**Crash Course in Critical Thinking**
**A five-minute no-frills course from WA Skeptics**

**It's just a matter of asking the right questions.** After some introductory stuff we give you six sets of questions to ask about paranormal beliefs. Choose the set that best fits your belief. All are taken from the literature. All are easy to use. Memo to teachers: comparing the six sets makes a good classroom exercise.

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|  | In the 17th century millions of people believed in witches flying on broomsticks. Could millions of people be wrong?  |

Whether our beliefs are truly ours or those of others, they guide us through life. They are all we have. But some beliefs are true (drinking cyanide will kill you), others are false (witches flying on broomsticks). **Critical thinking** helps you decide whether a belief is worth believing. Here are ten reasons for ten beliefs. How many are worth believing?

1. All men die. Mrs Brown is dead. So I believe Mrs Brown is a man.
2. Nobody has proved unicorns don't exist. So I believe unicorns exist.
3. Katie says she saw a ghost. I like Katie. So I believe ghosts exist.
4. If a cat is male he is black. My cat is black. So I believe he is male.
5. Taureans are lazy. I'm a Taurus and lazy. So I believe astrology is true.
6. John Edward contacts the dead. So I believe the afterlife exists.
7. ABC TV showed psychics solving crimes. So I believe they can do it.
8. Thousands of people say they were abducted by aliens. So it has to be true.
9. I read on the internet that Noah's Ark had been found. So I believe it.
0. The *West Australian* says a UFO has been seen. So I believe UFOs exist.

Maybe you reckoned about half. In fact none are worth believing, at least not without more details. Just because you saw it on TV does not mean it is true -- they said that Saddam Hussein's weapons of mass destruction existed, but they were wrong. As the Chinese say, if a thousand people believe a foolish thing, it is still a foolish thing.

**How to tell if something is true**
Suppose someone believes there is an elephant under your bed. Or that Vitamin C cures colds. You can tell if these things are true by testing them yourself (just look under your bed) or by reading the tests made by others (there are dozens on Vitamin C vs colds if you know where to find them). In the end it boils down to asking the right questions. We can even ask questions about asking questions, as in the next section.

**Four lessons from research**
Tim van Gelder, a former professor of philosophy at the University of Melbourne, is a specialist in critical thinking. In his article "Teaching critical thinking" in *College Teaching*, 45(1), 1-6, 2005, he gives six useful lessons from research into asking the right questions, here reduced to four.

**1. Asking the right questions is not easy.** Without training, most of us (including grown ups) haven't a clue. [The guidelines below will get you started]
**2. Practice makes perfect.** Try asking questions about as many beliefs as you can, especially yours. The more you practice the better you become. **3. But practice isn't everything.** For oldies it also helps to know some of the technicalities of critical thinking, and to show your reasoning in a diagram. You can then *see* what is happening or (more usually) not happening.
**4. Our thinking has dozens of biasses ranging from powerful to subtle.** The worst is our one-sidedness -- we resist changing our minds even when the evidence says we should. So we must either have no interest in the outcome (which is easier said than done), or put extra effort into finding evidence that contradicts our cherished belief. For more details see *Undeceiving Ourselves* on this website under Weird Things meet Critical Thinking > Undeceiving Ourselves.

**Guidelines for asking the right questions**
**about paranormal beliefs**

Here we summarise six published sets of questions for assessing paranormal beliefs. Try them on your own paranormal beliefs. They could change your life.

**Set 1: Baloney detection**
Abridged from Michael Shermer's article "Baloney Detection: How to draw boundaries between science and pseudoscience" in *Scientific American* for November and December 2001. Dr Shermer is the founder of *Skeptic* magazine. When I challenge common beliefs, people ask "Why should we believe you?" My answer: "You shouldn't. You should check things out for yourself". I call it baloney detection. To tell if something is true, you need to ask ten questions, here reduced to three:

1. What is the other side of the story? If the person making the claim does not know, then forget it. You cannot proceed without knowing both sides. If you do get both sides, ask the following:
2. Is the claim consistent with known facts and has it been verified by others who tried to disprove it? People may try to fool you by ignoring inconvenient truths. Don't take one person's word for it.
3. Is the claim based on impartial critical tests that anyone can make or on vague experiences or personal beliefs or vested interests? Only the first are worth having.

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**Set 2: Is it pathological science?**
In his article with Robert Hall in *Physics Today* 42(10), 36-48, October 1989, the Nobel prizewinning chemist Irving Langmuir observed that all cases of pseudoscience, or what he called *pathological science*, shared certain features:

1. They involve fantastic theories contrary to experience.
2. The effect is tiny and requires large samples to detect it.
3. There are claims of great accuracy.
4. Independent studies report conflicting results.
5. There are always excuses for brushing aside criticism.
6. Scientists eventually lose interest.

He concluded that pathological science exists not because people are dishonest but because they are unaware of how easily their experience can fool them. As the Nobel prizewinning physicist Richard Feynman observed, "science is what we have learned about how to keep from fooling ourselves."

**Some differences between science and pseudoscience:**
Science uses all the evidence, invites criticism, and changes according to the evidence.
Pseuodscience uses only favourable evidence, sees criticism as conspiracy, and resists change.

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**Set 3: Forget formal logic**
Professor Ray Hyman at the University of Oregon is world famous for his critical assessments of paranormal claims. In his article Assessing Arguments and Evidence, *Skeptical Inquirer* 11(4), 400-404, Summer 1987, he says that formal logic is of little use when teaching students how to assess paranormal claims. What matters is asking the right questions:

1. Exactly what is being claimed?
2. What is the evidence put forward by believers?
3. Does this evidence justify the belief? (See below)
4. What sort of evidence would justify the belief?
5. What other reasons might explain the belief?

If question 3 about the evidence is a hard one, try these additional questions:

3a. How reliable is the source? Hearsay or published scientific research?
3b. How recent is the research? Methods are always improving.
3c. Have the research findings been replicated by others?

The most reliable evidence will be based on recent scientific tests that have been replicated by others. Professor Hyman notes that: (1) Even the best reasoning will produce nonsense if the evidence is unreliable. (2) Outside of major scientific journals it is rare to encounter reliable evidence. (3) The moral is that, in most cases, rigorous assessment of paranormal claims will not be possible.

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**Set 4: Applying scientific principles**
In his book *How do you know it's true?* (Prometheus 1991) former professor of science education Hy Ruchlis shows young readers aged 11-14 how to tell fact from fiction by applying these four key principles of science:

1. Facts must be based on accurate observations that many people have verified.
2. Scientists make guesses (called hypotheses) about what explains their observations.
3. Guesses are not accepted as true until supported by experiments designed to prove them false.
4. Scientists are cautious about accepting guesses as true too quickly.

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| Cartoon | History has many cases where people thoughtthey were right but were later shown to be wrong.A good example is astrology, where hundreds oftests have not supportedits grandiose claims.Cartoon is by Albert Sarney from *How do youknow it's true?* by Hy Huchlis, page 39.Millie: Why don't we start our vacation?Billie: Astrology says wait until the sun is in the house of travel.Millie: Why didn't we leave when it was in the house of wealth?  |

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**Set 5: Three-legged stool test**
Ian Bryce is the chief investigator for Australian Skeptics. In an article in *the Skeptic* 25(4), 53, Summer 2005, he suggests a three-legged stool test for assessing any claims. You ask three simple questions, as follows:

1. Is there a scientific theory that makes the claimed effect possible?
2. Is there real evidence that the effect actually exists?
3. Does the claimant's track record establish their credibility?

If the claim fails any one test then, like a three-legged stool with a leg missing, it falls over. The required backing is not there.

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**Set 6: Dealing with crooked reasoning**
This is the simplest set. It is also the oldest. In his book *The Art of Clear Thinking* (Collier 1962), chapter 9 on "How not to be bamboozled", best-selling author Dr Rudolf Flesch gives examples of eight crooked reasonings dignified by Latin names beginning with *argumentum ad*, or "appeal to", which examples can be translated as follows:

*ad hominem = the person:* She's lovely, she's engaged, she uses the paranormal.
*ad populum = popularity:* How to be popular -- buy more paranormal books.
*ad misericordiam = pity:* Let the paranormal improve your dull rotten existence.
*ad baculum = brute force:* The paranormal is advertised on all networks.
*ad curmenam = money:* The paranormal costs much less than the normal.
*ad verecundiam = prestige:* Many world leaders were raised on the paranormal.
*ad ignorantiam = ignorance:* Never heard of the paranormal? You clueless oaf!
*ad captandum vulgus = the crowd:* The paranormal is everyone's favourite

But Dr Flesch notes that we couldn't function if we had to classify a given reasoning in 38 different ways before we could deal with it. So we need something simpler. He suggests that just two ways will do:

*1. The reasoning makes an irrelevant point.* Remedy: so what?
*2. The reasoning ignores a relevant point.* Remedy: specify.

**Example of successive applications:**
I believe in the paranormal (so what?).
The paranormal is advertised in the yellow pages (so what?).
Only the paranormal will save you (specify how).
The paranormal takes your mind off global warming (specify how).
The paranormal shows me the real reality (specify).
The real reality has been proven (specify).