Écrit par Spock
Mardi, 02 Mars 2010 18:47 - Mis à jour Vendredi, 02 Août 2013 13:40

There are no translations available.

Formal Reasoning & Truth-Detection: The Basics
(Mr Spock's guide to developing executive functions)

Introduction and Strategy

"Logic is the beginning of wisdom"

(Spock, 'The Undiscovered Country')

Logic has been variously defined as "the tool for distinguishing between the true and the false", "the science, as well as the art, of reasoning"; and "the science of the most general laws of truth".

Despite growing up in a society that values intellect highly, with schooling systems that push intellectual ability at the expense of virtually everything else, two thirds of adults tested cannot use formal reasoning (3).

Since this ability serves such skills as rational & critical thinking, decision making, assessment, planning, analysis, judgement etc., that means that two-thirds of the general public cannot think abstractly, reason logically, devise plans to solve problems, systematically test solutions or draw conclusions from the information available, nor can they apply all these processes to

hypothetical situations or understand the more complex issues in life that all of us from around age 15 should be able to understand.

This is an astonishing situation; that most people fail to develop their potential in this most fundamental way; the ability to reason. If we fail to develop the very faculty of our minds by which we should be able to deduce inferences from facts or from propositions; without reason allied to a clear view of reality, we cannot clearly distinguish truth from falsehood, fact from fiction, and ultimately beneficial from harmful.

It is my conjecture that the failure of two-thirds of adults to ever achieve the abilities of formal reasoning is due to wrong use of the relevant brain networks skewing healthy development, and that making the brain do the wrong things at the wrong ages is in part responsible for retarding ('holding back') this part of intelligence (although it is certainly not the only thing responsible) (4, 5).

To develop brain networks in the right order, we have to answer the questions intelligence is asking the universe, in the right order. Schooling does not allow us to continue asking the right questions for intelligence to fully develop: what, where, which, when, how and why. When we learn things in the right order for the brain's development to keep apace, that last question 'why?' comes to a mind that is equipped to search for its own answers, and our use of logic goes smoothly and fully into gear. Throughout development, we continue to see the associated relationships between everything. Life makes Sense.

For many of us life stopped making sense when we had our train of questions derailed by the distraction of training frantically to pass IQ tests, in other words answering the 'why' questions 'parrot-fashion' from what we were told, instead of being able to explore and understand it for ourselves via association.

Aside from this, it is not our aim here to examine the problem or its symptoms; instead we aim to reverse the causes themselves by direct instruction and procedural practice. Fortunately, we can begin asking those questions again at any age, and that is exactly what this tutorial is designed to assist.

Rational thinking is different from many other subjects in that it is difficult to learn about it

without doing it; indeed you cannot truly understand it without doing it, much like sex, swimming or playing a computer game cannot be learned or understood very effectively just from books. The whole point of knowledge is that it should give us abilities; abilities to do something new and different; in this case to think in a different way.

The new and different ability that rational thinking brings with it is the ability to perceive truth from falsehood, which is a very useful skill all over the galaxy and one of the reasons why rational thinking before decision-making can be such a rewarding skill for survival in general.

Reason is not only applicable to scientific subjects. We can focus on abstract and/or practical questions such as "What do the concepts of 'god', 'art', 'self' or 'mind' mean?"; "Is reality really as it appears in our minds?"; "Why do relationships fail?"; "Is the information on this website genuine?", "How does love affect health"; and so on. Rationality can be applied to any subject and if applied properly should enhance rather than diminish that subject for you, and should augment your awareness, perception, knowledge and wisdom regarding that subject.

Rational intelligence is NOT the opposite of emotional intelligence; they are complementary (eg they work together to give us more information), and the clear light of reason should make the beauty of things like stars and poetry more, not less, awesome. There is a deep spiritual aspect to formal reasoning for those who pursue it with rectitude. I hope you enjoy taking this journey with me.

Our strategy will be as follows; our aims for learning here are:

- To be able to explain what rational thinking is
- To understand and put into practice some basic skills of argument analysis
- To practice some critical reading
- To be able to apply rational thinking to misinformation to reveal truth

By the end of this tutorial you should be able to:

- Recognize what is useful about a rational approach to various issues
- Identify and use the basic tools of argument analysis
- Analyze information critically to reveal the truth, and present your own ideas logically

The aim of this article is to encourage you to engage interactively with what you are reading about rather than just absorb my words passively. The example analyses of scientific writing will give you the tools to do this; the exercises will give you feedback on your progress and the chance to put into practice what you have learned. I have given explanations for words that may be unfamiliar.

I am, and always shall be, your friend.

Live long, and prosper.

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Why Rational Thinking Is Logical, Captain

"Reality is that which, when you stop believing in it, doesn't go away."

(Philip K Dick)

Logic has been defined as "the study of the rules of correct thinking". It concentrates on the principles that guide rational thought and discussion. Logic plays a key role in critical thinking, invention, discovery, creativity, strategy, planning, judgment and decision making. If there is going to be any rational discussion of different ideas, concepts or positions, the discussion must use the rules of logic. While logic will not specify what the contents of statements are, it will tell you how to arrange the statements themselves in a logical fashion to best apprehend the truth.

Communication and Behavior are Based on Assumptions

"Insufficient facts always invite danger."

(Spock, 'Space Seed')

Abstract questions arise out of concrete reality in everyday life. For example, the heated debate about climate change can only be answered by addressing important abstract questions. What are the acceptable limits of individual freedom with regard to pollution or resource-wasting in a sensible culture? Are there ever justifications for forcing people to behave in a certain way for their own good? In other words, this debate is not just about drawing conclusions from climate change data but depends on (and creates) fundamental overall assumptions.

The analysis of reasons and arguments is an important part of rational thinking. Reasoning skills are applicable in any area where arguments exist and are also useful when you are being creative or planning, since it's helpful to see the reasons for what you are planning to do or intend to create. They can also give you insight about the intent or intentions of others and (very importantly) protect you from coercion or being deceived or lied to. For this reason a basic understanding of critical thinking is extremely valuable whatever subject you apply it to, from playing baseball to building a space station.

The Difference Between a Row and an Argument

"All things being equal, Mr. Scott, I would agree with you. All things, however, are not equal."

(Spock, 'The Undiscovered Country')

This is the first thing you have to learn. Arguments are very different from rows, but most people say "we had an argument" when in fact they had a row. In a row, each participant's aim is to prove each other wrong. In an argument, each participant's aim is to assist in discovering the truth. When the truth is found, everybody wins.

The most fundamental concept in logic is that of argument. The logical concept of an argument is: a set of statements, one of which is the conclusion, the others are premises, and the premises support the conclusion. In other words, it is a statement or assertion, along with the evidence that supports it. An argument must have at least one premise and one conclusion.

Argumentation is the interdisciplinary study of how humans should, can, and do seek conclusions through logical reasoning, that is, claims based, soundly or not, on premises.

An argument must provide reasons, information or evidence in support of a conclusion. It's probably easiest to demonstrate this with some examples:

Here is an assertion: "Free will doesn't exist"

This is the sort of statement you might hear in ordinary conversation, but why should anyone believe it? It is simply a statement of one person's belief; it is possibly a prejudice ('pre-judgement' -a view the speaker has arrived at without bothering to consider reasons or evidence for or against it).

The obvious action/reaction to this statement in a row is for those with opposing beliefs to say "Bullshit," at which point the row claims its first casualty.

The obvious interactive response is: "Why do you believe that free will doesn't exist?" As soon as the speaker provides some reasons in support of the view, it ceases to be a mere assertion and becomes part of an argument (although not necessarily a good one). By asking questions we are trying to get closer to exactly what the speaker means when they say these words; we are trying to get closer to the truth. Your prime responsibility in all rational thought is to seek the truth.

Our speaker might back up their assertion in this way: "Because if free will did exist, then nobody would ever have to do anything they didn't want to do."

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This statement alone does not lead to the conclusion "Free will doesn't exist". But if you are intelligent it is fairly obvious that the speaker assumes you realize that most people actually DO have to do things they don't want to do against their will. This assumption is unstated; it is 'implicit' in the speaker's association of thought and they assume that it is obvious; that 'everybody knows that'.

If we make their 'train of thought' explicit, we get:

  1.

(Spoken premise) If free will did exist, then nobody would ever have to do anything they didn't want to do

  2.

(Unspoken premise) Some people do have to do things they don't want to do

  3.

(Spoken conclusion) So free will doesn't exist

1 and 2 are the premises from which the conclusion (3) is supposed to follow. Premises are the building blocks of arguments.

IF/THEN Thinking

"You'd make a splendid computer, Mr Spock."

"That is very kind of you, Captain".

(Kirk & Spock, 'The Return of the Archons')

A computer solves a problem by assuming all the input data is true and accurate and proceeding from there. So let us assume 'for the sake of argument' that it is true that if free will did exist, then nobody would ever have to do anything they didn't want to do, AND that some people do in fact have to do such things.

Does it then follow that free will doesn't exist?

Logically it does follow: IF these two premises are true, THEN the conclusion (that free will doesn't exist) MUST be true.

Of course, reading this as an intelligent person, you realize that I personally am not saying 'free will doesn't exist'. I am merely saying that IF the two premises are true, THEN the conclusion that there is no free will must be true. We may well believe that the first premise ("If free will did exist, then nobody would ever have to do anything they didn't want to do") is probably false. There may be an explanation of why free will exists despite the fact that people sometimes have to do things they don't want to do. But what we are doing here is separating the content of the argument from its structure or form, because we need to understand the underlying structure of ALL arguments regardless of subject.

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So, when analyzing the structure of an argument we first put aside (temporarily) the question of whether or not the assumptions or premises are true; we think like a computer and concentrate on the question of whether or not the conclusion could really follow from the data (premises) given IF this data were factual.

Notice that in the spoken conversation, the conclusion "free will doesn't exist" was the first rather than the last thing said! We expect a 'conclusion' to come at the end, but in ordinary interaction conclusions are often given before (or without) the reasons behind them, which remain unspoken premises or assumptions. Assuming mutual understanding of these 'hidden agendas' is the cause behind much human misunderstanding, but the skills of rational thinking can unearth them.

DO IT NOW

"Tactical strategy" (IF/ THEN thinking in real life)

Imagine you are the tactical officer on the bridge of a starship. There are three ships nearby detected on your screen and you have the following information: The Minbari starship is aiming at the Centauri starship, but the Centauri starship is aiming at the Narn starship. The Minbari starship has armed her weapons but the Narn starship has not.

Your Captain turns to you and says, "Is an armed ship aiming at an unarmed ship?"

Do you answer 'Yes'? 'No'? or 'Cannot be determined'?

Answer is at end of tutorial.

The Difference Between Content and Form

"Linguistic forms are not merely instrumental, but fundamental—not only to persuasion, but to thought itself."

(Gideon O Burton)

To recap, when analyzing an argument, it is best to first rearrange the data so that the relationship between premises and conclusion can be seen clearly. We need to focus on the structure; the form.

In analyzing the structure or 'form' of an argument, its content is irrelevant. It will be easier to understand the difference between the content and form of arguments if you consider another example with the same underlying form as the one above:

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Assertion: "A spaceship landed near my farm".

Argument: "I know it did because there's a crop circle in my corn field."

Analysis (the speaker is assuming the premises (1) and (2) below to be true, and drawing the conclusion (3)):

(Unspoken premise) Crop circles are made by spaceships landing.

(Spoken premise) There's a crop circle in my corn field.

(Spoken conclusion) So a spaceship landed near my farm.

Like the previous argument, IF the premises are true, THEN the conclusion must be true. You can question whether or not the premises are true (for instance, you might think that a spaceship landing is not the only reason for a crop circle). But IF the premises are true, THEN the FORM of the argument is such that it follows that it's true that a spaceship landed near the farm.

Conclusions are often stated in ordinary conversations as though they were facts, thus contributing to general confusion between those who do not share the same unspoken premises, especially when this disparity of underlying assumptions is not known.

In most conversational contexts one or all of the underlying premises remains unspoken. For instance, if I said:

"Androids are humanoid"

"So they have four limbs"

it is fairly obvious that I assumed you would realize I believe the unstated premise:

"All humanoids have four limbs"

even though I hadn't spelt that out for you. With scientific arguments, it is usual to try to make explicit any such unstated premises so that the underlying structure of the argument becomes clear as an hypothesis. Unstated premises are called 'implicit' premises.

To make sure you've grasped the idea of implicit premises, do the following exercise:

DO IT NOW

Implicit premises

What is the unstated premise in each of 1-5 below? For each one, write down your answers in the following ways:

1. unstated premise
2. stated premise

3. conclusion

1.

Alice is creative, so of course she likes problems to solve.

2.

Your landing gear is damaged, so your craft will never get off the ground.

3.

Bob is a man, so he is mortal.

4.

Laughing helps to improve your thinking skills, so you should laugh frequently.

5.

I am the Internet. I think, therefore I exist.

Now check your answers against those shown at the end

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The Difference Between Truth & Validity

"Evil does seek to maintain power by suppressing the truth."

"Or by misleading the innocent."

(Spock and McCoy, "And The Children Shall Lead")

We looked earlier at the following argument:

- "If free will did exist, nobody would ever have to do anything they didn't want to do."
- "Some people do have to do things they don't want to do"
- "So free will doesn't exist."

This is a VALID argument. IF the premises are true, THEN the conclusion must be true. We use the words 'valid' and 'invalid' only to refer to the structure of arguments. AN ARGUMENT CAN NEVER BE TRUE OR FALSE; IT CAN ONLY BE VALID OR INVALID.

Things that can be true or false are things like statements, conclusions, assertions, assumptions, hypotheses, beliefs or premises. But NOT arguments. You may have to work at remembering this.

You will understand that the way we use language to describe reality in rational analysis is not

the same as it is commonly used in colloquial or everyday ways –we are using specific words here to define specific ideas, and these ideas are what it is intended you should grasp. In ordinary conversation the terms 'true' and 'valid' are interchanged largely through ignorance of their meaning, so do not let this confuse you. People often say "That's a valid point" when in reality they mean "I think what you said is true".

There is a great deal of difference between validity and truth.

A valid argument has a structure that works like a calculator program: it guarantees a true conclusion provided you feed in true data. It is 'truth-preserving'. However, if you feed in false premises, you may or may not get a true conclusion, and you certainly couldn't be sure of getting one.

For instance, in the argument we've been examining, if the premises are true, then the conclusion that free will doesn't exist must be true. This is a valid argument. However, IF one or both of the premises are false, THEN there is no guarantee that the conclusion is true, despite the argument's validity. The question of validity or invalidity must be addressed separately from the question of truth or falsehood. Validity is about the form of the argument; truth of premises & conclusion is about its content.

A valid argument presented with true premises is the best way of guaranteeing true conclusions. Such an argument is called "sound".

DO IT NOW

At this point it is worth practicing some of the key ideas introduced so far. Use the answers at the end of the tutorial to help consolidate your understanding.

Key ideas

Underline or highlight the conclusion in each of the following arguments:

- Robots don't eat animals. Chickens are animals. I eat chickens. So I'm not a robot.
- You can't have any pudding. The only way to get any pudding is to eat your meat. You won't eat your meat.

Underline or highlight those of the following that are valid arguments:

- Robots don't contain animals. Nuts and bolts are animals. So robots don't contain nuts and bolts.
- All humans are mortal. Robots are machines. So robots are mortal.
- Anyone who walks on a cliff has a small chance of falling off. Alice walks on cliffs. So she has a small chance of falling off.
- All forms of killing are morally wrong. Criminal execution and war are forms of killing. Therefore war and execution are morally wrong.

Match the following terms with the appropriate definitions, (a)-(h):

- Argument

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- Assertion
- Prejudice
- Conclusion
- Implicit assumption
- Sound argument
- Premise
- Valid argument

- (a) an unstated premise
- (b) a structure that guarantees a true conclusion if the premises are true
- (c) a statement from which an argument's conclusion is derived
- (d) a statement given without providing any reasons or supporting evidence
- (e) a belief that is formed without considering evidence for or against it
- (f) a statement derived from premises, from which it follows
- (g) reasons leading to a conclusion
- (h) a valid argument with true premises

Fake Argument Formulas that Can Con or Coerce: Fallacies

"There is some fiction in your truth, and some truth in your fiction. To know the truth, you must risk everything".

(Animatrix)

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Logic also reveals incorrect ways of reasoning. A set of statements that appears to be an argument but is not is called a fallacy. Consider the following statements:

- All starfleet officers wear uniforms
- My granny wears uniforms
- So my granny must be a starfleet officer

Is this a valid argument? NO. At first glance you might take it to be so. The structure seems similar to examples we've seen. However, if it had the exact same form, it would read:

- All starfleet officers wear uniforms
- My granny is a starfleet officer
- So my granny wears uniforms

THIS is a valid argument. IF the premises were true, THEN the conclusion would be true.

The first example is known as a 'fallacy', because the conclusion doesn't necessarily follow from the premises (regardless of whether or not the conclusion happens to be true.) The way the supposed argument is structured allows for the fact that someone could wear uniforms and yet not be a starfleet officer. As an argument, it is invalid; it does not fit the correct formula to produce a valid conclusion from premises.

Here's another example of a fallacy:

- All wizards wear pointy hats
- My neighbor wears a pointy hat
- So my neighbor must be a wizard

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Again you can see that the conclusion would only follow if the first premise read:

ONLY wizards wear pointy hats

So regardless of whether or not it is true that my neighbor is a wizard, the argument is fallacious: it is an invalid structure; one which is not truth-preserving. Even if the two premises were true, there is still the possibility of other people besides wizards wearing pointy hats.

Fallacies are exactly the sort of reasoning that advertising executives, religious leaders and politicians love, because less experienced thinkers can fall for and be conned or coerced by them (as the Monty Python team so aptly lampoons in the witch-trial scene of "Monty Python & the Holy Grail"). In addition to faulty reasoning, such fallacies are often based on possibly false premises such as 'wizards actually exist'. This can lead to certain characteristics (such as wearing pointy hats) being used as conclusive evidence that this or that person is a wizard.

DO IT NOW

Fallacies

Which of the following are fallacies, and which are valid arguments?

1. All geniuses have been slightly crazy. I'm slightly crazy, so I'm a genius.
2. All children feel insecure. You're a former child, so you must have felt insecure.

3. If you do something wrong, you get questioned by the police. You've been questioned by the police, so you must have done something wrong.

4. Some creative people have bipolar disorder. You're not very creative, so you can't have bipolar disorder.

5. All religions get donations. Sex in spaghetti is a religion. So spaghetti-sex worshippers should get donations.

The answers are at the end of the tutorial.

All the examples here of fallacies are of 'formal fallacies', which break specific rules of logic, but there are also 'informal fallacies' which usually are phrased to appear as an argument but the statements purporting to be premises to do not support the conclusion. One example of this is called a "circular argument", in which the conclusion is used as the premise; for example: "Why is taking drugs illegal? I'll tell you why. It's because it's against the law!"

Since "illegal" and "against the law" are the same concept, the speaker in the above informal fallacy is using the fact that taking drugs is against the law to prove that it is illegal. In effect the speaker is just repeating the same statement two times. Nothing has been proven.

Deduction and Induction

"I fail to comprehend your indignation, sir. I have simply made the logical deduction that you are a liar."

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(Spock, 'The Alternative Factor')

The examples of arguments we have considered so far have all been 'deductive' arguments; that is to say that they have all been constructed in a form such that if the premises are true then the conclusion must be true. However, there is another type of valid argument, and this second type DOESN'T guarantee the truth of the conclusion even if the premises are true.

A deductive argument is one in which the conclusion is certain based on the premises. In a deductive argument the conclusion is contained in the premises, much as in classical physics conclusive results are based on physical mechanics.

An inductive argument is one in which the conclusion is a probability based on the premises. In an inductive argument the conclusion goes beyond the premises, much as in quantum physics probabilistic results are based on quantum mechanics.

Inductive arguments are usually based on evidence which by its nature is not easily conclusive: conclusions can only be probabilities; never certainties. For instance, the following is an inductive argument:

All the scientists Bob has ever met had brown hair.

Therefore all scientists have brown hair.

The fact that Bob has met quite a few scientists, and that they all had brown hair, seems to support the conclusion that all scientists have brown hair. However, it only takes one non-brunette scientist to undermine this generalization. Bob cannot be absolutely sure that

there is not a blonde or redhead scientist on the planet somewhere. For all he knows, brown-haired scientists worldwide may even be in a minority.

If other people from other places also report in that they have never met a scientist whose hair wasn't brown, this lends further support to Bob's conclusion. Yet even then the possibility would remain that a non-brunette scientist would show up.

This inductive argument is very different from a deductive one because even if the premises are true, you cannot be certain that the conclusion is true. It just gives us a probability; a likelihood, of truth. The more information we have, the higher our probability of truth, but we can never say with 100% certainty that we are correct.

Inductive reasoning draws general conclusions from specific examples, deductive reasoning draws logical conclusions from definitions and axioms. A similar pair of complementary processes are analysis and synthesis (Analysis takes an object of study and examines its component parts, and mainly uses the processes of network 5 of your brain; and synthesis considers how parts can be combined to form a whole, and mainly uses network 4.)

A common form of inductive argument is argument by analogy. This is an argument in which a conclusion is drawn about a situation based on analogies (similarities of this situation to previous, other or imaginary situations). For example, if we predict that since we have some heavy lifting to do in the cargo bay today a certain colleague will be suddenly absent, because in the past when there was similar hard work to do this person was always suddenly absent, we are making a probabilistic inductive argument based on an analogy with the past similar occurrences.

DO IT NOW

Deduction & Induction

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Which of the following use deductive reasoning and which use inductive?

   1. All mythical supreme beings are immortal. Zeus is a mythical supreme being. Therefore Zeus is immortal.
   2. The sun has always risen in the past, so it will rise tomorrow.
   3. All the people I have ever met enjoyed drinking beer. So all people must enjoy drinking beer.
   4. If you make porridge on a full moon, it will always go lumpy. You made the porridge on a full moon, so it went lumpy.
   5. All animals have a sense of smell. Humans are animals. Therefore humans have a sense of smell.

Answers are at end of tutorial

Constructively Critical Reading

"Humans do have an amazing capacity for believing what they choose and excluding that which is painful."

(Spock, 'And the Children Shall Lead')

You've been using critical thinking in all the exercises so far, so now we're going to take a look at critical reading. This is a great skill to learn because it gives you the ability to discriminate the truth from rumors, gossip, propaganda or outright lies. And critical reading IS a skill that can be learned. To do it well requires the ability to concentrate, and it is an active rather than passive process; you have to think critically about something as you are reading it. You need both to understand the author's position and to check whether they have put forward a coherent case for that position.

This involves analyzing arguments. However, the arguments that authors use when writing books and articles are not often as clearly stated or straightforward as the ones we've been considering so far.

In this section of the tutorial we'll be looking at two pieces of writing; both are extracts from articles in online scientific publications. I am throwing every reader in together at the deep end here regardless of your experience, and some people may find these next exercises very difficult. If you've never done anything like this before don't worry if it takes you a long time to do or even if you can't do it at all; once you see a few examples the process gets much clearer with practice.

DO IT NOW: Critical Reading Extract 1

This first piece is an extract from N C Andreasen's article "Dissecting the Urge to Create" (1). Read through the extract on its own first a couple of times (without going on to the questions below) and decide what you think it is generally about and whether you think it seems convincing. Then go on to the questions.

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"What causes some minds/brains to achieve awe-inspiring artistic or scientific achievements? We cannot help but be fascinated by the fact that Shakespeare—a merchant's son with "small Latin and less Greek"—could emerge from the "nowhere" of rural Stratford to create the richest literary treasure in the English language. We wonder how Michelangelo—a stonecutter's son who also came from a rural nowhere—found within himself the vision to see the shape of David in a block of discarded marble or the apolcalyptic fresco of The Last Judgment on the wall of the Sistine Chapel. What genetic influences shaped their brains to create—and to create these very specific wondrous things? How did their environments promote or impede them? Would Michelangelo have been great without the patronage of the Medicis or the competitive edge induced by Leonardo? Great art and great science are indeed often forged in the smithy of pain—with the fire fueled by self-doubt, obsessive preoccupation, sorrow, depression, competition, or economic needs."

Questions

1. Why, according to the author, does creativity arise?
2. What conclusion is stated about the kind of conditions that creativity is assumed to parallel?
3. Why has the author put quotation marks around the word "nowhere"?
4. What is the unstated premise about creativity itself?
5. Does the author present a valid argument that there is a link between creativity and mental illness?
6. Does the author present a valid argument that genetics modulated by environment are responsible for creativity?
7. Does the author present a valid argument that rural locations are in fact inferior?

Answers at end of tutorial

Once you are sure you have understood not only what the author is saying, but also what hidden premises their words are implying, there are three basic questions that you should apply to everything non-fictional that you read or hear:

1. What is the author's main conclusion?
2. What reasons does s/he give in support of this conclusion?
3. How good is the author's argument?

In order to see how this works in practice, we shall apply these questions to Andreasen's passage on creativity:

1. What is the author's main conclusion?

Creativity is associated with environments considered inferior, and with mental illness. "Great art and great science are indeed often forged in the smithy of pain".

1. What reasons does s/he give in support of this conclusion?

Genetic influences and environmental moderation. Two examples are given (Shakespeare and Michaelangelo). In both cases the same consideration about impoverished backgrounds is applied. There is an unspoken premise that the same genes that 'cause' creativity also 'cause' mental illness.

1. How good is the author's argument?

It is a fallacy. The author's examples of creative individuals from backgrounds considered

'inferior' makes a convincing case that in at least some cases creativity and these backgrounds are correlated. But applying individual cases to 'everybody' is unfounded extrapolation and this is a fallacy. It is the equivalent of saying:

1. Shakespeare had fleas, and Michaelangelo had fleas.
2. Great art and great science were indeed often forged by people with fleas.
3. To be creative, people often have to have fleas.

What constructive criticism can be made of Andreasen's argument? One criticism is that the examples are sparse, very old, and differ significantly from the lives and backgrounds of many creative people. Another is that the article misses the possibility that all persons may be creative sometimes.

But the main objection is that it is fallacious. It is a rehash of the 'no pain no gain' cliche (which is itself a fallacy). We cannot assume that persons from non-rural backgrounds with no mental illness cannot be creative, or that all creative people conform to these conditions (or even that environmental experience is linked to creativity at all, from the evidence given). Even if both premises were true, the conclusion does not follow.

When you find a fallacy, you have found a non-workable structure. This means that whatever the content; regardless of what is being said, regardless of the writer's eloquence or emotive power, you have immediate proof that the argument does not make sense. It is not logical. No useful conclusion can be reached from this structure and you know ahead of time that the truth cannot be determined by considering it.

Did you have a different opinion of the validity of this article before and after considering these questions? Do you see how you can avoid wasting a lot of time and bypass an enormous amount of complicated content just by understanding when you are looking at a workable structure and when you are looking at a non-workable structure?

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DO IT NOW: Critical Reading Extract 2

Our second extract is from Ewen Callaway's article, "Damaged brains escape the material world" (2).

"Increased feelings of transcendence can follow brain damage, a study of people with brain cancer suggests.

As feelings of transcending the physical world can be part of some religious experiences and other forms of spirituality, the finding may help explain why some people seem more prone to such experiences than others.

The brain region in question, the posterior parietal cortex, is involved in maintaining a sense of self, for example by helping you keep track of your body parts. It has also been linked to prayer and meditation."

Questions

Summarize the passage above using no more than 25 words. Compare your summary with mine at the end of the tutorial.

1. What is the author's main conclusion?
2. What reasons does s/he give in support of this conclusion?
3. How good is the author's argument?

Answers at end of tutorial

Lies, Damned Lies, and Statistics

"It is not a lie to keep the truth to oneself."

(Spock; 'The Undiscovered Country')

Perhaps the biggest con trick that fools most of the people most of the time is that of information being pulled out of context so that in the literal sense it seems true, but the deception lies in what is hidden.

The best way of grasping this is by comparing the 'ideal' to the 'real'. People are given an 'ideal' concept that gives a false impression out of context. Here are some examples (the upper case statements are the 'ideals' we are given, the lower case bracketed statements put them back into context by revealing the hidden reality):

-   CONTAINS EXTRA VITAMINS (none of which you can digest)
-   CONTAINS AGENT 'X' THAT WHITENS TEETH (and causes bone disease)
-   AS AN AIR HOSTESS, PONGO DEODORANT KEEPS ME DRY ALL DAY (as an actor dressed up as an air hostess, I've never heard of Pongo but I'm getting $50 an hour.)
-   90% OF THE POPULATION VOTED FOR GENERAL FULLASHITE (once they understood that their families would be shot otherwise)
-   8 OUT OF 10 PEOPLE BELIEVE... (8 out of 10 people who did this survey claimed to believe)
-   LOW IN FAT (and extremely high in stuff that turns into fat right after you've eaten it)
-   NINE OUT OF TEN PEOPLE WHO TRIED BOTH DRINKS SAID THEY LIKED 'X' BEST (even though all testers agreed that both drinks were pretty awful)
-   FANTASTIC ROBOT TOY ONLY $10 (plus $20 worth of batteries every twenty minutes)

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DO IT NOW

Try some **hidden truth spotting** yourself. What information could be missing in the claims below?

   - CONTAINS NO ADDED SUGAR OR SWEETENERS
   - MORE PEOPLE HAVE SEEN THIS MOVIE THAN ANY OTHER
   - CRIME RATES DOWN
   - PEOPLE ARE READING LESS
   - ACCORDING TO FIGURES, THERE WERE FEWER CASES OF DEPRESSION THIS YEAR
   - AUTISM IS AT AN ALL TIME HIGH
   - $200,000 WAS ADDED TO THE BUDGET FOR ORGANIC FARMING THIS YEAR

 See my suggestions at end of tutorial

Mistranslation, Semantics and Reflexive Thinking

"Those who hate and fight must stop themselves, Doctor, otherwise it is not stopped."

"I suggest that good spirits might make an effective weapon"

(Spock, Day of the Dove)

 Sometimes we are led astray from the truth by other people's different translations or interpretations of the information given. This is why it is always preferable to go as far as you

can to the source of data that has led to conclusions and assertions. This (often unrealized) disagreement in interpretation leads to confusion of understanding, as we will see.

Sometimes mistranslation is blatantly deliberate; to invoke the 'scandal factor' that journalists love to exploit to provoke warmongering and controversy (this is what journalists do best).

Let us use an example from above; here's the short extract from Ewen Callaway's article again; "Damaged brains escape the material world":

"Increased feelings of transcendence can follow brain damage, a study of people with brain cancer suggests.

As feelings of transcending the physical world can be part of some religious experiences and other forms of spirituality, the finding may help explain why some people seem more prone to such experiences than others.

The brain region in question, the posterior parietal cortex, is involved in maintaining a sense of self, for example by helping you keep track of your body parts. It has also been linked to prayer and meditation."

Now imagine I am a journalist trying to cause a stir with this information. I could create something much more controversial; such as this:

Religious People May Be Brain Damaged, Scientists Discover

Scientists have discovered that people with brain damage get more religious. The part of the

brain affected gives us physical awareness, eg helps 'keep our feet on the ground', but people with brain cancer found their ability to do this decreases and religious feelings increase. Praying and meditation uses this part of the brain. Does this mean science has finally reached its goal of disproving God, or that all religious people have brain damage of some sort or other, or that religion itself is some sort of mental illness or mind control? Certainly not, unless you assume the majority of the population (including many scientists) to be seriously mentally disturbed! But despite laughing himself, this author bets the anti-religious lobby will be laughing their ass off at this one.

Hopefully you can see various ways how I have misinterpreted the original information to make it appear to mean something that it doesn't. I have misused the term 'Religion' to make it appear that the people reported feeling 'religious', which we have no proof that they actually did ("transcendent feelings" was the original term used.)

My main conclusion as this unpleasant journalist comes out as "Religious people may be nutters" and my 'proof' for this conclusion is basically "Scientists said so". I suggest this possibility repeatedly and then cover my own ass by saying 'certainly not,' implying that scientists are talking rubbish. I then reverse direction by saying I'm amused and so are the anti-religious, but I don't associate my humor with theirs directly, giving enough leeway for readers to hear what they want to hear. Religious readers will assume I side with them and am laughing at the scientists, atheists will assume I'm laughing at the religious. Oh what an asshole I am.

Now imagine if my nasty journalist's report were the only place you had seen this information!

With no access to the original, this sort of thing is what most people are given as 'news'. The more it is edited, the less accurate it gets. Scientific data starts with the original research report, which is edited for a main science magazine, edited a second time for popular science magazines, edited again for serious news publications, edited again for popular newspapers, and every time it's edited it could be twisted as badly as I have twisted the information above.

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Aside from deliberate misinterpretation in order to cause a stir, the vast majority of poor understanding comes from assumed semantics. Put simply, we believe that when other people use the same words we use, they mean the same things. Most of the time, we are completely mistaken.

This assumption is the cause of a great deal of relationship problems, international diplomacy disasters and unsuccessful team work.

For some reason, people find this concept particularly hard to grasp when it comes to matters of the mind; most notably emotion. There may be as many interpretations of the meaning of the word 'love' as there are humans saying it, half of whom have not experienced it yet despite claiming to be 'in it'.

Not getting clear definitions of what somebody means (or not remembering them when they are given) will impede your understanding of anything you read or hear. Always try to define clearly what the author means by a term, not what you think it means but evidence for what they think it means.

To narrow the problem down to our field there are several classics that can trip you up; so in NH we always work with the clinical meaning because this leads to most accurate understanding and results. If you forget these, you are likely to misunderstand the tutorials and much that you read on the subjects.

I list 'the classics' here:

1.

Shock. Clinical meaning: A physiological state inducing a collapse of circulatory function, can be caused by sensory overload, electrocution, poisoning, allergic reaction, blood loss, or disease, and characterized by pallor, sweating, weak pulse, and very low blood pressure.

Colloquial use: People use the word 'shock' for alarm, fear, trauma, panic, surprise, scandal and the sudden or unexpected .

1.

Stress. Clinical meaning: A specific (beneficial) response by the body to a challenging physical, emotional or mental stimulus, including the release of hormones & neurotransmitters according to the nature of the stimulus. In PTSD, the response repeats chronically without the stimulus.

Colloquial use: People use the word 'stress' for strain, anxiety, hassle, pressure, panic, trauma, inability to cope and coercion.

1.

Emotion. Clinical meaning: A specific (beneficial) mental, physiological and physical response subjectively experienced as feeling and physiologically involving changes that prepare the mind and body for relevant behavioral interaction.

Colloquial use: People use the word 'emotion' for sentiment, reaction, dependent attachment, melodrama and histrionics.

1.

Intellect. Clinical meaning: A conscious function of intelligence focusing on calculation and analysis, measurable by IQ tests, enabled mainly by one of six brain networks (N5) which has its cell-body nexus in the left and left frontal hemisphere.

Colloquial use: People use the word 'intellect' to mean intelligence, 'common sense', declarative memory, cleverness, academic, and cognitive thinking.

DO IT NOW
Semantic Problem Spotting

Suggest some contrary things different authors might mean by the following words and phrases:

- Affect
- I bought a house/ car/ supercomputer
- Complementary
- Confidence
- Controls
- Education
- Fear response
- Hallucinating
- Hysteria
- I couldn't live without...
- It's the truth, honest...
- Pride
- Psycho
- Scared
- Schizo
- Starving
- Theory

Suggestions are at end of tutorial

Sometimes the fault in clarity of reason is our own, and we should learn to recognize the traps that lead to sloppy thinking and reading. Following the practice of rational thinking will help you to refine your own clear definitions and apprehend the misunderstandings of others.

It is part of a developing intelligence to educate yourself, and reflexive thinking and refining your own definitions is important because if you don't have clear association categories in your own mind, your memory can accidentally reinterpret someone else's meanings before storage. Let's check that assertion:

DO IT NOW
Memory Accuracy Check

Try this exercise: without looking back, underline or highlight which of the following words appeared in the first extract you read (Andreason's "Dissecting the Urge to Create")

- Amazing
- Bipolar disorder
- DNA
- Family
- Genes
- Genius
- Gifted
- Grief
- Hardship
- Heredity
- Inherited
- Literature
- Masterpiece
- Painting
- Poverty
- Statue
- Upbringing

Answers at end of tutorial.

What Was That Again?

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"My guess doctor, would be valueless. I suggest we refrain from guessing and find some facts."

(Spock; 'That Which Survives')

A small but overlooked area of misunderstanding in spoken argument is pronunciation. This problem was brought to my attention by a Professor of Ancient History who constantly has to ascertain whether lecturers/students are discussing 'law' or 'lore', due to the fact that they pronounced these two words identically. (He went on to notice that they also pronounced 'raw' as' roar' and 'draw' as 'drawer'). This can, quite naturally, cause confusion; especially if he had guessed at their meaning rather than asking. It's easy for someone to hear the wrong word because of your (or their) accent, especially if they are not speaking in their first language.

Remember those early computer speech interpretation programs that translated "Recognise Speech" as "Wreck a nice beach"? Don't fall prey to the same misunderstandings yourself. If you are not sure of someone's accent or pronunciation, ask for definitions of key issues. Only when you have the true facts can you proceed to true conclusions about what is being said. Never guess what you think is being said! Your memory will forget it was a guess and proceed on the assumption it is true.

The Great Debate

"Change is the essential process of all existence."

(Spock, "Let That Be Your Last Battlefield")

Formal Reasoning & Truth-Detection: The Basics

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"What does it mean, 'exact change'?"
 (Spock; 'The Voyage Home')

Debating different arguments is an essential skill, because it leads to our discovering the truth. Although very few people know how to voice effective and relevant arguments, we should be able to debate effectively and defend our points with conviction and relevance.

The purpose of debate is to present opposing, paradoxical or different views on an issue or event and subject them to rational analysis; for example the observations:

"Light behaves like waves"

"Light behaves like particles"

Have, after debate, yielded to the conclusion, "Light can behave like either waves or particles depending on circumstances." Without such debate, we can fall into the trap of trying to make facts fit theories, rather than the other way round. The map is not the territory and we are not here to defend the map; we are here to defend the territory, which is 'the truth'.

Preparing Your Own Arguments

You are explaining why a certain point should be accepted. That is the definition of an argument. Things to use in your argument as premises: facts, demographics, theories, statistics, references, quotations, personal experiential reports, ideas, physical evidence; all of these can provide 'weight' behind your argument.

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To make sure you have constructed a good argument, use the mnemonic: SPOCK

- S = Structure: when planning and on ending, check that what you are saying presents the structure of a valid argument.
- P = Premises: Present your premises with clarity and make sure of their relevance, giving definitions for terms you are using. Remember, your job is to help people to understand exactly what you think and why you think it.
- O = Order: Make effective use of evidence by presenting information in a coherent order and with clarity so that people can see how you made your associations.
- C = Conclusion: Make sure your conclusion follows from your premises, if it does then you know you have a valid argument.
- K = Kick out any personal abuse, attacks, sentiment, rudeness & irrationality. They have no place in rational argument and they cannot help us find the truth. If you are too anxious to argue rationally without being rude, don't join in until you have fixed that problem first. This does NOT mean there is no emotion in debate; and nobody loves a passionate argument more than I do. It means there is no sentiment. Learn the difference; it is the hallmark of a healthy and mature intelligence.

Countering Argument in Debate

This is called 'rebuttal', and is a very important part of debate. All points made will stand if you do no rebuttal; even if someone's hypothesis is very weak, it will still stand if uncontested and unexplored.

If someone presents the conclusion; "The sun goes round the earth", it is of no use saying, "No it doesn't". We have to ask the speaker WHY they conclude this and then show if we can evidence why their premises are mistaken or their argument is not valid. We can present contrary evidence for another theory, and sometimes this is sufficient to disprove the argument, but as in the particle/wave situation sometimes proving a second thing correct does not necessarily prove the first thing wrong.

An argument may be wrong in content or form. If so, say how and why. An argument may also be true but irrelevant. Watch out for this, it is important.

Remember that it is not necessary to rebut everything, only what is relevant. All that you need to counter in a valid argument are the premises. Take care of these, and the conclusion will take care of itself.

Answers to Questions & Exercices

Answer to Tactical Strategy

More than 80% of people answer this question incorrectly. If you concluded that the answer cannot be determined, you're one of them. (So was I once.) The correct answer is, yes, an armed ship IS aiming at an unarmed ship.

How do we know? Most of us believe that we need to know whether or not the Centauri ship has armed her weapons in order to answer the question. But, using IF/ THEN thinking, consider the possibilities; because there are only two:

IF the Centauri starship has not armed weapons, THEN an armed ship (the Minbari starship) is aiming at an unarmed ship (the Centauri ship).

IF the Centauri starship has armed weapons, THEN an armed ship (the Centauri starship) is aiming at an unarmed ship (the Narn ship). Either way, the answer is yes.

Answers to implicit premises

1. unstated premise: All creative people like solving problems

stated premise: Alice is a creative person

conclusion: So of course she likes problems to solve

2. unstated premise: If your landing gear is damaged, your craft cannot take off

stated premise: Your landing gear is damaged

conclusion: So your craft will never get off the ground

3. unstated premise: All men are mortals

stated premise: Bob is a man

conclusion: So he is mortal

4. unstated premise: It is beneficial to do things which help to improve your thinking skills

stated premise: Laughing helps to improve your thinking skills

conclusion: So you should laugh frequently

5. unstated premise: Everything that thinks exists

stated premise: I think

conclusion: Therefore I exist

Answers to Key Ideas

1.

(a) I'm not a robot.

(b) You can't have any pudding.

2.

(a) Valid (even though one of the premises and the conclusion are false)

(b) Invalid (even if the two premises were true, they do not lead to the conclusion)

(c) Valid

(d) Valid

3.

(a) an unstated premise = Implicit assumption

(b) a structure that guarantees a true conclusion if the premises are true = Valid argument

(c) a statement from which an argument's conclusion is derived = Premise

(d) a statement given without providing any reasons or supporting evidence = Assertion

(e) a belief that is formed without considering evidence for or against it = Prejudice

(f) a statement derived from premises, from which it follows = Conclusion

(g) reasons leading to a conclusion = Argument

(h) a valid argument with true premises = Sound

Answers to Fallacies

1. Fallacy. From the premise: "All geniuses have been slightly crazy", it doesn't follow that anyone who is slightly crazy is a genius.
2. Valid argument (regardless of whether the premises are true)
3. Fallacy. Doing something wrong is not the only reason for someone to be questioned by

the police. So the conclusion cannot be deduced from the premises.

    4. Fallacy. The first premise doesn't state that ONLY or ALL creative people have bipolar disorder. So the conclusion doesn't follow from the premises, since you could still have bipolar disorder even though you weren't very creative, or you could still be creative even though you weren't bipolar.

    5. Valid argument (despite its false premise: sex in spaghetti is not a religion)

Answers to Deduction & Induction

1. Deduction
2. Induction
3. Induction (provided I haven't met every person in the universe)
4. Deduction
5. Deduction

Answers to Critical Reading Extract 1

    1. Why, according to the author, does creativity arise? Because of genetic influences ("What genetic influences shaped their brains to create"), modulated by environment (How did their environments promote or impede them?")

    2. What conclusion is stated about the kind of conditions that creativity is assumed to parallel? "Great art and great science are indeed often forged in the smithy of pain -- with the fire fueled by self-doubt, obsessive preoccupation, sorrow, depression, competition, or economic needs".

    3. Why has the author put quotation marks around the word "nowhere"? There is an unstated premise here that rural areas on the whole are 'nowhere' in comparison to urban areas; in other words rural environments are inferior.

    4. What is the unstated premise about creativity itself? That creativity is something only a few gifted or unusual individuals have.

    5. Does the author present a valid argument that there is a link between creativity and mental illness? No. Individual examples are given, but one cannot extrapolate from individual to general. This is a fallacy, even taking into account that the author says 'often' rather than 'always'. Two examples do not prove something happens 'often'. The author is assuming 'everyone knows that'.

    6. Does the author present a valid argument that genetics modulated by environment are responsible for creativity? No. No reasons or evidence are given for this assumption; the

unstated premise is taken as a given; 'everyone knows that'.

    7. Does the author present a valid argument that rural locations are in fact inferior? No. No reasons or evidence are given for this assumption either.

Answers to Critical Reading Extract 2

Summary: Increased transcendental feelings can follow damage to brain areas controlling body awareness, which might explain why some get these feelings more than others.

What is the author's main conclusion? That increased transcendental feelings can follow damage to certain brain areas.

What reasons does s/he give in support of this conclusion? A study connected with brain cancer, details of the brain area concerned and what its functions are, and that the region has been linked to prayer and meditation.

How good is the author's argument? This is a valid argument. IF the premises are true (and the full article does give references for readers to check the study), THEN the conclusion must be true. Even if the study used only two people, the author's use of the word 'can' makes the argument work. There is no claim that this is always the case or that it is the only thing that can cause such feelings (indeed, prayer and meditation are also mentioned). There is good clarity here in that the author distinguishes religion from spirituality. If people themselves claim an increase in feelings of transcendence after damage to this part of the brain, and this change is measurable with technology, then this is also a sound argument. We could argue that the sub-conclusion "the finding may help explain why some people seem more prone to such experiences than others" is unjustified (no evidence is given that implies this conclusion can be drawn and it unclear exactly what is meant here). We are also not told whether the 'transcendent feelings' were temporary or permanent, and that's a very important issue. An LSD trip or watching a sunset can cause 'transcendent feelings' but they don't remain there for the rest of your life.

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Hidden Truth Spotting

Here are some possibilities:

CONTAINS NO ADDED SUGAR OR SWEETENERS (but is mainly made from sugar in the first place)

MORE PEOPLE HAVE SEEN THIS MOVIE THAN ANY OTHER (more people have bought tickets to see this movie than any other)

CRIME RATES DOWN (people are reporting fewer crimes, and/or fewer criminals have been caught)

PEOPLE ARE READING LESS (people are reading fewer books and magazines, because they now mainly read the same stuff online)

ACCORDING TO FIGURES, THERE WERE FEWER CASES OF DEPRESSION THIS YEAR (fewer people reported having depression to their doctors this year)

AUTISM IS AT AN ALL TIME HIGH (more people are recognizing autism and more doctors diagnosing it because more people know about it now)

$200,000 WAS ADDED TO THE BUDGET FOR ORGANIC FARMING THIS YEAR (and $200,000,000 was added to the factory farming budget).

Answers to Semantic Problem Spotting

Formal Reasoning & Truth-Detection: The Basics

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Affect: Often used as 'effect' when describing experiments

They bought a house/ car/ supercomputer: Almost always the truth is "They borrowed a house/ car/ supercomputer", unless the specified item was in fact fully paid for. Watch out for similar twists in the obvious in other everyday discussions that most people take for granted.

Complementary: Often misused to mean 'complimentary', and vice versa. Complementary neurotransmitters are transmitters that work together to maintain balance. Complimentary things are things that give you compliments, such as "You're a really smart dude", and "Cool hairdo".

Confidence: Often misused to mean 'assertiveness', extroversion or arrogance. You will find big problems with emotion related words; currently neuroscience hasn't categorized them very effectively (more on this below.)

Controls: Often used in popular science articles to mean 'modulates', 'adjusts'. 'increases', 'decreases, 'changes' turns on/off' 'is one of a number of factors controlling', 'correlates with', 'is associated with', 'may be associated with', and even 'is controlled by'. Make sure you know what the author means by 'controls'. The prime examples of this usually are: "The gene that controls..." or "The area of the brain that controls..." Statements like this are almost always untrue.

Education: Can mean indoctrination, schooling, instruction, learning, academic qualifications, experience, teaching, literacy,

Fear response: A seriously misused term, associated with problems classifying emotions and sentiments.It is used to describe all sorts of responses and reactions; such as 'fight or flight', panic, the release of adrenaline, the release of cortisol, specific behaviors, shock, hysteria, alarm, defense, paranoia, hesitation, learned avoidance, PTSD and too many more to mention. Be careful to understand what the author means when you encounter this term.

<u>Hallucinating:</u> Used for 'imagining things', also for seeing or hearing things, also for 'high on drugs', 'fantasizing', 'demented', 'disturbed' and 'confused'.

<u>Hysteria:</u> Used for panic, fear, anxiety, melodrama, histrionics, phobia, tantrums and insanity in general.

I couldn't live without... Usually really means "I'm too insecure to let go of".

It's the truth, honest... Could mean "I'm not lying", "This is a true account of what I believe", "It is a proven fact", "It is what I believe to be true", "Everybody knows that", and many other possible things. It can be hard to explain to someone that although they are telling the truth, what they are saying may not be true! If you understand this you have a good grasp of rational thinking.

<u>Pride:</u> Could mean pleased at your achievements, or could mean hubris (unjustified bragging beyond actual achievements). Also used to mean 'arrogance' and 'vanity'.

<u>Psycho:</u> Interchanged with 'schizo' (see below)

<u>Scared:</u> Emotion words are a nightmare of misunderstanding because they are dependant on the personal scale of experience and intensity of individual experience, but assumed to be mutually understood. A paranoid person, a firefighter, a monk, a racing driver and a soldier will all use the word 'scared' to define different intensity levels of feeling as well as completely different emotions or sentiments, when in reality they may mean anything from 'mildly alarmed', 'apprehensive' or 'surprised' to 'fight & flight' or 'crapping my pants and passing out', so it becomes clear that 'scared' is not describing the same experience. Remember this problem with ALL emotion words (and descriptive terms like 'very' or 'enormous'). Such terms are always relative.

<u>Schizo:</u> Could mean schizophrenia but is often used for bipolar disorder, psychopathy, multiple personality disorder, or any general mental condition that causes bizarre behavior. It is also used for mass murderer, serial killer, violent person, and 'lunatic' in general.

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<u>Starving:</u> Could mean dying of starvation. Could mean restricting food from self or other. Could mean 'I'm really hungry'. Could also mean 'I haven't had my lunch'.

<u>Theory:</u> A theory is an hypothesis that has gained a lot of proof for and none against, for example Newton's gravitational theory or Evolution theory, but this word is used in the popular press to mean anything from a random guess to fact, including hypothesis, wild imagining, idea, belief, consideration. If the press are quoting you as a scientist, everything you say may be labelled 'your theory'.

Answers to Memory Accuracy Check

NONE of these words are in the article. The ones you thought you remembered will have revealed to you your own associations with the subject, which your memory has mistaken for the author's.

Summary of Key Skills in Rational Thinking

- Understanding and identifying arguments, either explicit or implied, and the goals of critical reading in different types of presentations.
- Identifying the premises from which conclusions are derived
- Establishing who made the initial claim in argument (and is thus responsible for providing evidence why his/her position merits acceptance).
- For the one presenting the argument, the task is to present evidence for his/her position in order to show the reasoning that has led to the conclusion. The method by which this is accomplished is producing valid, sound arguments, devoid of weaknesses.
- In a debate, fulfilment of the burden of proof creates a burden of rejoinder. Both sides must try to identify faulty reasoning in counter-argument, to investigate the reasons/premises of the arguments, to provide counterexamples if possible, to identify any logical fallacies, and to

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show if a valid conclusion cannot be derived from the reasons provided for any given argument. Interactional debating is useful because many minds working together can reveal weak arguments quickly.

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