

# ANOMALY

Journal of the Association for the Scientific Study of Anomalous Phenomena

Number 38

May 2006

ANOMALY is published twice a year. It is free to members. Single copies can be bought by non-members at £2.50 (including postage and packing - see last page for address details). PLEASE NOTE that the names of witnesses and places have been changed in line with ASSAP's Code of Conduct. The views expressed by individual authors are their own. ASSAP has no corporate views.

© ASSAP 2006

ISSN 0969-7713

Editorial Team: Maurice Townsend and Valerie Hope. Front Cover Illustration: Wendy Milner. Printed by March Press, Adderwell Road, Frome BA11 1NJ.

ASSAP Web site: [www.assap.org](http://www.assap.org)

ASSAP is a registered charity (327422) and a company limited by guarantee (2075226).

## CONTENTS

**How to ...** 2  
*by Maurice Townsend*

**Magnetism Debate** 16  
*by Jason Braithwaite*

### Editorial:

Considering that most researchers readily accept that orbs are a natural phenomenon, there is surprisingly little known about exactly how they are caused. For instance, why are orbs so much more common with digital cameras? In this issue we take an in-depth look at orbs and other common causes of anomalous photos.

Also, Jason Braithwaite replies to Ian Stevenson's detailed comments on the theory that certain magnetic fields can cause ghostly hallucinations. The wide-ranging debate touches on the philosophy of science and the structure and workings of the brain. It also demonstrates how science progresses through informed debate.

# How to ...

by Maurice Townsend

... take anomalous photos. Anomalous photos are popular these days so we thought we'd produce a guide to how to take them. It isn't as easy as you might think!

I have examined a great many 'anomalous' photos over the years and always find them intriguing. I have even taken a few myself. So what IS an anomalous photo? My working definition is that it is one that shows something unexpected, unusual or not immediately explicable. Photos can show anything from light trails and strange light effects to uninvited 'guests'. Easily the most common type in recent years has been 'orbs'. I'm sure everyone reading this is familiar with orbs and the controversy surrounding them. I will discuss them later.

## **Not Orbs**

Examining anomalous pictures is always interesting because they are so varied. However, one common factor I have noticed over the years (and this is shared with orbs) is that, in the vast majority of cases, the photographer did not observe the anomaly at the time of the exposure.

Indeed, some anomalous photos look entirely unremarkable except for the fact that the photographer insists that something in the picture was not there when they took it. For instance, wispy strands of what looks like smoke appear, though the photographer insists they were not having a cigarette at the time. People are pictured in the background when the photographer insists they were quite alone.

In the absence of any obvious evidence of image manipulation, simulacra or photographic faults, it usually comes down to a case of the photographer's memory versus the apparent facts on the photograph in front of you.

Still photographs capture a single moment, usually a fraction of a second. It can be difficult to remember what was happening at that precise moment. Indeed, with the photographer looking through a tiny camera viewfinder, concentrating on framing the shot, things can easily happen entirely unobserved. If the photograph is just one of many taken at the time, it will be difficult to remember the exact circumstances of each shot. It is, then, unsurprising that the photographer's memory may differ from the photographic evidence.

Cameras are dumb things, they just record the pattern of light in front of them, according to their physical limitations. When people see, they use not only their eyes but also their brains. The brain actively adjusts its view of the world to accommodate such things as light levels, colours, contrast, movement and even emotional reaction to what is in view. Brains tend to pay attention to what they see as important.

Cameras, on the other hand, don't react in the same way. Indeed, until the invention of auto-focus, auto-exposure and auto-white balance, they didn't react at all. Digital cameras need a mechanism called 'white balance' to replicate colours in the way we see them. Colours change according to illumination. Human eyes automatically adjust to keep 'red' looking 'red' in most circumstances. Still cameras need a chip to do the same trick!

Still cameras deal with contrast rather less well than we do. Photograph a bright object next to a dark one and a camera will fail

to pick out detail in one or the other or both. Human eyes, on the other hand, can pick out detail in both by switching attention between them. Still cameras also have problems with movement. An object may be in perfect focus but still appear fuzzy on the final picture due to either the photographer's hand moving or object movement.

Then there is the question of flash. A flash completely changes the colour and contrasts within a scene. Unfortunately, the photographer cannot appreciate what a picture will look like at the time of exposure because the flash is over in a fraction of a second. Generally, the aim of flash is to give an effect like daylight. This looks completely different from the dimly lit scene the photographer actually sees when taking the photo.

Given the above, it is not surprising that photographers' memories sometimes differ from the photograph. The solution to this problem could be to review digital pictures at the time of exposure, using the LCD screen on the back of the camera. Unfortunately, this is usually so small that only very obvious anomalies are likely to be detected. Recent models allow you to zoom in to inspect detail. If you DO see anything weird in this situation, please take more photos immediately, including ones from different angles. This will help hugely in eliminating things like simulacra and certain photographic faults.

Of course, some picture anomalies are photographic 'faults' or camera foibles. Modern cameras are pretty reliable but they are still capable of producing odd results in certain known situations. For instance, there is 'flare', which occurs when a bright light source is in, or more commonly just out of, the picture. This causes internal reflections within the camera 'lens' (which is, in fact, usually a tube containing several lenses). It shows up on pictures as angular, often

colourful, transparent light shapes, similar to orbs. It can be prevented by using a lens hood or casting a shadow (with your hand, for instance) over the lens.



*Fig 1: Light trail deliberately produced by flash, a torch and camera movement*

One spectacular effect, prevalent on vigil photos, are light trails (fig. 1). These appear as brilliant lines stretching across a picture. They occur because, when taking flash pictures, the shutter is open for a much longer period than the flash itself takes. If the picture includes a light source, or a bright reflection, and the camera is moved during the exposure, a light trail will often be the result. Typically, the light trail will appear to issue from a light source, like a torch. The movement of the camera, with shutter still open, causes the trail

from the light source while the rest of the picture is 'frozen' by the flash, which may take less than a thousandth of a second. For technical reasons, the shutter takes much longer than this (typically tenths or hundredths of a second - called the 'flash synchronisation shutter speed') to close.

One classic source of photographic anomalies is where the camera strap accidentally hangs in front of the lens. This can produce a dark shadow or a bright, amorphous object. A give-away is often that the 'object' typically touches the edge of the picture (ie. it is not an isolated 'blob' in the middle). It can, typically, produce bright spiral patterns.

Then there are simulacra - random shapes that look like something else, such as a face or figure. This is technically known as pareidolia. It is often easy, with a little imagination, to see a face in foliage, fruit, clouds, etc. Typically, this is not obvious to the photographer at the time of exposure because slight movements constantly change their viewpoint, destroying the illusion.

Another common theme I have noted among anomalous photographs is that they are often taken at haunted or 'sacred' locations. Photographs taken at such locations are often examined minutely for anything odd. What would be dismissed as a 'mistake' if it occurred in a wedding photo may be viewed as evidence for the paranormal when exposed at haunted locations.

Some problems arise from the use of digital technology. Many cameras typically take pictures in a compressed format (such as JPG). If you repeatedly edit them in software on a computer, you may be unwittingly compressing them each time you save. This will result in loss of detail and can even change the shapes and colours of objects in the picture. With cheaper cameras, in particular, you

may see edges of objects as jagged because they use low resolution (low numbers of pixels). There is also something called CCD-smear (also called 'blooming'), where light appears to 'leak' out of very bright things (such as highly reflective objects caught in a flash), giving them non-existent streaky edges.

And now there is a new problem which will induce paranoia! Some very recent cameras allow you to manipulate your images while they're still in the camera. Thus, while it will appear that no one has tampered with an image, they could have! Of course, no paranormal researcher would do this, but what if your friends got hold of your camera and decided to do it as a joke? So keep a close eye on your camera and remove the chip between sessions!

## **Orbs and Mists**

The two commonest photographic anomalies are orbs and mists. You can find many examples of both, including paranormal explanations, on the web.

ASSAP did some early experiments to demonstrate that fine particles spilt just in front of a digital camera resulted in orbs. Many people now believe orbs are dust, while others go for various paranormal theories. There are some people who differentiate between 'genuine' paranormal orbs and 'natural' ones (ie. caused by dust). The main differences are said to be size, colour and the appearance of details in the orb.

I am only going to discuss the dust\* theory here. Where I say 'orb' below, please understand this to mean 'dust orb'. I'm going to go into some detail as 'dust in front of the lens' is really only a shorthand explanation. In particular, I'm going to consider a

question that puzzled me for years - what is it about digital cameras that makes them produce orbs so well?

I decided to review, using the web, what the photographic community (manufacturers, professionals and serious amateurs) thought of orbs. Mostly, I discovered, they just ignored them, but there was some information on why digital cameras produce orbs.

One of the big changes with the advent of digital photography was an increased depth of field in camera lenses. This is the distance in front of the camera over which objects are seen to be in focus. Crucially, it determines how close an object can get and still be in focus. The depth of field depends on the focal length of the camera lens, the aperture (the f-stop) and the distance from the subject. A lens with a long focal length (or telephoto = high magnification of image) will have a smaller depth of field (for the same aperture) than a lens with a short focal length (a wide-angle).

When cameras were designed using CCDs (charge-coupled devices) for digital photography, the chips were much smaller than the conventional 35mm frame size (typically half the size or less) for economic and technical reasons. To achieve equivalent resolution, when blown up to prints, they had to use much sharper lenses. Specifically, the so-called 'circle of confusion' (CCONF - the smallest circle that can be seen as sharp by a human eye) had to be much smaller. To achieve this, the camera manufacturers used lenses with a much shorter focal length. The result was a much bigger depth of field. This in turn brought the nearest in-focus point closer to the camera. It also meant that objects just out of focus would be closer too. When objects are out of focus, each part of their image (made up of CCONFs) expands to become diffuse circles (fig. 4). Particles of dust are so small they produce single CCONFs. When illuminated by a camera's flash, they appear as bright orbs.

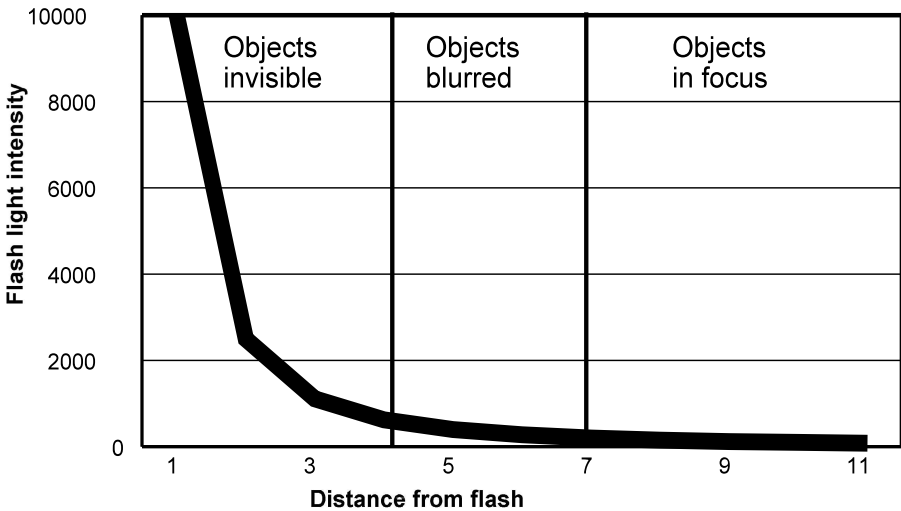


Fig 2: Typical focussing in a film camera (showing light intensity at object)

When any object is closer to a camera than the inner limit of its depth of field, it will be out of focus, appearing blurred. If it is extremely close, it will be so out of focus that the blur is smeared over the whole frame and the object actually becomes invisible!



Fig 3: The metal pin



Fig 4: Now blurred

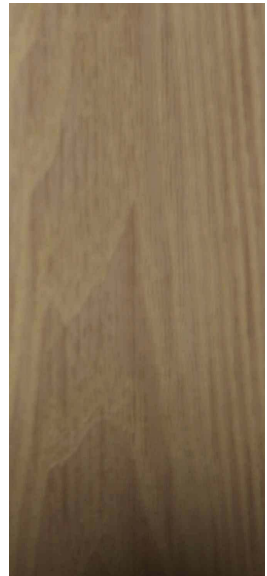


Fig 5: Invisible!

In fig. 2 you can see how these three zones (in focus, blurred and smeared into invisibility) are distributed over distance with a typical film camera. While the units of light intensity and distance and the zone boundary positions are arbitrary (for illustration only), the shape of the light curve is accurate. In fig. 3 you can see a metal pin in focus. In fig. 4, where the camera has got closer, the same pin is now blurred, its highlights have turned into diffuse CCONFs. Finally, in fig. 5, where the camera is closer still, the pin has virtually disappeared, though it is still physically present in front of the lens! Note that the background is in focus in figs. 4 and 5.

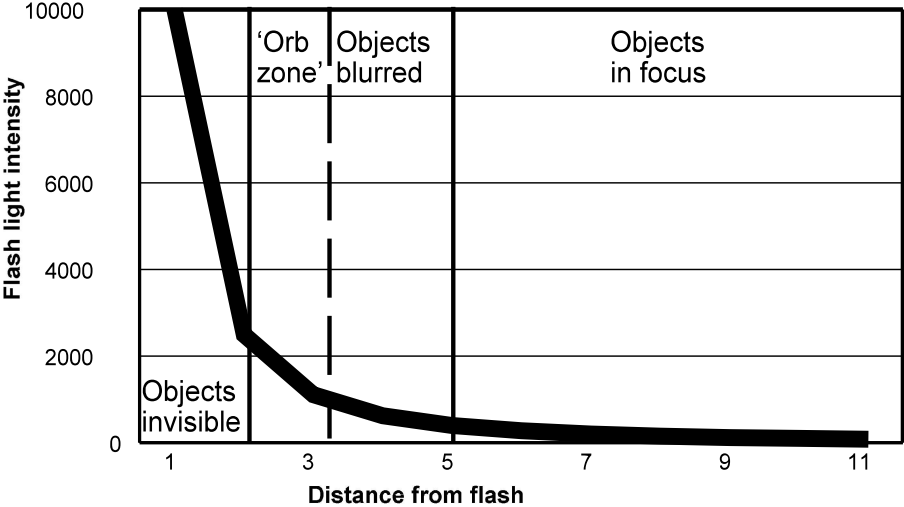


Fig 6: Typical focussing in a digital camera (showing 'orb zone')

In a typical digital camera, all these focussing zones are compressed towards the lens, due to the larger depth of field. This means the zone where objects are blurred is subject to much brighter light from the flash unit (fig. 6). This creates an 'orb zone' where tiny bits of dust are now bright enough to appear as luminous circles (CCONFs).

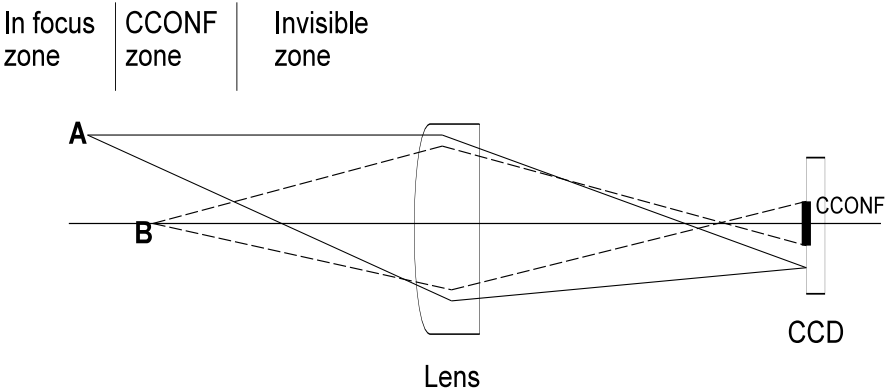
The reason that the illumination is so much brighter in the 'orb zone' is that its intensity increases with decreasing distance from the flash, according to the inverse square law. This means that it is orders of magnitude brighter than at the intended subject of the photograph. Indeed, if the subject of your photograph is at a distance of 5m, a particle of dust at 5cm from the camera receives approximately 10,000 times greater light intensity! This steeply rising light intensity is illustrated (to scale) in figs. 2 and 6.



Fig 7: Background blur

So, if orbs are out-of-focus dust, why do they appear as crisp, well-defined circles? They are, as we've seen, actually 'circles of confusion' (CCONFs). When a point light source (such as a dust particle illuminated by a bright light) is seen through a lens, it appears as a point image when it is in focus. It is an accurate image of the point subject ('A' in fig. 8). When the point source is closer to the lens, and out of focus, its image is widened into a diffuse circle ('B'). Though the CCONF may look crisply defined, it is actually the image of a point uniformly smeared out into a circle (instead of the sharp point it should be). When a light source larger than a point goes out of focus, it actually turns into multiple overlapping CCONFs that

give an overall blurry 'out of focus' impression. In fig. 7, for instance, our metal pin is out of focus and its image has split into many 'crisp' overlapping CCONFs. The background, which is also out of focus, also consists of many tiny overlapping CCONFs but they are so small (being further away) that they have merged into a blurred mass. The pin is just centimetres away and too close to be in focus. The background is about a metre away and too far away



*Fig 8: How a circle of confusion is produced*

to be in focus. If you examine lots of photos closely you will often see CCONFs in the strongly out-of-focus bits, particularly when the object is close to the lens and well lit. Most of the time, though, the small circles are too small to see, particularly with digital cameras with their big depth of field!

In fig. 8, point light source 'A' is far enough away from the lens to be in focus. The light rays (unbroken lines) come together at the camera's CCD, yielding a sharp point image. Point light source 'B' is closer to the lens, in the blurred (CCONF) zone. Its focal point is in front of the CCD so the light rays (dashed lines) diverge at the CCD producing a smeared circular shape - the CCONF.

The circular shape of orbs is derived from the shape of the aperture in the lens. If you had a triangular aperture, orbs would be triangular. The size of an orb is related to the object's distance from the lens. Larger orbs are formed by objects closer to the lens which are more out of focus and have a larger CCONF (which is fainter).

So what about orbs with a definite structure or colour? Both of these effects are due to aberrations in the camera lens and are more

frequently found in cheaper cameras. No lenses are perfect and they all have such aberrations. In more expensive cameras, as I mentioned earlier, a 'lens' is actually a tube containing a whole series of lenses. These lenses are there to counteract the aberrations. In cheap cameras, less effort is spent on fixing these problems. Orbs with a definite structure (such as a 'nucleus' and 'skin', resembling a living cell) are a result of spherical aberration. Orbs with various colours are a result of chromatic aberration, where light is refracted like in a prism. The Japanese are keen on deliberately generating CCONFs to produce pleasing effects, a technique called bokeh. For instance, half circle CCONFs may be generated when the light from the particle (particularly rain, which may reflect light back in a

different direction) illuminates only the bottom half of the camera lens. Adjacent particles may produce intersecting CCONFs, giving other weird shapes. Darker CCONFs (from darker dust) can intersect with lighter ones to give the impression of a 'hole' in an orb. Fast moving particles, like rain, can produce orbs with tails.



*Fig 9: Mist reproduced*

As well as dust, other things can now be caught in the 'orb zone'. Smoke from a cigarette or even the photographer's breath on a cold night can be seen as a hazy mist. Some larger droplets within the mist may be big enough to appear

as obvious orbs, making for a spectacular picture. Mists generally need a dark background to show up. Thus they typically appear outside at night. In fig. 9, the steam from a kettle was used to reproduce such a mist. The steam shows a 'structure', typical of ghostly mist photos, which appears, on close examination, to be made up of thousands of tiny orbs made by water droplets.

Now, here is the promised advice for producing (or avoiding) your own anomalous photos.

<b>Effect</b>	<b>To Create</b>	<b>To Avoid</b>
<b>Light trails</b>	Move camera while taking flash photos of scenes that include light sources such as torches	Keep you camera still for around 1 second during exposure
<b>Orbs</b>	Take flash photos in dusty rooms with compact digital cameras with built-in flash	Avoid using flash or, if you must, use a camera with a flash far from the lens
<b>Mists</b>	Breathe heavily on cold nights outside while taking flash photographs (same camera as for orbs)	Hold your breath while taking photos outside and don't smoke
<b>Spirals</b>	Dangle your camera strap in front of the lens while taking flash pictures	Hold your strap behind the camera
<b>General anomalies</b>	Forget everything about the circumstances of taking photos at haunted locations!	Check photos immediately for anomalies; if there are any, take more photos

Note: A digital version of this journal will appear on the ASSAP web site ([www.assap.org](http://www.assap.org)) allowing closer examination of the photos!

Selected Internet Sources:

<http://www.vanwalree.com/optics/dof.html>

<http://www.luminous-landscape.com/essays/bokeh.shtml>

[http://www.btinternet.com/~dr\\_paul\\_lee/orbs.htm](http://www.btinternet.com/~dr_paul_lee/orbs.htm)

\*Finally, what IS dust? The component of dust inside a building that



is most likely to float around and cause orbs consists of fibres shed by fabrics. The principal sources of such dust are clothing, soft furnishing, carpets, towels, etc. Dust is easily kicked into the air by any kind of movement. Such movement is caused by human activity, drafts, any source of heat, fans, etc. In neglected environments the dust gradually settles to form a visible layer.

*'That parrot wasn't there when I took the photo ...'*

# Magnetism Debate

by Dr Jason Braithwaite

Science progresses not only by theory and experiment but also through debate. Regular readers will be familiar with the lab experiments by Persinger showing that certain magnetic fields can induce ghostly hallucinations. They will also be aware that recent attempts to find suitable fields in haunted locations have met with some success. This controversial research has started a debate around the whole idea that some ghosts could be magnetic hallucinations. In *Anomaly* 36 Ian Stevenson gave his views on the direction of this research. Here, Jason Braithwaite replies to the important points raised in that article. The debate touches on the philosophical foundations of parapsychology itself.

I would like to thank all individuals for taking the time to respond and provide feedback on a number of my earlier articles in *Anomaly*. I have chosen not to respond to each and every communication, preferring instead to wait until a 'body' of comments exists with which to grapple. Science moves by debate and this emerging discussion appears to me as if it's going to be a fascinating one. Note also that few other associations are even entertaining these issues, let alone having and welcoming an open discussion - viva ASSAP! It is clear that these are indeed exciting times for research. I would like to restrict my comments here to just some of the important points raised by Ian Stevenson's excellent article published recently (*Anomaly* 36).

Firstly, I would like to thank Ian for taking the time to respond. I am glad the debate has challenged him in his thinking and prompted him to make his welcome and well articulated comments. His article has certainly given me some things to think about, and I greatly enjoyed reading his thoughts. I think it is clear that Ian and I see things quite differently. However, I do think that some of his points are questionable in terms of their underlying logic. Furthermore,

they reflect some of the very assumptions that my earlier articles were directed at. I will make just some of my preliminary and initial responses here.

Ian was correct in his reading of my earlier article ('Are vigils useful?', *Anomaly* 32) where I stated that traditional and current paranormal views of apparitions are becoming increasingly difficult to defend. They most certainly are. By traditional views I was passively referring to the typical and all-too-common, 'ghosts are recordings', 'ghost are spirits' or 'ghosts are souls' types of account. Although Ian seems to suggest that my comments may have been a little rash, he does not provide anything that goes directly against my observation (either in his opening comments or throughout the article). The best functional accounts and most helpful understandings for these experiences seem to be coming from the mainstream areas of science (eg. physics, psychology, neuroscience, etc.). This may indeed change - and I am certainly open to all possibilities - but there is no evidence just yet for a need to swing to paranormal frameworks. The big problem, as I see it, is that to make these paranormal ideas work one has to assume some degree of paranormality in the first place (see highlighted quotes below), which I find makes the ideas unhelpful and somewhat circular. In other words, the initial assumption and premise is highly questionable, and thus the following logic is compromised. Indeed, on more than one occasion Ian asks that we start by assuming something paranormal and his reasoning starts from that point. For example - *'Let us assume for a moment the existence of a supernatural world or dimension. We can only know it by the way it interacts with 'our' world. We can know it by its effects, but its causes are not capable of being examined.'*(p. 3).

Here the basic premise is perhaps the biggest one any researcher could make. This premise not only assumes the paranormal exists,

but starts to describe a mechanism of interaction for it that, rather predictably, cannot be tested. What is the evidence that its causes are not testable? Is this not a fallacy of reasoning? Is it not unscientific to generate ideas so vague that they cannot be tested? Here an explicit claim that it cannot be tested is made.

Ian also states; *'If I were to see a spirit, assuming they exist* [my highlighting], *my neural activity might match that induced in the lab to stimulate a similar reaction, but it would be real.'* (p. 4)

What is the evidence that the neural activity is a perfect match? What is meant here by real? Why would it be real and how would you know?

Firstly, and to labour the point slightly, what happens to these ideas above if we don't assume the paranormal exists from the start (but say we will work towards that interpretation, if indeed it is the correct one)? Where now? The idea from the start that the paranormal exists as some kind of 'external event' is a damaging assumption. It could be that the experiences are simply that - experiences. If I don't make the questionable assumption that ghosts exist in the first place, these points don't work. In other words, let's not assume they exist from the start. Where now? I will return to these points in later sections.

Secondly, the suggestion that patterns of activity in hallucination and real experience are the same is only partially true. When we actually see or imagine a physical stimulus, some of the same early visual and attentional areas in the brain appear to be activated. This suggests that visual imagery (in the absence of any external stimulus) does share some of the visual and spatial representations with the same 'real' stimuli. However, the evidence also shows some important differences between imagery and perception (at

least in normal observers). For example, the level of stimulation elicited for an imagined stimulus is around 70% - 80% of that of veridical perception of that stimulus (so imagery induces less of a response in visual areas). These differences can occur in early sensory areas - but are also present in higher levels in the brain where certain structures are not activated under both circumstances. These decision areas or 'reality monitors' seem crucial to normal conscious experience and what constitutes reality to the individual. Interestingly, this makes a nice prediction for Ian's points. For example, if the apparition is real, in the sense that it is 'out there', then very early brain areas dedicated to processing external stimuli will be highly activated, relative to higher processing regions, during the experience. If the 'apparition' is internally generated then the converse would be true. Research on hallucinating schizophrenics shows that their hallucinatory experiences are more like real perception (around 90% of the level of veridical perception in early visual areas). However, there is a clear bias of higher-order brain areas being involved and this is coupled to their internal 'reality monitors' being compromised. Thus, stimulated hallucination and real perception do have important and diverse neural signatures to them and are distinguishable at the neural level. This is discussed more fully in later sections.

Moving on, in response to whether Persinger has elicited experiences of peace and love - he has. Indeed, the pioneering work of Penfield and colleagues (using direct electrical stimulation of epileptic brains) in the 1950s/60s has shown that all manner of perceptions, feelings and intense emotions can be created via direct electrical stimulation of very specific regions. The literature on these effects pre-dates Persinger's work considerably and has been known to neuroscience for over 45 years. There is still a great deal we need to know about these experiences and how they are realised in the brain - but the evidence is that they are realised in the brain

and specific structures housed within it. These experiences can be accounted for and explained by neuroscience.

On another point, Ian is right that most of the good work on magnetic fields is lab-based (a point I made in my articles) and there is now a serious need to field-test the idea in the natural situation - in an appropriate manner. This job needs to be done correctly and it will take many years before we know how right or wrong it is. I totally agree with this sentiment. Recently, I was fortunate in being awarded a generous research grant from the SPR for assessing the spatio-temporal aspects of magnetic anomalies at one of my interesting cases - where a magnetic anomaly has already been implicated. This work marks the beginning of a new phase in such detailed projects and reflects a commitment and vision from myself and others to see this project through over the coming years (note - these studies all employ the MADS, which was funded in part by generous contributions from ASSAP). This grant has already produced papers either published in peer reviewed journals or currently in press. Ian's comments here add further support to a growing need for proper, controlled field studies.

In his discussion of Persinger's effects, Ian makes some interesting comments, he says, *'To induce those feelings in the lab proves only that those feelings can be induced by MFs. It doesn't mean that when we experience them elsewhere, they are unreal'* (p. 4).

This logic is seriously questionable, and I discuss below both theoretically and empirically why this is the case. He goes on: *'If the lab can induce in me the same feelings I have when I enjoy a beautiful sunset, it does not mean the sunset was only in my head'* (p. 4).

The first point makes some sweeping assumptions and actually represents a fallacy of scientific induction. What the lab experiments

do show, is if magnetic fields have an effect in one condition, this makes it **very likely** to have an effect in another condition. So these studies show a clear potential link - an actual mechanism of interaction between stimulus (magnetic field) and brain. In other words, a fundamental part of the theory has been supported, ie. that magnetic fields can have consequences for cognition. There is no getting away from this potential effect. If you have shown a **possible** underlying mechanism, there is an arguable degree to which it may be a **probable** underlying mechanism, at least relative to unsupported and unspecified paranormal claims. So my initial response to this would be, the fact that MFs can induce such changes not only reveals that they could most certainly be involved in spontaneous cases, but also the brain regions that could be involved for the nature of the experience as well. Indeed, what is the evidence that those experiences reported from elsewhere are any more 'real' (by Ian's use of the term) than those from stimulation studies? Therefore, if we accept the essence of Ian's first point, the evidence, by default, also certainly does not mean that the experience is that of a 'real' ghost either. In other words, the explanation does not become a paranormal one simply by default. Ian may not rule this magnetic explanation in, but his critique does nothing to directly rule it out either! Interestingly, Ian makes no reference to the field-studies that currently exist showing that anomalous magnetic signatures can distinguish haunted areas in some cases. This observation seems particularly problematic for his position, as evidence from the spontaneous situation is now also converging towards a magnetic hypothesis for some experiences - as predicted directly by laboratory experiments. So it would seem that spontaneous experiences **can** reflect magnetic components in some cases.

Could we not also argue that because the stimulated experience is similar, obeying similar experiential rules with the same

behavioural consequences, that there is no distinction between the experiences? Is this not the theoretical 'path of least resistance'? They are both very real as experiences - but both based in the brain - no less fascinating but not paranormal. In other words, paranormal experiences, like all other experiences, still require a brain to process them. Is it not the case that the simplest explanation will always be the most likely? We simply don't need a ghost to actually experience one!

Viewed in these terms, Ian's examples and position simply don't work, at least for me. They centre on the assumption that the experiences must be different in the first place and work from that premise. If we question that central, initial assumption - as I do here - they fall down. They also seem to propose a situation that cannot be tested, which can hardly be described as scientific. More fundamentally, where I differ from Ian is over the distinction he makes, or assumes, between 'real' and stimulated 'less real' experiences, which to me seems somewhat artificial. As noted above, to make his idea work we have to assume that one experience is purely internal (existing only in the brain) and the other is external (which may share a similar internal neural representation but is associated with a real external stimulus - that is, a real ghost). If I understand Ian correctly, I think this is a fair summary of his points.

However, applied to apparitions, this reasoning appears circular. For example, it crucially depends on the clear assumption that there is an external thing or stimulation (ie. a visible ghost) to be distinguished from an imagined or synthetic ghost in the first place (this is the very assumption I am questioning). In other words, fundamental to the idea is the initial acceptance that apparitions exist. This is then used as an explanation for any possible difference. So here Ian uses a conclusion to establish a premise, which then

supports the conclusion (hence, to me, it is circular). If I don't make these assumptions (because the evidence is questionable, as well as the logic), the whole point collapses like a house of cards. In contrast, scientific evidence and facts are those things which, when I stop believing in them, do not disappear. Interestingly, the natural example Ian uses to illustrate his argument is based on an experience from direct external stimulation (watching a sunset), which might not happen at all with apparitions (at least via direct vision)! So I don't think this logic actually works.

Ian assumes that the magnetic experiences themselves are unreal and are somehow distinguishable from these 'other' more real experiences. This seems central to his points and this is what I think is fundamentally questionable here. As scientists, we must adopt the simplest and most probable account - the one that has been experimentally demonstrated gets my vote. If the evidence changes, so will my position. However, to fully tackle this on many levels we need to view these comments in terms of neuroscience and psychology. I apologise for going into this detail here - but the comments Ian highlights are so interesting they truly deserve a proper debate. I am not going to get philosophical, as I often find it goes nowhere, but I am going to get a little neuroscientific about the discussion (as you will see, these are not so far apart)! So here goes.

## **The cognitive neuroscience of reality**

Everything we think, feel, say or do is the product of our brains in action. Put simply, the mind is what the brain does. Every experience, perception and imagination is rooted in complex neuro-cognitive processes. Perception and experience are not passive but active constructions and interpretations generated by the brain. As a consequence, our perception and experience of the world are, in many ways, illusory. All our versions of reality are

given to us by our brains. Furthermore we, as observers, have no direct access to the world 'out there', only our internal representations, which are based on transformations and interpretations of both incoming signals and internally generated ones. However, we are only conscious of the products of such processes, not the processing itself or the stimulus prior to it. An external stimulus can generate a representation in the brain and an internal stimulus can also generate a representation. Only the brain 'knows' or 'can know' the difference. In fact, Ian's example of the sunset illustrates this nicely (though not in the way he intended it to). For instance, there is no colour in the 'real world' out there - only wavelength. There is no sound in the 'real world' only vibration. The eye and brain transform wavelength into colour and the ear and brain transform vibration into sound. This is why we can only see certain colours and hear certain frequencies. These limitations are neuronal ones and the experience of the sunset was created by, exists within, and is limited to, his brain. So, although his experience was tied to an external stimulus (ie. the sunset), the actual nature, content, feeling and emotion are constructed by his brain. The stimulation is external, but the experience does not exist externally.

Similarly, consciousness might not represent external stimuli correctly or at all. There are situations in the laboratory where we can make observers incorrectly perceive what was presented or miss information completely from their field of view. Here, the integrity of the external stimuli is not preserved in conscious awareness.

Let me push these issues some more with some examples. As noted earlier, when we actually see or imagine a physical stimulus, the same early visual and attentional areas in the brain appear to be activated. However, evidence also shows that higher levels in the

brain are not activated under both circumstances. At some level the neural codes are similar and at some levels they appear different. It would be interesting to see how apparitional experiences in the normal brain would fare in relation to the data already known in these areas.

On a similar theme, the hallucinatory voices heard by a patient suffering from schizophrenia are just as real as 'real' voices from other persons. The mechanism that allows the rest of us to 'know' the difference has broken down in these patients, resulting in their hearing their own thoughts as external voices. But their reality monitor stamps the experience as real, and in terms of, and relative to, any other experience they have, it is. In other words, at the level of the brain they are the same: both are reality. So for many researchers the emerging picture is that 'reality' is not necessarily something 'out there' but must be defined at the level of a neuronal and representational code. This does not mean that the code exists independently of external signals (there is clearly a correspondence), but the representations are not 'pure' exemplars of the stimulus. Furthermore, what about the evidence suggesting that certain birds can 'see' magnetic fields and changes within them - is their world any less 'real' than ours? Or is there some aspect of reality 'out there' that we are missing? Ian seems to suggest that what is 'out there' is real and what is internal is not 'as real'. What I am saying is this is a little simplistic and actually falls down particularly when applied to apparitions.

So what do all these points mean for this debate? Well, firstly, whether the paranormal really does exist or not, the experience will exist in, and be dependent on, a working brain. The question is, if I have a hallucination of a ghost, or really see a real ghost (**assuming** they exist), and **assuming** the same brain areas are involved in both, how do researchers know it is a hallucination and not a real external

stimulus (ie. a real ghost in front of me)? This seems to me to be the essence of Ian's elegant suggestions. However, as noted earlier, this question is based on a clear assumption that there is 'something else' outside of the hallucinatory experience going on and neural patterns are the same under perception and hallucination (which is not strictly the case). It has to make the assumption that ghosts exist as an external stimulus in the first place in order to work. There is, of course, an important difference between a neural code representing something that is 'out there' and something that exists purely in the mind (as noted above). The brain usually knows the difference (but 'we' might not), particularly if certain reality monitors break down. So, it is not that some perceptions are linked to an external stimulus and some are not that I struggle with (as clearly this is true and Ian makes this point well), but that this can be directly applied to some 'real' apparitions in an unquestioned manner. This is the crux of the point, I think, and is where my thinking departs from Ian's.

Secondly, Ian makes some clear cut distinctions between what is, and is not, reality or real. At the level of experience, this is not so clear cut. Observers often think that they would know the difference between 'reality' and 'hallucination' if it happened to them, and this underlies the conviction that their experiences could not have been hallucination and must have been paranormal. Unfortunately, this is not the case and none of us would know the difference at the level of experience as we were having it. If the brain stamps an experience as real (as a consequence of a dysfunctional reality monitor), it is real to that observer, as real as any other experience they have ever had. This 'stamping' process can go wrong. So at the level of the 'experience' the distinction of reality could be rather artificial. Although it is true that there are distinctions to be made between external stimulation and internal experience of that stimulation, this cannot be applied to apparitions due to the circular

reasoning outlined above. There is no convincing scientific evidence they exist as external stimulation, or even of how they could exist.

Thirdly, we know a good deal about hallucinations, the brain mechanisms involved, the experiential content, the likelihood of them occurring to whom and under what circumstances. We can induce them under controlled conditions and we can model (functionally, mathematically, and computationally) their initiation, propagation, content and form quite accurately. This whole process is revealing some fascinating insights into the structure and function of the brain, cognition and consciousness. When one studies hallucination it soon becomes apparent that no aspect of the ghostly experience is unique to it. It can occur under a variety of conditions that assume no paranormality. The perception of a 'haunter' or apparition has been documented with many pathologies (including schizophrenia, autoscopy and the Charles-Bonnet syndrome), so we know that the brain is more than capable of generating these full-blown perceptions. I think these experiences are not that far removed from so-called paranormal encounters and may help to understand them in some cases. In contrast, assuming ghosts exist as a paranormally defined external stimulus does none of this. It explains nothing. In terms of apparitions, I see no evidence other than that for the genuine 'real' internal experience itself, and Ian provides no evidence for any alternative to this.

## **Popular science**

In the closing sections of his article Ian relates numerous arguments from the realms of popular science concerning the brain and where future answers may lie from these exciting new avenues. The underlying theme is that current science and my approach are reductionism and that many other approaches exist that are equally useful. However, I would point out that we know more now about

the brain than we have ever done. We know more about it than physicists know about the cosmos, or geologists about plate tectonics. This knowledge has come from good old fashioned experimental science - applied appropriately and carried out effectively. In other words, there is little wrong with what mainstream science is doing, as far as I can see. As such, there is no reason to abandon it just yet. Ian cites the work and theories of people like Pribram, of holographic mind fame. But it is important to point out that these ideas are not accepted in the mainstream, not even by small clusters of the mainstream. This does not make them wrong (hypothetically), but they have in no way provided any universal understanding to match that of standard science. Nor is it likely that they will. I do not find that work in anyway useful for understanding the brain and I don't know of any top publishing neuroscientist who uses it as a framework for his findings anywhere in the world. I think the appeal is more at the level of metaphor than testable theory. Following on from this, I reaffirm my original position that researchers claiming 'ghosts are the spirits of dead people' are in an increasingly difficult position. I am up for convincing, and if Ian could produce a workable, testable theory along those lines I would be happy to test it.

My personal frustration with these emerging popular science fields is that they are too metaphorical, avoid large sections of current neuroscientific research, and seem intent on generating confusion rather than understanding. Researchers in these fields tend to avoid a logical or relatively simple explanation like the plague, preferring instead to 'describe' phenomena in a metaphor-laden language that often pushes the object of study outside the realms of what we can test. The idea seems to be, *'why bother to talk about what we do know when we can talk about what we might know in the future?'* This area is also well known for hi-jacking concepts from other sciences in order to pull together a form of 'coherent' argument, which often falls

down when one takes a closer look. Sciences currently suffering are quantum physics, string theory, geophysics, and psychology. Examples are concepts of 'other dimensions' (but not in the way a physicist would understand it); 'holographic minds and dualism' (metaphor and little else) and 'string theory' (described by some physicists as theoretical mathematics and little else, ie. no actual proof). I personally will leave it to the physicists for now until some principles are established, before I integrate the findings into my view of the conscious universe.

Mainstream cognitive neuroscientists (of which I am one) have now begun the assault on consciousness and its neural basis. It has been a long time coming but consciousness and awareness are a major feature in contemporary research. The popular view has often been that science avoided it as it was a somewhat nebulous construct to grapple with. It is indeed a difficult area, but acceptable definitions, methods and theories are now emerging. There was a time when scientists did feel uncomfortable around the issue of consciousness, but this view is somewhat out of date. As researchers, we may still view it differently between us, we may still have to use simplistic definitions for it, but we are making important inroads. All of these developments show clearly that consciousness is an emergent property of neural functioning.

I would also like to make some other points on consciousness and awareness as, at times, Ian seems to suggest that the current view that the mind is what the brain does is questionable - it is not. The idea that consciousness is contained within the brain, produced by the brain, and dependent on the brain is strongly supported by four main independent sets of findings (I am summarising for clarity as there are many more).

Firstly, perceptual experience is limited to the function and capacity of the neurons that give rise to it. In other words, you cannot see colours the eye is not capable of producing. An example would be why we cannot see into the infra-red or ultra-violet light spectrum. We do not have the neural machinery to do so and so we cannot be consciously aware of it. Therefore, these colours do not enter our awareness (even though the wavelengths are present and surround us). If mind is not restricted to brain, why does it show such a close correspondence?

Secondly, when the brain is damaged the mind is seriously impaired. Even small damage can have major implications for cognitive function. If the mind were a separate ephemeral thing, why would it be so hampered by such a violation of physical matter?

Thirdly, when the brain is stimulated the mind responds and consciousness is altered. This is true of magnetic stimulation, electrical stimulation, drug stimulation, sensory deprivation and so on. If they are indeed separate things, why are there such alterations in mind from the stimulation of organic matter?

Fourthly, the activity in the brain is influenced by the mind / mental tasks being performed at that time. This shows a clear neural correlate of mind and cognition to some degree.

I find these collective themes quite convincing and far more so than dualistic notions or spiritualistic ideas of the brain / mind relationship. Any true theory of dualism would have to tackle these findings convincingly without recourse to sweeping theoretical concepts from a metaphorically embellished pseudo-language.

## **Putting magnetism in its place**

Finally, I would like to make a few other general comments at this point, not all of which relate directly to Ian's points but I think add some clarification for all readers. Firstly, neither I, nor any other researcher working in this area, have ever stated that ALL apparitional experiences are due to magnetic fields. This is clearly untrue and the theory must be put into context. No single explanation models them all. Therefore, there is no reason why the experience of apparitions should also be reduced to a single unifying cause. Magnetic fields are one possible physical parameter with the capacity to influence perceptions and they may be doing so in certain circumstances and for certain cases of a haunting. But there is no reason to assume that every haunting / poltergeist case will have a magnetic component to them. Other natural explanations may be relevant across other cases. Indeed, even within a single case, some phenomena may have a magnetic component to them and others may not. This is important, as the failure to find a magnetic component in any one particular case is not evidence against the hypothesis, just that it might not be crucial in that particular case or for that particular experience. Falsification of this theory is easy at the laboratory level (which has produced positive results) and in the field will have to come at the group-case level. Indeed, I have recently argued that comparing cases where magnetic fields have been shown to be involved relative to cases where they have not might be an extremely interesting research project in its own right.

Consider the possibility of a relationship between magnetic fields and the intensity of experience, or more prolonged experiences, or even certain experiential factors being more likely when anomalous magnetic fields are present. I have no idea if this will ever turn out to be the case, but I am excited by the possibility either way.

Secondly, other influential natural explanations that also need to be assessed include: (i) neurophysiological correlates of the observers, (ii) belief systems and suggestibility of observers, (iii) attentional biases and semantic biases, (iii) contextual influences from the immediate experiential situation, (iv) the interpretation of ambiguous stimuli by certain observers and in certain contexts, (v) prior knowledge and expectation - either general or specific, (vi) other physical correlates such as drafts, lighting, suggestive architecture, and (vii) levels of arousal, to name but a few. I am currently investigating many of these in relation to my own cases. Sometimes certain factors seem crucial, at other times, less so. Then, of course, on top of all this, we need to assess the role of interactions between variables. Magnetic fields may have an effect on their own, but their influence may also be increased by the co-occurrence of other factors, such as those listed above. I think an extensive investigation of these needs to be undertaken before any paranormal interpretations are entertained. After all, we need to exclude all natural explanations first, don't we?

The magnetic theory is just one theory - it is not the only one, nor should it be. There will be instances when it is applicable and instances when it is not. However, when and where it is not relevant does not, by default, mean we have to recruit paranormal ideas for the experiences. A truly comprehensive theory of apparitions will involve many variables - specific to the environment, situation, context, and individual. These must all be assessed for their potential role and contribution. I remain completely open to the possibility that the paranormal exists, but I also remain completely open to the probability that it does not.

*We welcome further contributions to this important on-going debate (including a reply from Ian, if he wants to!). Please send letters / articles to the editor in the usual way.*

*Ed.*