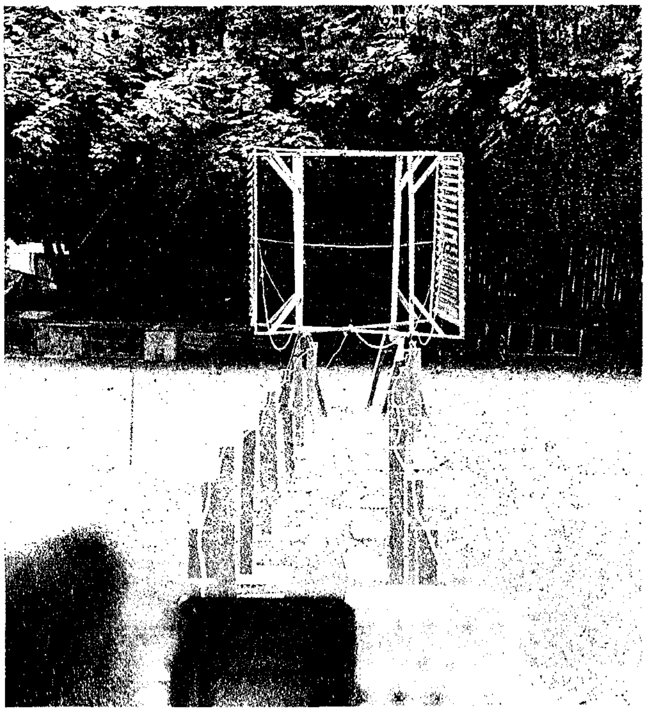
Thirty six nanoseconds faster than light

This article is based on refined measurements made with the Obolensky electrical circuit arrangement which, in its various versions, has been around since 1977. Since then various reports on possible faster than light events with various speeds have been made.

P T PAPPAS, ALEXIS GUY OBOLENSKY



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The present measurements indicate definite anisotropy of the normal velocity of light, depending on the orientation, the time of the day and the polarity of the current. Certain practically instantaneous interactions seem to have occurred beyond the available resolution of the instruments. Other signals have been observed at precisely twice the velocity of light. All the above measurements withstood the statistical analysis for an artifact effect.

In particular, the anisotropy discrepancy is a function of the travelling path, which goes to zero inverse proportionally to the separation distance. The double speed light signal is similarly delayed inverse proportionally to the distance of propagation. The coincidence and phase shifts in the dual channel fast oscilloscope change in accordance to the above effects, indicating that the observed effects are real and not an effect generated in the instruments, detectors or other media.

They suggest that certain signals can travel up to twice the speed of light. These experiments have been conducted since 1977. Similar observations and reports have been made on several occasions by Obolensky [1].

However, systematic experimentation with the parameters of the experiment and systematic numerical analysis of the results was made for the first time during August 1988 at the Technithion/Bromion laboratories at Sloatsburg, New York and are presented here. In this way the significant factors of the experiment and their relation became clear, so that the experiment is reproducible in all its versions.

The experiment employs one of the top fast oscilloscopes available in the market, the Tektronix 2764. Three effects were observed, 1) practical instantaneous interactions, 2) signals propagating at twice the speed of light and 3) anisotropic signals with respect to the direction. None of these cases were expected by the electromagnetic theory.

DESCRIPTION OF THE EQUIPMENT

The Obolensky circuit consists mainly of a symmetrical triangle circuit, as shown in fig 1, a battery to supply current around it, two relays to interrupt its current and few more accessories described below. Two 60Kohm resistors are placed symmetrically as shown in the figure, to limit the current so that the battery will not be short circuited and destroyed when both relays were closed. The battery was 250V, a commercial photoflash battery.

Near the two base corners, two identical mercury relays interrupt the Obolensky circuit, which when not excited are normally closed and conducting. Next to the two relays, two signal sensor coils are placed. The two coils were identical. The primary coil is actually the base wire of the triangular circuit, passing through the axis of the coil. When there is a signal through the wire, ie, a change in the current density, an induced signal, ie, an emf potential appears at the coil terminals, proportional to the current intensity change. The induced signal was impedance matched to 50 ohm, through another transformer inside the relay package and connected to a high quality 50 ohm coaxial line.

The coaxial lines from each transformer were mounted on wooden stands about 60cm above the ground and they were arranged symmetrically to each other. They were brought to the oscilloscope and connected through the 50 ohm inputs provided there. The base of the triangle, in the August 1988 experiments, was of variable lengths as well as the 50 ohm transmission lines. For the base lengths of 5,10,18, and 20ft were chosen; and for the transmission lines from 35 up to 105ft lengths were chosen. The base wire was a single commercial wire with a plastic insulation around it. At the ends of this wire and perpendicular to it, two square metal plates of 1.5×1.5 square meters were placed and made contact with the base wire, as shown in the figure.

These metal sheets face one another and form the plates of a capacitor. Their function was to enhance the signals received at the oscilloscope. The whole apparatus was movable and could be placed at various orientations. In the first series of the experiments, the apparatus was placed with the base wire facing east/west and the two transmission lines going south.

THE OBSERVATIONS

While the experiment was in operation one of the two relays were excited with 12V AC at 60 Hz, transformed from the 110V mains. This caused the relay to open and close 60 times a second while the other relay remained closed. The signals received at the oscilloscope are shown on page 1164. Obviously when one relay, say relay A figure 1, is energized the event of the capacitor discharge is propagated via two routes to the dual channel oscilloscope: one short route ABF and one longer ACE route. The trigger was set near to zero level and what is shown is the events received from both transmission lines, when either the left or the right relay interrupted the circuit. One signal was always inverted inside the oscilloscope, so that the two traces did not overlap.

The first thing always to notice is the fact that two signals arrive simultaneously from each line, with no detectable time difference. These two signals with initial almost zero amplitude, both increase progressively in magnitude with time. Then a sudden enormous signal appears, almost a vertical spike, which changes the amplitude in the opposite direction. After these two events, dumped oscillations, consisting of similar spikes follow outside the range of the oscillograms, until all the signals go to zero. The signals shown in the oscillograms relate to the event which is caused by one of the relays interrupting the circuit. When the circuit is first interrupted the current still flows, due to the distributed inductance; and it charges the two capacitor metal sheets. The voltage increases between the plates and appears across the opened contacts of the relay. Due to this excessive voltage an avalanche initiates between the relay contacts and the capacitor plates discharge giving a relatively huge instantaneous current, several orders of magnitude bigger than the DC current flowing under steady conditions.

Because of the extremely weak coupling of the signal transformers on the base wire, only the violent event of the capacitor discharge is the event recorded by the oscilloscope. The event of closing again the contact of the relay corresponds to a current increase from 0 to 2mA in about 100 nanoseconds. This is a too small change compared to the capacitor discharge in less than one nanosecond resulting to a change from 2mA to several amperes and back to zero.

The obvious puzzle is what are these two simultaneous signals, related to a common cause, but via unequal paths. Numerical analysis of the data of the August 1988 experiments showed the following facts.

1. The time difference between the two spikes from each channel is proportional to the length of the base wire, the ratio of the length of the base wire over this time difference, is about equal to the expected velocity of an electromagnetic wave along an antenna, which is close to the velocity of light in vacuum.

2. This time difference relates to the direction of the triggering relay and to the polarity of the DC current in the base wire, and according to A. Obolensky, considering earlier data for a given current polarity, it varies with the time of the day; and it depends on the horizontal and vertical directions of the base wire.

3. The time delay, from the moment the two signals appear simultaneously until the first spike appears, is proportional to the transmission line length. The ratio is practically constant and slightly over twice the speed of light in vacuum.

4. Making the lengths of the transmission lines unequal, the two signals no longer arrive simultaneously, but one delays with respect to the other by the amount of time needed to travel the extra length at twice the speed of light.

With the above discoveries, the values for signal velocities along the lines, which best fit all the data are as follows:

a) Two one way Maxwellian velocities C_0 along the base of the Obolensky triangle:

$C_0 = (271 \pm 1.8) \times 10^3$ Km/sec, r.e. 0.7%, for clockwise propagation
$C_0 = (278 \pm 2.2) \times 10^3$ Km/sec, r.e. 0.8% for counter clockwise propagation.

This velocity is responsible for the relative propagation delay of the huge spikes. It is a measurement of one way velocity and not the average measurement of the go and return velocity, as it is usually the average velocity, measured in the case of light. In this way, the one way velocity is found slightly anisotropic as described above and depending on not properly understood factors such as direction and orientation. This uncertainty introduces the relative high error in the data compared to the top technology instrumentation employed in the experiments.

b) A practically instantaneous, non Maxwellian velocity C_{nm} or a higher velocity than the resolution which the oscilloscope allows to detect, along the base of the Obolensky triangle:

$$C_{nm} \cdot 100C$$

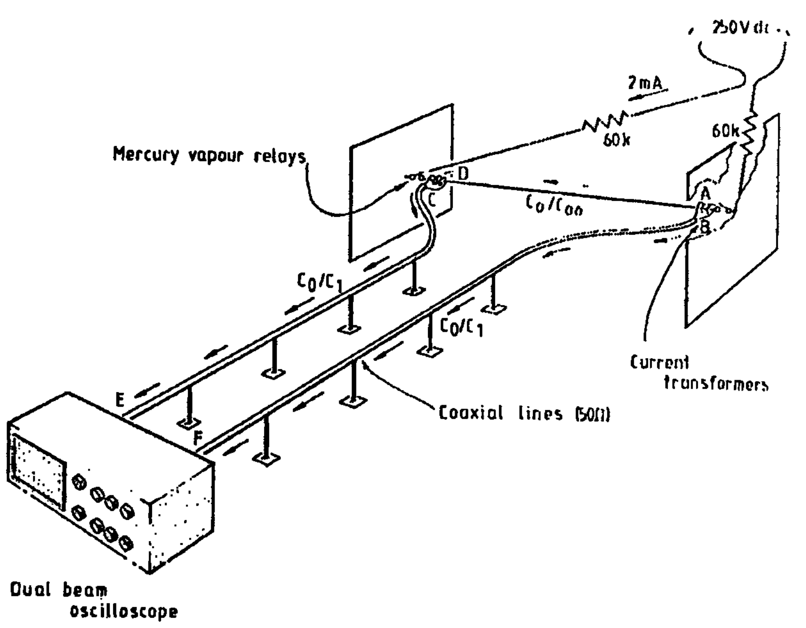


Fig.1. A.G. Obolensky's experiment. Oscilloscope is Tektronix 2764.

Table 1: 10 Velocity in the transmission lines

Trans. line length/ft	Time lapse* ns	Velocity Km/s
74.5	36	630031
39	18.8	632155
39	19.3	615696
39	19	625449.6
55.5	27.2	621792
56	28.2	608990
64.5	32.5	604723
82.5	41	613257
91.5	45	619658
108.5	53.8	614476

mean velocity 619660 Km/s
standard deviation 2764 Km/s

*Time lapse between the simultaneous appearance of the two arrival signals and the first spike.

Table 2: Clockwise and counterclockwise velocity

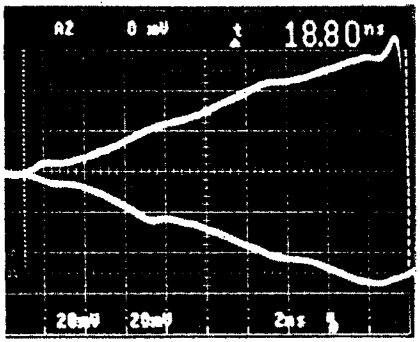
Straight line/ft	Time lapse* CW	Time lapse* CCW	Velocity ft/ns CW	Velocity ft/ns CCW
5	5.65	5.74	.8849558	.8710802
5	5.62 ns	5.78 ns	.8896798	.8650519
5	5.62	5.74	.8896798	.8710802
5	5.65	5.81	.8849558	.8598452
10	10.85	11.25	.9216589	.8888889
10	10.7	11.00	.9345794	.9090909
18	19.2	19.75	.9374999	.9113924
20	21.4	22.00	.9345794	.9090909
mean velocity Km/s			278000	271000
standard deviation Km/s			1800	2200

*Time lapse between the two successive spikes.

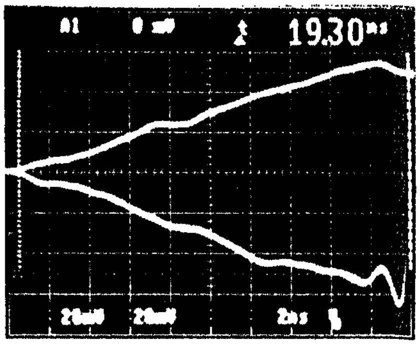
Measurements show that there might be a phenomenon – a purely electrical signal speculate the authors – that travels faster than light. It shows up here as the simultaneous arrival of a low level signal (at the origin on the left of each trace) occuring just before the relatively massive swing that you would expect to see when the relay opens.

Antenna distances and transmission-line lengths have been varied, and even the orientation of the set up has been altered. In each case, the phenomenon remains.

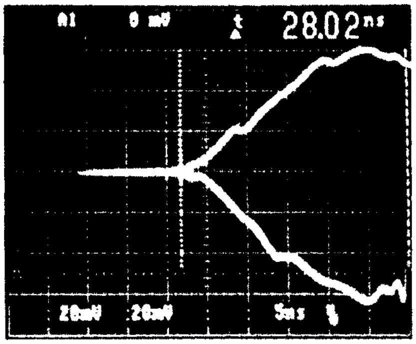
The pulse relay has picosecond rise and fall times.



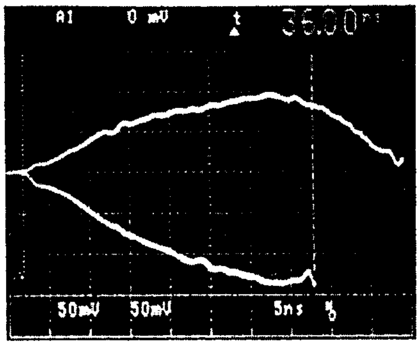
Antenna 10ft Transmission line 38.5ft
$C1 = 2.074 \times 10^9$ft/s=632155km/s



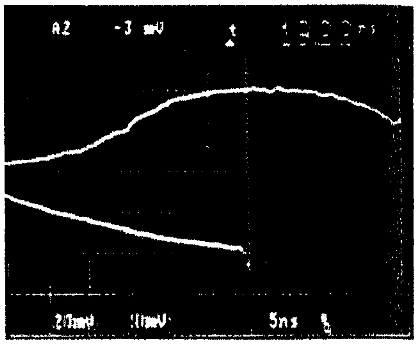
Antenna 10ft Transmission line 38.5ft
$C_1 = 2.02 \times 10^9$ft/s=615696km/s



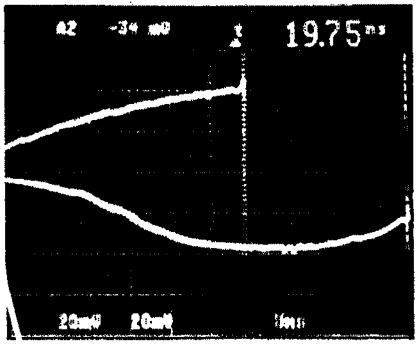
Antenna 10ft Transmission line 56ft
$C_1 = 1.998 \times 10^9$ft/s=608990km/s



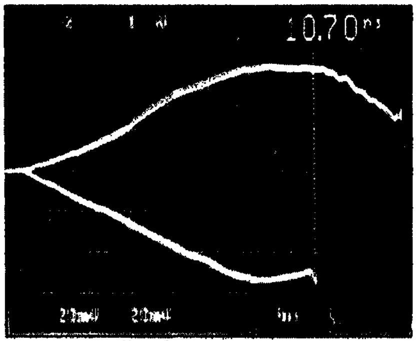
Antenna 10ft Trigger south Transmission line 74.5ft
$C_1 = 2.069 \times 10^9$ft/s=630.031km/s



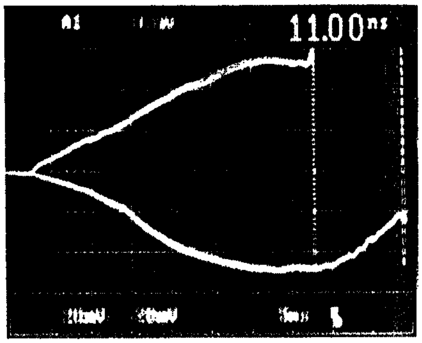
Antenna 18ft Trigger west
$C_0 = 0.937 \times 10^9$ft/s=285597km/s



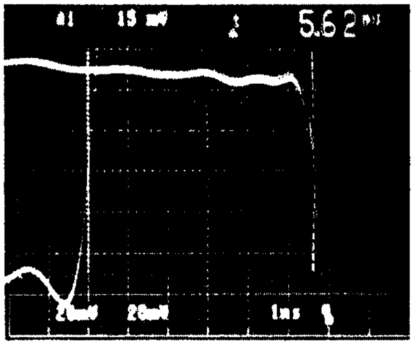
Antenna 18ft Trigger east
$C_0 = 0.911 \times 10^9$ft/s=277672km/s



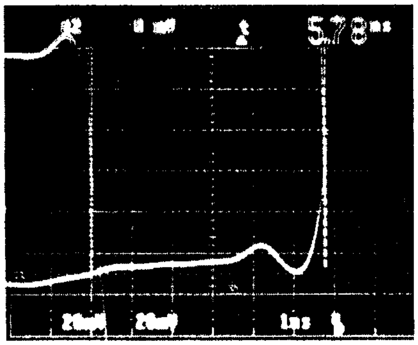
Antenna 10ft
$C_0 = 0.934 \times 10^9$ft/s=284683km/s



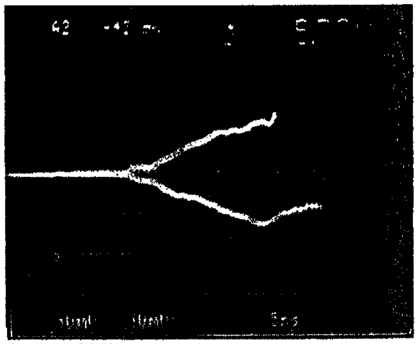
Antenna 10ft
$C_0 = 0.909 \times 10^9$ft/s=277063km/s



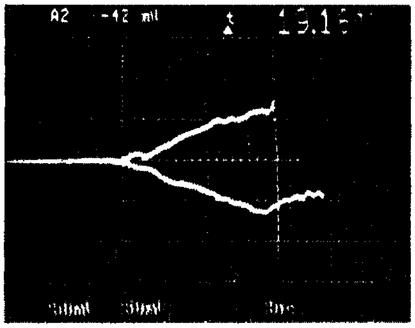
Antenna 5ft
$C_0 = 0.889 \times 10^9$ft/s=270961km/s



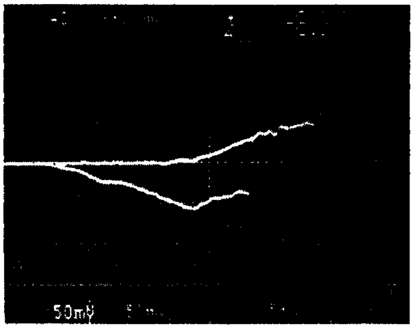
Antenna 5ft
$C_0 = 0.871 \times 10^9$ft/s=265480km/s

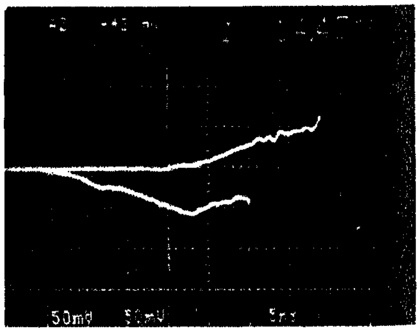


Antenna 5ft Trigger south
Transmission line 35.5/35.5ft



Antenna 5ft Trigger South





Addition line length to one leg produces expected lag

This velocity is responsible for causing no delay to the low amplitude signal, travelling the base of the Obolensky triangle and through the remote transformer down the coaxial line to the oscilloscope. This signal arrives simultaneously with the other signal travelling the shorter route, ie from the energized relay to the nearby transformer and via a coaxial line of the same length, finally to the oscilloscope. No difference is caused to the simultaneous nature of the signals, by changing the length of the base of the Obolensky triangle.

c) A Maxwellian velocity C_1 close to the velocity of light along the transmission lines, which is the expected standard propagation velocity of the coaxial lines. This velocity does not affect the relative positions of all signals for equal transmission lines. This velocity as determined from our limited data was:

$$C_1 = 200110 \text{ km-sec.}$$

This velocity is responsible for the propagation of the huge spikes along the transmission lines. Their absolute delay is affected accordingly to this velocity and to the length of the transmission lines.

d) A non Maxwellian velocity C_0, about twice the velocity of light along the transmission lines.

$$C_0 = (620 \pm 2.7) \times 10^3 \text{ km/sec, r.e. } 0.4\%$$

This velocity is responsible for the propagation of the low amplitude signals at the beginning of the oscillograms. The relative appearance of these signals is proportional to this velocity and to the length difference of the transmission lines.

Similarly, the relative delay of the first spike from the beginning of its signal trace, is affected accordingly to this velocity and to the length of the transmission line it propagates.

From the above, we see that there are two modes of propagation in each line. One mode which carries most of the energy is the normal velocity of propagation mode known for these transmission lines which we call Maxwellian mode. A second non Maxwellian mode of propagation with much higher velocity than the first, carrying a low energy signal of the same event. However, it was found for the coaxial line to operate at the superluminal velocity, non Maxwellian mode, it was necessary not to be near bulky objects or the ground and not to undergo sharp bends.

This was the reason the coaxial lines were mounted on elevated wooden stands. It was found that the speed of the signals drops considerably as soon as the coaxial lines come close to the ground or to a bulky object. Analysis of this behaviour showed that the speed signal in the coaxial line is about twice the speed of light for the section between the transformer and the first section close to a bulky object or to the ground. After this section the velocity drops down to about its Maxwellian value. It seems possible that several internal and external factors determine this non Maxwellian velocity, and have to be found.

No theory available at the moment seems to explain these superluminal velocities. The fact that they carry low energy signals under special conditions, seems to be the reason that they have been unnoticed today.

REFERENCES.

1. Alexis Guy Obolensky, Proceedings of "The International Tesla Conference", Colorado Springs, 1986 and 1988.
2. Harold W. Milnes, "Faster Than Light Signals", Radio Electronics, V. 54, No 1, p.55, 1983. (This article came to our attention after writing this report).

Wu, Chu and superconductors

Alabama and Texas are at war. Fortunately, the war is currently being conducted with words as the weapons and patent applications and commercial contracts as the prizes, but it is beginning to warm up a little.

Dr Maw-Kuen Wu of the University of Alabama in Huntsville and Dr Paul Chu of the University of Houston are at odds (or, rather, their universities are) over the share of credit each of them is claiming for the discovery of yttrium-barium-copper-oxygen material which becomes superconducting at 98°K. Some of the heat in the controversy is possibly generated by the signing of an agreement between DuPont and Houston to "commercialize superconducting products and processes based on the discoveries of Dr Paul Chu", to quote the local Huntsville paper *The Huntsville Times*. Both the university and Dr Chu stand to receive substantial profits from the agreement, particularly if a patent on the material is granted.

In January 1986, Bednorz and Muller at IBM in Zurich came up with a lanthanum-barium-copper-oxygen material which superconducted at 30°K. On the publication of this work in September 1986, Dr Chu reproduced the results at Houston and mentioned the fact to Dr Wu, who had been one of Chu's students and had subsequently gone to Huntsville. A worldwide crescendo of activity ensued, with a view to increasing the superconductivity temperature, the Houston group finding transient indications of the effect at temperatures up to 100°C.

Chu, at Houston, believed that there was a real chance that a number of new materials based on the IBM work could now be made and promptly filed a patent with, reportedly, an extremely wide scope for materials which had not yet shown reproducible effects at over 77°C – the boiling temperature of nitrogen.

Seventeen days later, Dr Wu at Huntsville was able to show the effect at 93°C in a sample of Y-Ba-Cu-O material and immediately informed Dr Chu, since the two had agreed to co-operate fully on the research. A press conference was held a couple of weeks later. Chu being the senior of the two, he was accorded the major share of attention and, therefore, credit for the discovery, though he was personally meticulous in including Wu in his remarks. The down-grading of Wu's (and therefore his university's) efforts by the press has been exacerbated by the DuPont contract with Houston, but the two scientists have tried to remain aloof from the wrangling. The discoverer of the first, reproducible high-temperature superconductor will probably be recorded as Dr Chu of Houston with, at the most, a passing reference to Dr Wu. It seems strange that the two IBM researchers who started it all are rarely mentioned.

Dr K.A. Gehring of GEC Hirst Research Centre speculates on the first uses of superconductivity.

Microwave components come right at the top of the list of possible superconductor applications. There are real benefits in using superconductors in that you get dispersionless and lossless propagation of e-m waves. It enables construction of higher quality filter systems, resonators and so on and yet the fabrication technology required for these applications is not even as sophisticated or demanding as it is for active electronics. Superconducting quantum and radiation detectors present a typical early application.

Hybrid superconducting and semiconducting devices are particularly interesting. Many of the standard semiconductor devices work happily at liquid nitrogen temperature. New superconducting materials close the gap. There are now perfectly accessible operating temperatures at which both superconducting and semiconducting materials will operate simultaneously. This means that 20 or so years from now there will be a range of novel devices of which there are, as yet, no known details. The potential for the combination of these two particular types of material is immense.

Superconducting magnets is an obvious application of these materials. Where helium technology is currently used, the new superconductors could bring benefits, provided the materials problem can be overcome. The range of materials which display superconductivity at these high temperatures is now fanning out. New materials are being discovered at a comparatively rapid rate.

Japanese industry has a planned superconducting train. It feels confident enough to produce a model for public inspection on the platform at Tokyo railway station complete with leaflets for school children. Superconductivity has been brought to the attention of the man in the street as well as the Japanese research laboratories.