

Anomalous Propagation

A short story by [Trevor Hopkins](#)

“We’re right in the centre now,” Dave said, struggling with the map in the wind, while I examined the view from the hilltop.

There was nothing to see in any direction. Finally, I looked up. I could see nothing but low dark cloud fitfully reflecting the distant orange streetlights of Rochdale and Oldham. In any case, the wind blowing the drizzle more or less horizontally over the hilltop made it near-impossible to see very much in any direction.

I was beginning to wonder if we had been wasting our time, that all we had to look forward to was a mile walk in the wind and rain. We might not even make it to the pub before closing time. I thought back the sequence of events and just how we had got here.

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I have to admit that I am a Radio Amateur – a Ham Radio enthusiast if you insist, although generally we don’t really care for the term. If pressed, I would also have to agree that this is a rather anorak-y hobby, rather like train-spotting (for which I have no enthusiasm whatsoever) – although I was certain very glad of the heavyweight waterproof cagoule I was currently wearing.

Actually, amateur radio is not all sitting in damp wooden shacks at the bottom of the garden, applying soldering irons to mysterious electronic components and speaking to distant strangers over the airwaves. In fact, there is a strong social aspect, and I am a keen member of the local radio society. The club organises a whole variety of different events, including regular weekly meetings in the community centre.

This particular fixture was a radio Direction-Finding contest, and was one of the more frequent evening activities. Now, these foxhunts have their roots in the Second World War. The scenario is that spies are communicating their intelligence using a hidden transmitter. Our task, as the Good Guys, is to track down the agents and apprehend them, using only the sporadic transmissions for guidance.

A small team – usually two people – sets out early in the evening to erect a suitable aerial in some out-of-the-way but publicly-accessible area, preferably somewhere with trees or bushes to conceal the operators. They take a portable transmitter and a twelve-volt car battery to run the thing. I've done this myself a time or two, and I know it is worth taking an old sleeping bag and plenty of warm clothing, since you need to remain quiet and motionless for extended periods, hidden in the undergrowth. It was a cold November evening, and I certainly hoped the operators had remembered their winter woollies.

On this occasion, the 'fox' transmitter was being operated by two blokes from the club I knew quite well: Alan, known as "The Good Doctor", partially because he really does have a PhD and partially because he looks a little like a younger Isaac Asimov, and John, known as 'JS' to distinguish him from the numerous other Johns in the club.

The participants gather in their cars at a designated starting point, which might be ten or twenty miles from the hidden transmitter. Competitors are usually in teams of three: a radio operator, a driver and a map reader. The first team to locate the hidden transmitter is of course the winner, although finding the 'fox' at all is often a challenge for newcomers to the exercise.

The hidden operators make an initial transmission at a pre-designated time and using a specific frequency. They then transmit at certain defined times over the next half-hour, and then at random intervals no more than ten minutes apart. The transmissions get longer towards the end, with a final continuous transmission, to make it easier for less experienced, or just less lucky, teams to successfully locate the transmitter. All this is carefully timed so that it is possible to track down the transmitter, get the hidden operators to sign the entry form as proof, and still meet in the pub afterwards for a steak-and-chips supper and a pint or two of beer.

Originally, these events used short wave frequencies, just like the wartime Secret Agents or Resistance Fighters, depending on your point of view. These days, though, the ready availability of reliable and miniaturised kit – made in Japan as a rule – means that every Ham I have ever met would be carrying a two-metre portable transceiver in their pocket.

Now, 'two metres' does not refer to the size of the equipment, but rather to the wavelength of the radio signals. This also defines the size of the antenna used. For foxhunts, the aerial is shaped like a capital

letter 'H' and is invariably homemade from aluminium rods and tubes, a variety of odd bits of plastic and copious quantities of sticky tape.

The homebrew device has long arms about a metre long (a 'half-wave dipole') set on a crosspiece, the bar of the H, about half a metre long. There is a compass fixed to the crossbeam handle, and a short cable which runs to a portable receiver (kept in an inside coat pocket to keep it dry) with headphones (usually ex-army surplus, since they are likely to get wet and muddy).

The two dipoles are phased so that the reception pattern is heart-shaped: good reception all the way around the points of the compass, except for one direction – a 'null' – so that the signal disappears when pointed at. You will just have to imagine a car park full of anorak-wearing nerds carrying silly aerials swivelling around frenziedly trying to get an initial bearing on a distant transmitter.

The bearings are plotted on 1-in-50000 series Ordnance Survey map of the area, which are usually carefully covered in transparent self-adhesive plastic – yes, the famous Blue Peter 'sticky-backed plastic'. This makes the map still readable in the inevitable rain and, more importantly, it allows marks and bearings to be made using those dry-wipe pens intended for whiteboards.

The technique is to take one bearing from the official start, then leap in the car and drive manically (I mean, 'with all due care and attention', of course) to a selected point to one side of the expected direction. The objective is to take several bearings from different places and plot these on the map. You normally expect to find the lines crossing to form a triangle, since there is likely to be a few degrees error in any reading. The hidden station is probably somewhere in the triangle, so you drive closer – to within a mile or so, and take more readings.

All was going according to plan until Dave and I took the third reading. We had screeched to a halt at the side of the road when I had heard the latest transmission, and I leapt out of the car to take another bearing. Dave unfolded the map and plotted the direction I had shouted out. The second and third lines diverged. Now, this is of itself not entirely unusual; when you've been hurried or careless, or not held the beam steady while reading the compass, it is easy enough to get it quite wrong.

We still could infer some idea where the transmitter was hidden and, after a certain amount of huddled discussion, Dave suggested that we

drive as far as we could before the next transmission and see if we could get a better fix.

We tried this, and again, but whatever readings we took, there seemed to be an area of the map which radio signals just would not propagate through. The transmissions seemed to be coming from two points simultaneously, separated by a distance of perhaps a mile.

The modern environment contains huge amounts of electrically conductive material, such as the steel reinforcing rods in modern concrete buildings. If the metalwork is separated by gaps significantly smaller than the wavelength, then the radio waves just will not propagate inside the building. At this frequency, for example, an excellent Faraday cage can be constructed using just chicken wire.

Large objects containing a lot of metal, such as the skyscrapers in cities, tend to reflect and refract radio signals, leading to dead spots, as well as re-radiation where the entire structure acts as an aerial and re-broadcasts the signal.

By this time, I had begun to suspect that the Good Doctor had devised some sneaky way of disguising the origin of his signals. It was not unheard-of, for example, for a hidden station to be deliberately sited close to overhead power cables, so that the radio signals appeared to emanate from multiple metal pylons along the line of the wires.

As we were taking more bearings, we had been steadily converging on the dead zone bracketed by our measurements. I was convinced that the 'fox' team had deliberately identified some location where strong re-radiation produced the confusing signals we had detected. This was just the sort of cunning trick I expected from JS and the Good Doctor.

Even so, I was confused. A closer look at the map showed that the zone was located in remote area, well away from fixed, high-power transmitting sites (TV masts, for example) and the map showed no sign of power lines. It was just an area marked with the moors and fields of an ordinary East Lancashire hillside.

It was this nondescript point that Dave and I were currently heading for, alternatively walking and running up the hillside in increasingly poor weather, having abandoned the car at the end of a rutted track.

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I dragged the headphones over my ears. Nothing – the receiver was not working. I took it from my pocket and noticed that the battery pack was loose again. I had cracked the plastic latch by dropping the thing on

a previous foxhunt and it could have easily become dislodged during the stumbling hike over the moor. I jiggled it back into place; it re-seated with a click, and the receiver burst into life.

The Good Doctor was transmitting continuously now, nearing the end of the competition. I was getting a very strong signal but, as I waved the beam aerial around, I could not find a null in any direction. The transmitter could not be far away, but I had no idea of the direction.

Meanwhile, Dave was swinging his torch around, looking for telltale signs of movement in the dark mounds of heather and gorse bushes that dotted the area. An essential part of the foxhunter's equipment is a powerful torch, preferably with batteries which can be recharged from the car cigar lighter socket. The portable lanterns both Dave and I were carrying were heavy and cumbersome, but were as powerful as car headlights and lit up the countryside all around.

On a whim, I pointed the beam upwards. The signal in my headphones dropped off suddenly and, almost automatically, I stiffened into a position which indicated a clear direction. I was detecting a deep null from almost straight up, as if the hidden station was somehow hovering in mid-air over our heads.

Or, the thought rushed into my head unbidden, as if some large metal object was hanging over our heads, reflecting the signal from the transmitter.

“What are you doing?” Dave bellowed.

“The signal!” I shouted in reply, “It’s coming from up there!”

As one, we swung our torches upwards. There was nothing to see, other than droplets of rain glittering in the wind. Just then, something happened. There was a great sense of movement immediately above us, somehow telegraphed by strange movements of the winds. The drizzle seemed to be moving upwards, swirling around in the light of the torches, rather than being blown uniformly sideways as it had been only a few moments before.

The movement was accompanied by hissing, rushing sounds, loud enough to be audible over the noise of the wind and rain beating on the hood of my anorak. These noises were joined shortly afterwards by a near-subsonic rumbling. It did not sound like any aircraft I had ever heard before.

For a few moments, we could not actually see anything out of the ordinary. But then, there was a disruption to the clouds above us. I

could see strange movements lit by the distant street-lighting as some black bulk, impossibly huge pushed its way upwards, just visible as a contrast against the grey low-lying cloud base. Then it was gone,

What I think happened is this. Almost all radio receivers also *transmit* signals, although most people do not realise this. The super-heterodyne principle, used in pretty much all receivers, requires the use of a local oscillator. By design, these oscillators do not emit very strong signals, but they are nevertheless detectable over short distances. This is how those old TV detector vans used to work.

Whatever it was up there, it became aware of the receiver only when I reconnected the battery, and faint but detectable signals suddenly started coming from directly underneath it. We simply scared it off.

Thinking about it later, the flying object, whatever it was, possessed effective optical camouflage – a cloaking device, just like the Klingons in some old episodes of *Star Trek*. Actually, I understand that such technology is theoretically possible: the properties of certain molecules can be employed to bend light around an obstacle, perhaps, or the use of phased array optics to project a hologram of the view from all directions.

I can imagine that this technology could be made to work for kinds of electromagnetic radiation other than light, which probably explains why the object was not detected by radar. Modern radar uses millimetric waves (microwaves, as in the cookers). These obvious strong signals, with characteristics special to radar, could be managed by suitable countermeasures, absorbing or re-routing the microwave energy around the object.

On the other hand, VHF radio, like the two-metre wavelengths we were using, is populated by a large number of low-power transmitters, everything from police walkie-talkies to taxi companies. These devices are intended for local communications, and are in highly intermittent operation. There would be almost nothing to distinguish the occasional transmissions from our competition fox from any of the myriad of other radio signals in the vicinity.

So why did it run away? Perhaps we were just too close to allow the same cloaking to work, or maybe there was no need to hide itself from radio signals. But it must have easily detected our presence –we were not trying to hide ourselves, flashing our portable searchlights around – and simply decided to move away.

But what was it, really? A UFO, obviously, some kind of flying machine, but was it really an alien spacecraft, some visitors from another

plant on their own inscrutable mission, hovering over an out-of-the-way place for more than an hour? I cannot imagine what the attraction of that particular spot was. Was it attempting a landing, or perhaps waiting to rendezvous with some other vehicle?

Or was the Unidentified Flying Object of entirely human origins, some kind of top-secret military aircraft on a night-time training mission over an obscure part of the English countryside? I have no way of finding out.

It was just dumb luck that the Good Doctor had chosen to locate his hidden transmitter not so far away from the mysterious object, whatever it was. The transmitter was actually located in a wooded valley, slightly shielded in the direction of the hilltop where Dave and I ended up, but with a clear propagation path towards the official start-point.

I made a few discreet enquiries at the pub later that evening. It turned out that we were the only team to head west for their second and third readings, the only team to notice anything unusual, and so we were the only team to observe this anomaly.

Back on that wet hillside, stunned and shocked by what we had seen, Dave and I looked at each other.

“What are we going we do?” I asked.

“I don’t know,” he replied thoughtfully, “But I don’t think anyone is going to believe us, whatever we say.”

Slowly and carefully, Dave started rubbing out the lines on the map.

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