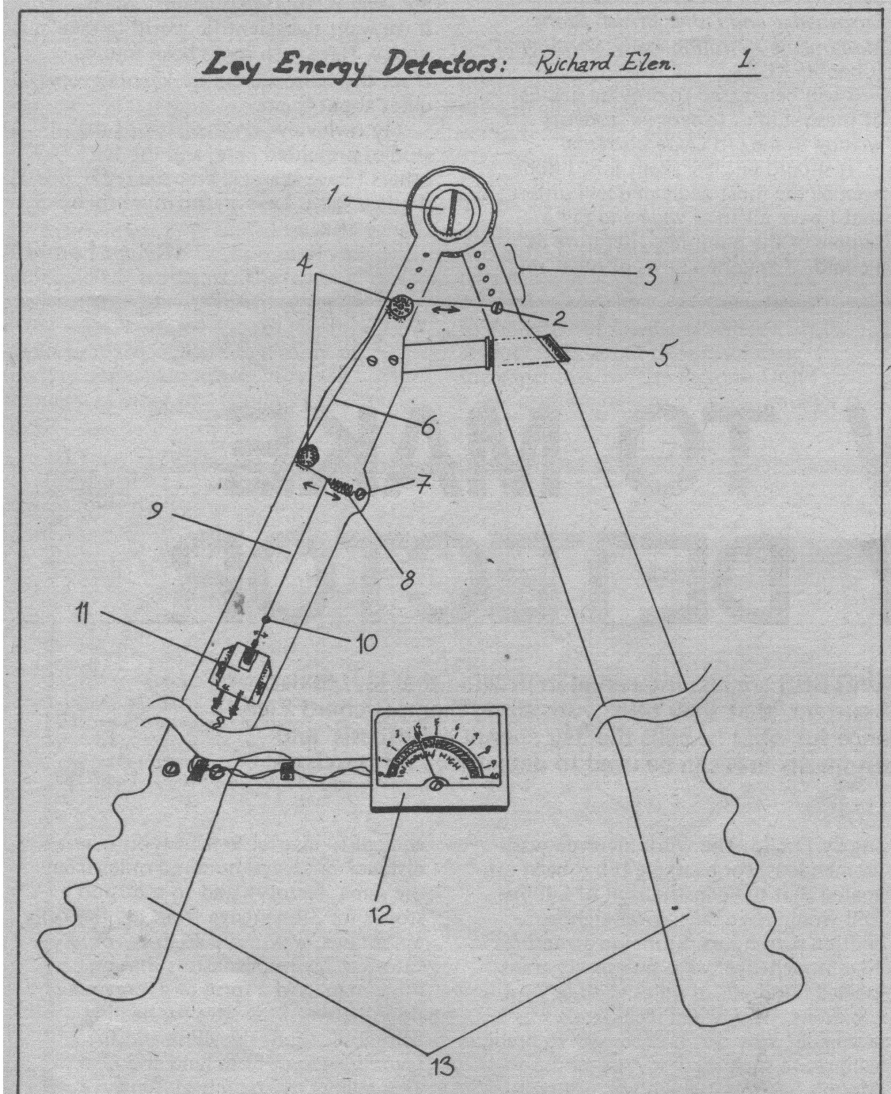
Some researchers have suggested that ley energy may be a manifestation of Reich's 'orgone Energy'. On this hypothesis, structures like Silbury Hill may operate as 'orgone accumulators' with their alternate layers of organic and inorganic material. Silbury could have stored orgone energy produced at by the stone circle at Avebury, which is nearby.

Detecting ley energy

John Taylor's research can be tested by using a suitable gaussmeter. I have got interesting but variable results with a simple magnetometer. If possible an accurate device, which can be set up to remove the normal field due to the earth and which has a separate probe, should be used.

Jim Goddard's piezo-electric effect can be demonstrated with the two instruments described in figures 1 and 2. Figure 1 is a design for a piezo-electric dowsing rod. It will respond to both 'objective' changes in the piezo-electric effect and to 'subjective' changes in the dowsing response.

Figure 2 shows a more sophisticated instrument which will only respond to objective effects. A piezo-electric transducer, driven by a 3 kHz sine or square wave oscillator, is coupled with a second transducer which converts the mechanical energy back to electricity. There are two probes: *A* is made of a crystal earpiece driver and a crystal record reproduction cartridge receiver; *B* of two cartridges, one as driver and one as receiver. In both probes coupling is mechanical. It is expected



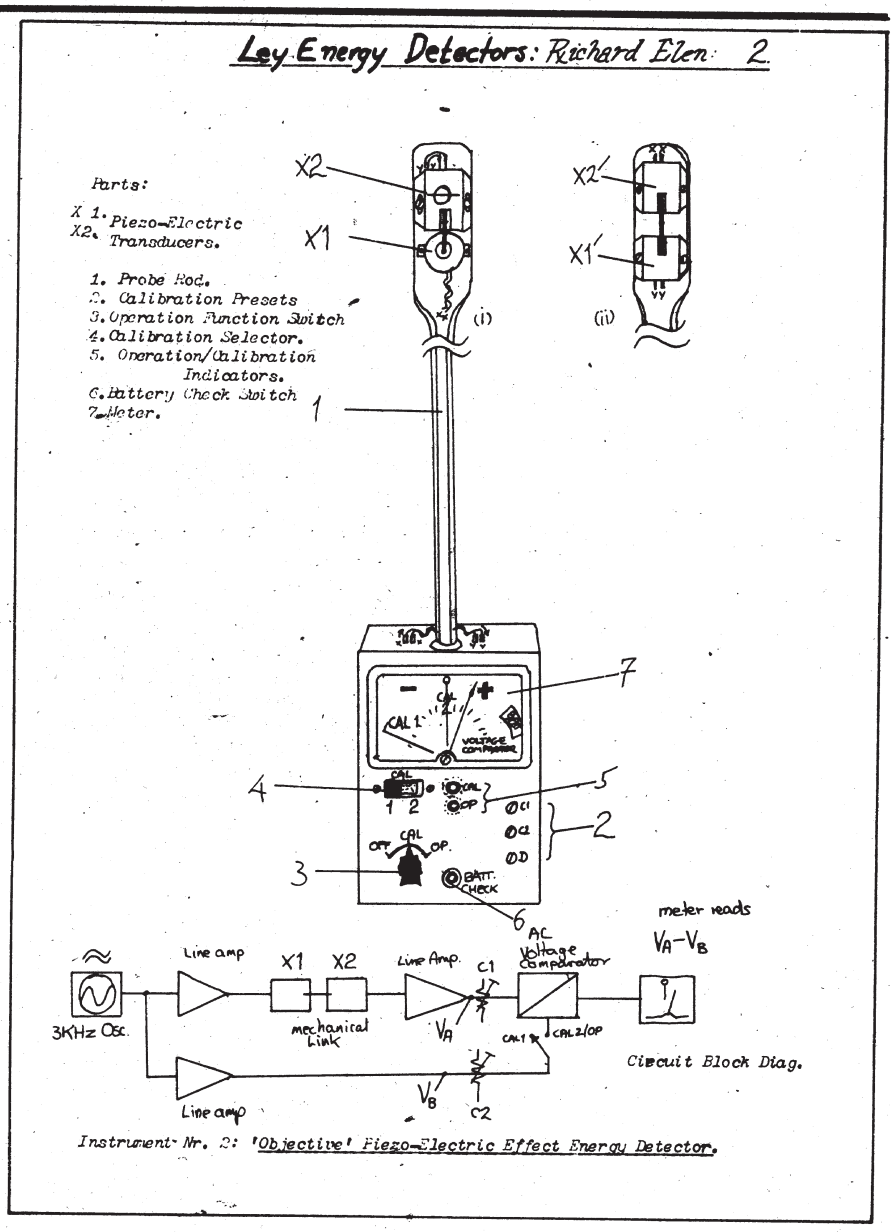
that the use of two crystals will double the effect. The output of the oscillator should be about one or two volts. It should be possible to vary it.

To increase the sensitivity of the device, the oscillator should have variable frequency so that it can be 'peaked' to read a maximum on the meter when it is being calibrated. This will ensure that the transducers are working at their maximum efficiency. Use a voltage comparator and a centre-zero meter with variable range and a high input impedance to compare the output from the oscillator and from the transducer. The device will need to be calibrated in a 'normal' environment to equalise the two voltages and get a zero reading on the meter.

This device is simple to use: having checked that the meter is at zero, move the probes towards the line or stone under study. If necessary ask a dowser or sensitive to choose a site where they subjectively feel there is energy.

If repeated trials yield no result we shall have to conclude that the 'Goddard effect' is purely subjective and no more than a variant of the normal dowsing response. It seems more likely, however, that it has an objective component as well, We can only try it and see.

Richard Elen



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1. *Megalithic Lunar Observatories* and *Megalithic sites in Britain* by Professor A. Thom (Oxford University Press).
2. *A Computer Study of the Megalithic Alignments of Land's End* by Chris Hutton Squire and Pat Gadsby *(Undercurrents 17)*.
3. *Dowsing* by Tom Graves (Turnstone Books).
4. *Pattern of the Past* by Guy Underwood (Abacus).

Fig. 3. Preliminary indications of energy fields around stones, and effect of stone movement. A and B are stones in their original positions. At 1, a stone has been moved a short distance. Note how it still has a field, and a line back to the original site, although sometimes it will bend the line (the energy hypothesis does not necessarily require dead straight lines). At 2, the stone is further away, but still 'talks' to its original site. At sufficient distance, about 0.5 miles, the connection will be broken, although there may be a small 'induced field' (3). Beyond this, the stone will probably be 'dead' (4), although there may still be a residual field at the original site. This residual field may be increased by the presence of a marker, as at Avebury, although the resulting field will not be as strong as the original stone. In cases 1, 2, and 3, note how the moved stone is still linked with the original stones in the alignment, thus distorting its Watkins-described dead straightness.