

## **Overview: Critically Thinking About Business**

The most important and highest paid skill sought in today's business is Critical Thinking. You will learn what it is, and its relation to the business professional. No math is needed, however some logic and good reading skill is required. Critical thinking is a philosophical as well as practical, hands-on tool. Business professionals constantly work with new ideas and encounter different technologies and societies with varying morals and ethics which necessitate critical thought in order to optimize decisions, or minimize risks. Wherever philosophy arises, so do religion and morality. We treat all faiths equally, with respect and fairness, and to do this well none are treated specially. The readings, homework and quiz are not aimed at making you accept anything unwillingly. Nor are they intended to offend your sensibilities. You may rarely be asked to express an opinion, but it is not to judge if your opinion is correct. In such a case full credit is possible even if you do not agree with the author. In all other cases you should be able to explain what a scholar said, or explain something that science accepts. It is important to be able to express yourself clearly. Test questions will be about facts from the readings. Tests will not require the student to pretend to accept or reject something against their conscience.

### **By completing this module, you will be able to:**

- Learn the meaning of Critical Thinking
  - Learn about Type-One Errors
  - Learn about Type-Two Errors
  - Learn how Critical Thinking bears on
    - Philosophy
    - History
    - Politics
    - Business
    - Economics
    - Religion and morality (all matters of faith treated equally, with respect and fairness, none are special)
  - Learn the difference between learning sufficient to understand versus coercion to accept ideas against one's conscience
  - Learn how to disagree professionally, calmly and dispassionately
  - Learn how knowledge evolves over time
  - Learn about the external environment called the universe
  - Learn about the internal environment called the mind
  - Learn how to reconcile environments by using critical thinking
  - You will also watch a short Ted-talk video called "Trial, Error, and the God Complex" which addresses the dangers of not thinking critically. After completing the readings you will have a discussion, assignment, and quiz.
-

## **Reading 1: Critical Thinking, by Edward G. Engh**

### **Introduction: Reading 1, Critical Thinking, by Edward G. Engh**

Critical thinking is the oldest and most important tool ever devised. It allows humans to see danger as well as opportunity. Critical Thinking is the source of science and engineering, but also our primary tool for winning the game of competitive life, including the game of business. All progress is a mixture of critical thinking and serendipity (good luck), but man cannot count on the latter. To progress, and to win we must have a strategy and the first strategy is to think critically. Critical thinking is error detection, and there are two kinds of error. A type-1 error is rejecting something that is true, whereas a type-2 error is accepting something that is false.

**Things to ponder:** While completing this reading, you should think about the following questions. Similar or related questions may be included in the module assignment, discussion, and quiz.

- What is reality?
- What are facts?
- What is “Self Correcting”?
- How can society Think Critically?
- How are Profits, Free Will and Determinism related?
- How can critical thinking influence my future?

**Reading Vocabulary Terms and Definitions:** In order to improve your comprehension of this reading, study the following words and their definitions. You will be responsible for knowing these words as part of the module quiz. Deeper explanations are available in the GLOSSARY--> [Link](#)

<b><u>Vocabulary Word</u></b>	<b><u>Definition</u></b>
• Asymmetrical	Irregular, as in unequal vertically and horizontally (not symmetric)
• Conservation	Law of nature, matter & energy & information are conserved
• Critical-thinking	Error detection, type-one and type-two
• Determinism	Something known and unalterable
• Dialectic	Inquiry of contradiction in an argument without resolution
• Empirical	Information obtainable by independent inquiry or questioning
• Indeterminate	Something unknown and capable of variation
• Law-of-nature	Science with no successful alternative explanation
• Probability	Uncertainty expressed as a fraction or decimal $0.0 \leq P(K) \leq 1.0$
• Ramification	Something resulting from (or caused) by something else
• Rational	Something capable of explanation based on critical thinking
• Reason	Communication based on critical thinking, reason or fact
• Rhetoric	Communication based on emotion and prejudice
• Scientific-fact	Tested by scientists independently, accepted by consensus
• Self-correcting	A system capable of correcting its own errors
• Supreme-ethic	Tell the truth
• Tergiversation	Intentional use of misleading language
• Type-one-error	Rejecting something that is actually true
• Type-two-error	Accepting something that is actually false

---

**Reading: Critical Thinking, by Edward G. Engh** Copyright information: © 2016 Edward G. Engh, Salt Lake City, Utah

“Business is a game and deception is Key to winning all games. A player may let the odds of chance determine the outcome, but a strategically minded business will not rely on mere serendipity. Instead the best businesses employ critical thinking to change the odds. This is the way to maximize profits. Hunting for profits is a game of survival of the smartest.” - Edward G. Engh

## What is Reality?

The Universe is everything, and it exists whether humans know about it or not. It is experienced by all living things through **perception**, using the five senses: sight, hearing, touch, taste, and smell. A person can share their perceptions through speech, allowing others to learn something indirectly, assuming the speaker tells the truth. People may say anything, even the truth, but freedom of speech may encourage something called **tergiversation**, intentional distortion of the facts. Add to this that some people have more respect than others, and their expressions carry more weight. Some people seem to have more authority than others do. Some people say things, even ridiculous things: and use tradition to back them up. This creates difficulties. Suddenly humanity is faced with a dilemma; what is truth, what is real? A human can say something is **real**., but saying so does not make it so, no matter whom the person is.[2](#). To know something is real means it is **rational** and **empirical**. In other words, it can be tested, and everyone can see the results.[3](#).

## What are Facts?

A **scientific fact** is something that is judged to be real by scientists. The principles governing the process of discovering scientific fact are embodied in *laws of science*. If something is a law of science, it is also called a *law of nature*. It has been observed to work every time. No one has reason to think it will not work according to the law, because there is insufficient evidence. A law of science is only a law, as long as there is no reason to doubt that it works.[4](#) It is also called a theory, or truth. In other words, theory or truth conforms to the laws of science, and vice versa. Another way to say something is real in science is to say it is empirical. It is very important to understand that scientific laws are descriptions, not forces. Objects fall to the ground not because *Isaac Newton's* law of gravity makes them fall: but because of a force in nature, which Newton's law merely describes.

## Self-Correcting

Suppose at some point that someone does perceive an event different from what a law of nature describes. Does this mean the law is wrong? Yes. The law of science must be corrected. Science is **self-correcting**. Laws of science or nature should be viewed as questions, always open for discussion. This may cause great frustration for people who want things to be absolutely true and unchanging, but it may also indicate that such frustrated people are immature and do not want to question things. Many times philosophical truth and scientific fact agree with each other.[5](#) Yet no matter how much one loves truth, philosophy is in the mind, whereas reality is separate and independent of the mind. Likewise, no matter how many facts humans compile there is always the nagging awareness that reality is complex against the wishes of mental simplicity. There will always be some distance of time and space between the mind and reality.[6](#).

## Asymmetrical-Universe

Things would be nice if the Universe and our experience of it were simple, or symmetrical. **Symmetry** is an "Exact correspondence of form and constituent configuration on opposite sides of a dividing line or plane or about a center or an axis."[7](#) However, the situation is not simple.

Reality and perception are independent of each other creating an **asymmetrical** relationship. In other words, ". . . The mind is its own place . . ." [8](#) and so is reality. All human perception stands in between. Some philosophies or systems of thought are frustrated, even overturned by this picture. Science accepts this asymmetry as fundamental simply because the conscious thought in the mind is never in perfect correspondence with the reality outside the mind. Figure one, shown below is a two dimensional visual model of the universe in which each person lives. It happens to be the same model used to test hypotheses throughout the world, and it has served us well for hundreds of years. Business students encounter the same model in courses called Business Statistics, in the chapter called *Hypothesis Testing*. Reality is represented across the top on the right side, whereas perception is shown on the lower left side. Both are subdivided into true or false, columns for reality and rows for perception. [9](#). The model is made simple so it can serve as an introduction. For example, there are two discrete rows for perception, one labeled true and the other false. Someone either truly sees something or they do not. Reality is also simplified in this illustration, allowing something to be real, or not. Critically, reality and perception have four intersections. This provides for four different possible relationships between the mind and the universe.

## **Error-Detection**

A girl may perceive a hummingbird clinging to her finger, right before her eyes. This is only rational if the bird is actually there. Since this is remarkable, she ought to confirm what she sees and feels, especially if she wants to tell others about her adventure. As long as the bird really is on her finger her judgment is sound. Likewise, if the bird is not really there, and she perceives it is not there. In spite of all this attention to detail, the possibility always exists that she is imagining the whole thing. Suppose a black widow spider is crawling on her hand. If she fails to notice it, she is committing an error. Error can be deadly. Only if people learn to perceive well can they hope to understand the real universe. These errors are not limited to individual humans.

## **Survival of the Smartest**

Science is full of examples of species which have not survived. No doubt, some were overwhelmed by cataclysm. So far, humanity seems to be the only one capable of influencing survival through exercising rational thought. Man is capable of discourse and this might increase man's ability to perceive. It must be made clear that just as many may perceive what is real, many may also fail to perceive, and this poses grave danger to humanity. History is filled with civilizations, nations, empires of the past. They do not exist now because they failed to make use of their perceptible surroundings and paid for the mistake with their lives.

## **Expanding Perception**

From birth, infants try to see, hear, touch, taste, and smell everything around them. As humans develop they soon discover arms, and they reach out to gather more information. As soon as they are able to move, they further expand their perceptions, exploring everything in sight. Eventually all people discover there is a limit to what one person can experience directly. The brain may be thought of as an integral processor, correlating all the information from the senses. Yet the senses and brain are limited tools for comprehension. If not for some great invention of man, this would signal the end of human progress.

## **Culture**

Tools were invented to overcome the limits of humankind. Thus we develop physical tools to improve our senses; glasses, microscopes, telescopes and magnifying glasses for seeing; other tools to improve our ability to hear far beyond the human limitations; and still more for smelling touching and tasting. An example of such a tool is the Gamma-ray Spectrometer. This is used to taste and smell objects on other planets, far beyond arm's length. The word for the physical tools made by collective groups of humans is **culture**. When studying a culture, we explore the tools developed for those people at that time and place.<sup>11</sup> There are non-physical tools however. The greatest tools are not physical, but mental. Consider how much of the Universe is not yet perceived by anyone. Nearly everything real exists without our **knowledge**.<sup>12</sup> We have no perception beyond our limits. We can move to look around a corner, and the next one; but no one may look around all corners. Humans are not alone though. The time in life, when we realize we are not alone is critical. It determines largely our perceptions thereafter. Education is possible from that moment. Education is the foremost of all tools of the mind.

## **Independence**

Reality is independent from perception. The Universe is vast. Since perceptions are finite, knowledge is as well. Our ignorance is vast. If reality and perception are treated as equivalents, they become **rational, measurable, and testable**. Since reality exists independent of perception, it can be treated separately, without harm. Similarly, perception can be tested, treated, and measured without any harm to reality. Education therefore becomes a tool for man to Comprehend Reality.

## **Nonsense**

What do we call something for which there is no sense, no perception, and no empirical evidence? Things, which no one can see, hear, touch, taste, or smell, are called: **nonsense**. Nonsense means there is no rational reason to believe in it. Yet humankind has a long history of accepting nonsensical things. Different cultures and civilizations developed vast schemes based on superstition and ignorance. The fact that these schemes persist is evidence, not of their reality, but of the feebleness of humanity. In many societies, the cause of something is believed to be miraculous, supernatural, or perhaps sinister. Generations come and go believing things that often impede their progress, and failing to question the nature of cause and effect.

### **Who invented Critical-Thinking?**

Figure 1 above represents the collective thoughts of four great thinkers from antiquity: Socrates, Plato, Aristotle, and especially Epicurus.[13](#). It represents one of the greatest discoveries of all time. In spite of this, rational thinking has been furiously fought, resisted, and nearly snuffed from existence several times in human history. All these men were at one time or another accused of impiety, heresy, even treason, and one was executed: not for some act of cruelty but for teaching this method of thinking.

Among the first Greek scholars to seek the fundamental causes of natural phenomena was the philosopher Thales, in the 6th century BC. The mathematician and philosopher Pythagoras established a movement in which mathematics became a discipline fundamental to scientific investigation. At the Academy of Plato, deductive reasoning and mathematical representation were emphasized; at the Lyceum of Aristotle, inductive reasoning and qualitative description were stressed. The interplay between these two approaches to science has led to most subsequent advances.[14](#).

### **Arabic Culture Saves the Day**

If it were not for the diligence of other, wiser cultures that saw the value in these ideas, critical thinking might have been lost entirely. Fortunately, the Islamic-Arabic cultures protected and preserved the writings of the philosophers and scholars of Classical Greece and Rome. When the Western-mind was ready to confront the Universe, rather than run away from it, these books and ideas were transmitted back to the Universities springing up throughout Europe, but we should never forget that Islam cherished critical thinking while the west shunned it. It was a dark age for critical thinking in Europe from the fall of Rome (in the fourth century CE) until the Renaissance (in the fourteenth century CE), a period that lasted one-thousand years.

### **Developing Societies = Youthful Brains**

It is important to distinguish the role played by misperception and superstition in developing societies. One might view superstition and tradition as tools for decision-making. If so, then they may be tolerated. They ought more properly to be viewed as obstacles to understanding, barriers to rational thought, and a way to stop decision making. This is a view accorded by many anthropologists who have developed comparative science to high degree. Comparing many societies facing the same problem, why does only one develop a solution to the problem? Those societies, which did not develop a new approach to solve a problem, were passionately fenced in

by traditional ways of thinking, belief in magic, superstition or supernatural interpretations. People are very passionate about their nonsense.

## **Rhetoric**

Another way to describe such passion-riddled thinking is rhetoric. Rhetoric is based on emotions, prejudice, and a distinct lack of interest in pursuing questions of truth. The purpose of rhetoric is to persuade. It is a highly developed art, and several great philosophers wrote extensively on rhetoric.<sup>15</sup> [There is a time and place for everything, even emotion](#). Many things are designed to appeal directly to our emotions and prejudices, for example art, music and fictional literature. However it is important to remember that anything which detracts from our ability to think critically is a handicap. This is why the ancient philosophers recommended that important discussions should always be done calmly and dispassionately. Disagreements are commonplace when groups of people try to formulate a consensus opinion, especially among critical thinkers and scientists, politicians and business leaders of all sorts. It is vital to avoid confusing the facts with any emotions used to communicate or persuade. Experienced teachers are familiar with this problem. It is important to present the facts clearly to students, but students are more likely to remember things if the teacher can cultivate a personal interest about the subject in their mind. To do this rhetoric may be used, but sparingly. Nevertheless, there are times when it is appropriate to shout “fire! There’s a fire in the house! Fire!”

## **Dialectic**

Dialectic<sup>16</sup> is an improvement on rhetoric. In **dialectic**, contradictions are recognized, and there is the potential of truth: but that is usually the end of it. Dialectic makes little effort to test the cause and effect of things, their truth or fiction: but dialecticians at least agree that there is a contradiction, and getting that far in some discussions is an indication of some progress. Dialecticians use their contradictions to manipulate and control the masses. Angrily throwing contradictions at a hungry mob can easily stir up protests and riots in the desired direction. There are various methods, even whole schools of dialectic thought, but reality cannot be perceived solely through discussion of contradictions. A clever politician may be happy with dialectic results, but a critical thinker will not leave a contradiction unresolved. Debates can lead to apparent truth, or flimsy truth, something that looks like victory on both sides of an issue. Dialectic is often content with contrast alone, rather than determining which possibility is correct. Hegelian dialectic even proposes that two complete opposites, called **thesis** and **antithesis**, may join together into one kind of truth, called a synthesis. This approach may make people feel good, but it fails miserably in solving a real, scientific conflicts of issues. Beautiful though dialectic ideas may be, the process of using dialectic often fails to produce facts, and leads instead to compromises: and a truth-seeker should never be content with a compromise. In ancient times when an athlete had won a race in the Olympic games, it was customary to place a laurel wreath upon his head, and then give him an large ceramic amphora (vase) of precious olive oil. For someone to be content with dialectic-results is tantamount to cutting the laurel wreath into pieces, giving one to each contestant who merely tried.

## **Reason**

Reason is the highest, most exquisite form of thought. Reason is not easily achieved. It often goes unrewarded, and almost always frustrates other people. Though wasteful, much human activity is driven by rhetoric. Conversely, most of the great turning points in human progress are the result of reason. Practicing reasonable thought requires discipline, and a calm dispassionate approach. In fact, passions as described above, usually lead away from truth. This is contrary to popular perceptions of truth seekers, who are often portrayed as romantically engaged with their quests and discoveries. A few scientists and philosophers, when perceived through the lens of history may be seen this way; this image does not fit the vast majority.

## **Critical Thinking**

What is critical thought? It is the process of turning rational thinking upon itself, to improve the mind of the student. This requires self-perception. Students must look at their own thoughts, examine in their own writings, not so much for spelling errors but for errors in reason. They must always be on alert for errors in judgment. This is easier said than done. It is relatively easy to point at the errors made by others. Not so with one's own mistakes. Ego and pride are great obstacles to good thinking. Even things we are raised to value such as patriotism, culture, gender and race are often obstacles to good thinking. A good general does not assume his or her own troops are innately superior to the soldiers of the enemy. You will learn how this applies to business in a future module, when you read Sun Tzu's *The Art of War*. It would be foolish for a business person to assume that foreign competitors are incapable of producing superior products to one's own. The most frequent cause of business failure is not the competition, it is the uncritical thinking of the owner. If you always try to escape blame by pushing it off on others, you are unlikely to learn from your mistakes, and yet this is vital. If you assume you are incapable of making mistakes, you have already made one, the gravest! Yet it is so hard to examine oneself. Some of the reasons for this difficulty may lie in the family in which one is raised. If they are too proud they will promote the misconception that "we never make mistakes." Of course that is nonsense. We use the word "pride" here, we must be careful to explain that we do not mean the concept of "pride of face" common in Asian cultures. We risk great confusion if we do not delineate this carefully. Critical thinking requires humility, not pride. In face pride is an obstacle to good thinking. This does not mean one should grovel at the feet of others. We do not speak of that kind of humility. False pride is what we speak of. Do not let yourself become emotionally invested in some false delusion of superiority. It will cause errors in judgement. Instead, focus on your quality of mind, to ensure that your judgements are as error free as possible. Do not misjudge others. Do not overrate yourself. Do not undervalue others. Do not underrate yourself. Our species constantly evolves, we invent new ways of doing things all the time. When a superior way to do something becomes clear in one's mind, create it, make it real, make it profitable, turn the idea into a business, and then the old way will become the obsolete way. Repeat the process and you may just succeed in staying in business. Fail to evolve and your business will fail.

## **Physics of Critical Thinking**

Critical thinking is the basis of all forms of rational thinking and reasonable problem solving. The word critical tends to cause people to associate it with negative or skeptical thinking. Nothing could be further from the truth. A mind capable of problem solving can also find

opportunities. This should be obvious for one simple reason; a missed opportunity is a problem. Failure to see an opportunity to make a great deal of money is a grave error for a business person. Would you call someone who sees such opportunities a 'negative thinker'? That is hardly wise. Likewise, a problem not yet solved is an opportunity. Critical thinking is error detection, the resolution of misunderstanding in the mind in order to understand nature. Nature refers to anything real, and this could be something very remote and abstract, but also close at hand and practical. This means critical thinking applies to things ranging from understanding the forces of nature, such as energy, to very mundane things, such as what is the most efficient way to maximize profits: from cosmology to economics, from climate science to business analytics. You may not be used to thinking of business as a kind of science or physics problem, but consider this. What if you assume your product is safe when the truth is that it is not safe? What if you assume you can trust those you employ to relay the facts to you, but then they assume that you will ask if you ever want to know something? What if you misjudge someone's character? What if you fail to invest in researching better products? What if you let your fear of risk prevent you from investing in something that could be enormously profitable, if only you would research it? In playing the game of business one must always be alert to both types of error, rejecting something real and believing something that is not real. For a scientist or academic the rewards of critical thinking are public acclaim and academic awards. In business the rewards for critical thinking may be security and profits. Both require critical thinking, and both place enormous pressure on one's morals and ethics.

## **External Environment**

Outside of every conscious entity is its environment, the place and time in which it exists. For an organism, this refers to the natural environment, the resources necessary to sustain life, and the threats, including those other organisms, competing for access to those resources, but also the rest of the universe. Humanity is an organism with an enormous appetite for resources, thus the more humans understand their environment the better they should be at making sustainable use of it. Perception precedes use. Those perceptions must be correct. Perhaps one way to define consciousness is awareness of reality, the self, but also everything around the self. See figure 2 below. In the external environment, nothing can be both real and not real. Remember, the external environment is not in the mind, it has nothing to do with one's perception or consciousness of its reality. It exists or does not exist. If resources do not exist, we must find them. If they do exist, we must acquire them. If others seek them as well, then a game occurs with use of the resource the stakes. All living things play this game called 'Survival or Extinction'. It is very important to realize that the environment is external to the organism.

## **Internal Environment**

Inside every conscious entity is its mind, the brain is the home of the mind of man. Eyes provide visual information, the ears audio, the nose smell, the tongue taste, and skin provides the sensation of touch. Each sense provides metaphorically a window on the external environment. Individually each sense only provides specific and limited information about the external world. When senses combine, they permit a much more complete perception. The mind is the place that receives, stores, processes, hypothesizes, and analyzes information for decision-making. Each individual mind must function correctly for the individual organism to survive. See figure two below. The five senses evolved as tools to help an organism find necessities: food and shelter, and a mate.

It would be a faulty sense to see something that is not there to be seen. The same is true for the other senses: imagination can play tricks on the mind. An organ of perception may not function properly: in which case the eyes may not perceive where they should. That is an error. A mind (or brain) may also be defective. That too is an error. See figure 4 below.

## **Many Paths to Error**

For many centuries people assumed there was only one way to make a mistake. An idea was either correct or incorrect, or so they thought. Actually, there are two ways to make a mistake. See figure 5 below. If something is real but one fails to perceive it as real, this is a serious fault in the mind. Scientists and philosophers refer to this kind of fault as a **Type 1 Error**. When analysts formulate a hypothesis this would be rejecting a hypothesis one ought to accept. If something is not real, but one accepts it as real, for any reason, this too is a serious fault in the mind: and scientists refer to this as a **Type 2 Error**. In testing hypotheses, this is equivalent to accepting a hypothesis one ought to reject. In summary: If the mind fails to perceive something real, we call this a Type 1 error. If the mind believes in something that is not real, we call this a Type 2 error. These are the root of every problem facing humankind. Every danger, threat, or inefficiency: every waste, misuse, overuse, or failure to use well: every avoidable accident, preventable disease, missed opportunity for profits, is traceable to these two types of errors. Yet they are capable of solution. All these problems are solvable, avoidable, curable, or capable of minimization. Every underutilized resource, untapped capability, is correctable. Science is the careful and systematic use of critical thinking. Engineering is the application of critical thinking

to problems of production, quality, efficiency, capacity, safety, resource sustainability. Logistics is the specific application of critical thinking to matters related to transportation efficiency. Supply-chain is the specific application of critical thought to optimized resource selection. Business analytics is critical thought applied to all things related to business.

### **Simple Type 1 Error**

If one cannot define something, this is one problem, if one cannot give examples to demonstrate the definition, this is another problem. Definitions of the two types of error that are possible appear above, in figure 5. It is vital to produce examples of good critical thinking, but also examples of Type 1 and Type 2 Errors. We begin with simple examples and proceed to complex cases. If a woman is hungry and recognizes the fact, then action ensues to resolve the problem, and there is no error in this procedure, she eats. If however a woman is hungry but fails to perceive this fact for whatever reason, then action will not lead to resolution, and this is a Type 1 error. If it continues, the woman in question will die.

### **Simple Type 2 Error**

Consider the opposite state of affairs in which a person is not hungry, but also does not consume, once more this is not an error. If however a man is not hungry but continually eats when unnecessary, he will develop health problems, which are physical proof of errors. If this persists it may lead to heart disease, and or diabetes, and or musculoskeletal problems, and he may eventually yield to an impulsive death, and all this because of Type 2 error. These simple examples illustrate in each case the danger of rejecting something one should not reject, and the equal danger of accepting something one should reject.

### **Complex Example Type 1 Error**

Now consider examples that are more complex. In science or critical thinking, a question is a hypothesis. Consequently, we say that something unknown or untested is hypothetical. What is more, something tested and known, we say it is theoretical. Sometimes a theory long supported by consensus may be termed a law (but critical thinkers and scientists increasingly avoid the word law because of its association with abstruse legal and religious ideas about unchanging things, i.e., dogma, maxims, or irreducible complexity). To say something is law suggests it is unchangeable. Theory is truth, for example gravity, or evolution. The true state of nature is that gravity is real, it pervades the universe, and gravity waves pass through all things changing them however subtly. Accepting the law of gravity makes one less likely to rush headlong toward the top edge of a high cliff. This demonstrates the cautionary benefits of accepting critical thought. A person declining to respect his own knowledge of the law of gravity for whatever reason removes the advantage of caution and may suffer death at the bottom of a cliff when they experience a lethal Type 1 error. What could cause such a thing? That many organisms fly demonstrates they use their perception of reality in the form of gravity to advantage, they not only survive, they thrive in a dimension, which at once protects them from danger, which they would face if they were restricted to the surface of earth. It is doubtful that flying organisms justify their thoughts about gravity. However, justifying, explaining, and rationalizing are precisely what humans do. Humans may place themselves in danger two ways, by experiencing impaired perception through drugs, alcohol, or delusion, but also by conceding to faulty or erroneous understanding, i.e., doing the wrong thing for some stupid reason, or not doing the correct thing for another stupid reason. Anything capable of mental impairment could cause this. There are also delusions and brain injuries capable of producing mental malfunction. Could someone be conscious, un-medicated, and uninjured in any way, yet still not accept gravity? Yes, distraction and emotion, both can lead to Type 1 errors. This is why one must always be calm and dispassionate if one hopes to avoid error. Thus, one who is drunk may simply walk off a cliff. One who fails to accept the logic of the law of gravity, and denies the warning of a sign reading "Warning---cliff ahead" may also fall to their death. Both are Type one errors. Why are they Type 1? They are Type 1 errors because the reality is, things fall, warnings in place, laws of science taught, yet people still fall unnecessarily.

### **Complex Example Type 2 Error**

Now let us examine a complex Type 2 error. Type 2 means the error of accepting a hypothesis that is groundless, believing something that is false or senseless. Not all people are trustworthy is a true statement. Believing that all people are trustworthy is a Type 2 error. Things fall because of a force in nature called the law of gravity, and this too is a true statement. Believing in

levitation at will is a Type 2 error. An object at rest will stay at rest unless acted upon is a true statement. Believing that mental exertion alone can cause objects to move at will is a Type 2 error. The tensile strength of a graphite fiber of certain diameter is a certain value. Believing it is a much greater or less value is a Type 2 error. The part of the human body containing the mind and emotions is the brain, and this is a true statement. Accepting the heart as that organ is a Type 2 error. All observable actions of the human body are explainable as the product of matter and the forces of nature alone is a true statement. Believing that the explanation requires a soul is a Type 2 error. If one therefore assumes there is evidence for the existence of souls, a soul, or the soul, they burden themselves with a Type 2 error, which may misguide many other decisions. If a soul requires admission of an afterlife, then this too may be a Type 2 error. If an afterlife demands acceptance of some kind of other world as real, then this too may be a Type 2 error. How would such beliefs influence decisions? Would Type 2 errors have any influence on one's decision process? Take the hypothesis that medicine should focus foremost on keeping body and soul together. If, because of this hypothesis a physician avoids lifesaving drugs or procedures, and instead resorts to charms, incantations, and supplications to supernatural forces, what is the likely outcome? If one took a fatally sick loved one to a physician, and after the death of the loved one discovered the doctor had followed the procedure just described, how should one react? Type 2 errors describe believing something one should not. Why is this so hard to accept? Accepting Type 2 errors seems the most difficult obstacle to people attempting critical thought for the first time.

### **Society Tries to Think Critically**

So far, we have been discussing critical thinking as an activity done in the mind of one person. Humanity is not the kind of organism that survives individually. Although one individual may "survive" for a time, alone, they cannot pass on anything to the next generation without forming a bond with another human. Currently Biology (i.e. Life) does not seem to care about the individual. Biology has evolved to favor the genetic information in a species, not the individual. [Note: if critical thinking survives long enough, perhaps in the form of humanity or something humanity creates, i.e. artificial intelligence, then maybe this will change. For an artificial intelligence, the term 'external environment' requires more explanation.] Humanity survives by working together; indeed collective endeavor is not unique to humankind. The reader is aware that humanity does not do this very well. Nevertheless, in spite of weapons capable of destroying all life, we are still here. Many kinds of organisms function as a social organism: ants, bees, termites, wolves, all of these form communities (or societies if you will), and this increases the chance of their survival. Collectivism is thus a strategic advantage in the game of survival. When many people combine their perceptions by discussing them then the sample of information grows, and increases the probability of accurate perception of the environment. However, things can still go wrong. This is why critical thinking is essential to human survival. Critical thinking is the only tool capable of resolving errors of misperception about the real situation outside the mind. Information arrives in the mind from perception through the five senses. All observable human behavior is explainable by full understanding of the brain and the other systems that support it, as well as the mental processes at work within it. Society and deliberation (or discussions) between individuals in a society are the mind of humanity by which we mean humans working together. The group of minds making up a society must also operate well for decisions by a group of people.

## Consciousness and Intelligence

Once upon a time many thought, only man was conscious and intelligent. Then science demonstrated that many animals are conscious of their environment. Now we also perceive that plants have some very basic components of consciousness, such as memory and forgetfulness making them part of the spectrum of environmental awareness, of which all organisms partake. To achieve this understanding it was necessary for science to refine the meaning of words such as consciousness and intelligence. The common person once conceived of energy as a substance, and they called it **phlogiston**. This was a terrible distraction for critical thinkers, and an even greater obstacle for engineers attempting to build **phlogistic** engines. In spite of the discovery that energy is not a substance, the blunder still appears quite frequently in entertainment: either where humans come face to face with spirits, ghosts, or space aliens made up of pure energy, or they encounter beings who have mastered its secrets. Of course, this is all nonsense, but perhaps it makes profitable (though bad) entertainment. Superior entertainment appeals to the human capacity for critical sophistication rather than exploiting for profit's sake the tendency of entertainment corporations to pressure fiction writers to write to the lowest, laziest, unethical, and anti-intellectual common denominator for public consumption. This discussion of phlogiston may seem to be a distraction, but there is a vital reason we mention it. It is an example of the problem faced by all critical thinkers, opposition. It would be very foolish to imagine there are no people opposed to critical thinking. Mastering critical thinking requires first understanding the external environment, the world (or universe) of all things outside the mind. Who would oppose this?

## Study Thine Own Errors, Not Others

For example, recall the passage about rhetoric above. It is probably easy for students to see someone else using rhetorical arguments, and thus discount their position. That is useful, but far more useful is detecting one's own capacity for rhetoric and dialectic. In fact, it is so easy to see the mistakes of others that it becomes a distraction. Do not let distraction stand in the path of self-improvement. Remember too that the more sensitive an issue is, the more it must be explored rationally. Sensitivity, like distraction, blocks objective reasoning. People frequently judge another's way of thinking to be silly. They are too sensitive and unwilling to laugh at themselves however. This in turn leads many to shore up their ego, as a defense. Curing oneself of this flaw is difficult. As long as the issues are minor or inconsequential, lack of the cure may be tolerated. However, the issues of life are increasingly important, very consequential, and must not be trivialized. Thus, humanity must cure this hypersensitivity to criticism. Humans are very diverse, and the freedoms of modern life permit more exposure to other ways of thinking than ever before. This exposure can lead to greater strength and understanding, or it can lead to weakness, fear, and anger. Pride is the fruit of egotism, and it often leads to a fool's paradise or a genius's hell, neither of which is desirable. The ego, with all its sensitivities, may damn all hope of thinking rationally.

## Popular Among the Strong Minded

Demonstrating this requires an extensive example. Gandhi is considered the 'father' of modern India. He wrote a great deal about the problems of the modern world, and he pointed to the

causes of many.<sup>17</sup> In one such comment, he observed emphatically that modern business is sinful. To weak-minded, insecure people, this meant by extension that capitalism <sup>18</sup> and America are likewise sinful.<sup>19</sup> They reacted to Gandhi's accusations, they hid behind their ego, and by doing so completely missed his point. Now compare the weak-minded thinkers (above) to the vigorous thinkers. The vigorous thinkers first removed their pride and sensitivity, so that these emotions did not blind the eyes of reason, and second, they boldly perceived the meaning of Gandhi's dart of sin.

### **Unpopular Among the Weak Minded**

Make no mistake about it, some circles of people resent critical thinking, others even fear it. They may not want to have their ideas discussed at all, or if they cannot prevent discussion--- they may wish to control it. They might use legalistic (courtroom style) arguments to prevent discussion, or to block evidence from being presented. They might walk out of a discussion, or not invite people who think critically. Science or critical thinking is not obstructed by such delaying tactics: for that is what such strategies amount to, they merely delay things, and only for a time. Sooner or later the truth surfaces: as long as critical thinkers pursue their inquiries. Anyone attempting to promote an uncritical idea may feel insecure, and they may attempt to protect their idea, or try to place it off-limits for discussion. There are no forbidden topics; nothing is off limits. All such strategies are nonsense! Many social and political questions are perfectly valid subjects for inquiry, from any point of view, but many people get uncomfortable discussing them critically. Egotism is part of the problem, human egos are fragile; we tend to be very insecure. Political correctness is another problem, and ego-sensitivity may be the hidden cause of political correctness. Political correctness may be a widespread phenomenon, but that does not make it rational, or protect it from scrutiny by a critical thinker. Moreover, in discussions of factuality, people who invoke political correctness are often trying to block a discussion of the facts, by making frank conversation appear offensive, when it is intended to be instructive. This is not to say critical thinkers should say offensive things intentionally. They should not. Offense is as much a product of the offended party as it is the supposed offender! In so-called politically correct thinking, the offended one nonsensically becomes not only the victim, but also the judge, jury, and advocate. This can turn discussions into an emotional mess, whereas they ought to be calmly and dispassionately discussed in a matter-of-fact way. In summary, the critical thinker will always maintain a calm, dispassionate stance, and steadfastly focus on finding the truth through minimizing the error.

### **Minimizing Error of the Body**

Failure to understand reality is an error. Failure to see an opportunity is an error. What could be more important in business than seeing an opportunity? Rejecting the existence of something real is one kind of error. Thinking something real, which is actually unreal, is another kind of error. From the days of Epicurus in ancient Greece, thinkers have kept both types of error distinctly apart. Critical Thinking (hereafter as CT) approaches reality by minimizing the chance of getting things wrong. It is a syntax or rubric to minimize the probability of rejecting a truth but it also minimizes the probability of accepting a falsehood. This is the only way to maximize the probability of truth. Thanks to a marvelous molecule called deoxyribonucleic acid, or DNA, every gene and allele in every organism uses error reduction to breed true cells, and thanks to

Charles Darwin, we know the process of evolution is a process of error elimination from one generation to another, for a mutation is an error in organic chemistry. If only the human mind was as finely tuned as the cells themselves, then how error free our thoughts might be!

### **Minimizing Errors of the Mind**

Sigmund Freud was one of the first to analyze the human propensity for mental aberration: not merely the individual mental illnesses humans suffer from individually, but those mental errors in human society. In a cell, the signal of error is a mutation or a cancer. According to Freud, the evidences of errors in human society are religion and superstition, political parties and ideology. [Note to students: Students are never required to accept something they do not wish to, but they should be able to explain what a scholar said, or explain something that science accepts.]<sup>20</sup> If we do not understand reality, we say it is because there is an error in our perceptions of it. Scientists say that error comes in only two varieties, type one and type two. Type-1 error means to reject a truth, to deny something we ought not to deny. Type-2 error means to accept something actually false, to accept something we ought to reject. It is possible to reduce error to small proportions or probabilities. If it is not possible to prove something is true, we say it is possible to reduce the probability of error in our understanding. It is easier to say what is not true, or not probably true, than to say something is true. To say that something is true implies there is no evidence against it, however small. That is difficult. Instead, science takes the approach that minimum error in perception is the best and most efficient road to knowledge.

### **What is Knowledge?**

Knowledge is the probability of correct perception of reality. **Probability** occurs as a fraction or proportion (decimal in the US). In the following notation, K stands for knowledge (or knowing something); P is the symbol for probability, and C the symbol for chance. Thus, the expression P(K) stands for ‘the probability of knowledge,’ or ‘the probability of knowing something.’ To express probabilities, fractions or proportions are used. To express chance percentiles are always used. To express boundaries for a variable use minimum and maximum values. The three formulas in figure 6 below express the boundaries of knowledge:

$$0/1 \leq P(K) \leq 1/1$$

$$0.0 \leq P(K) \leq 1.0$$

$$0\% \leq C(K) \leq 100\%$$

**Figure 6. The Limits of Knowledge.**

### **Knowledge is a Form of Modesty**

In all three expressions, the right side yields the same conclusion. What is the meaning if the probability of knowing something equals 1 or 1/1? It means that whatever it is, it has already happened, and, you saw it happen. In scientific terms we would say “a photon has reached my eyes from the object in question, therefore I know it exists”. If you had not witnessed it, there

would still be some doubt. (If you are honest.) If you heard about something from another person, that narrative is anecdotal, and there would still be doubt. (If you are honest, again.) If something has not happened, it may not. Doubt remains however small. This is how science, philosophy and every other professional discipline interprets these expressions. One should not say, "I know . . ." lightly. In all science there is one **supreme-ethic**: tell the truth, be honest. This is what creates the precision of these definitions. You may use words any way you please. The questions are; do you wish others to understand what you say, and do you want to understand others. If so, then words ought to convey clarity, not confusion. Do you know something? If so, then produce the evidence. If unable to produce the evidence, do not say you know something. Examine the values on the left of the formulas. What is the meaning if the probability of knowing something equals 0.0 or 0/1? In that case, it means just the opposite: it means it cannot happen, wait as long as you wish, you wait in vain. This means it would contradict another acknowledged fact of science, a so-called **law of nature**. What does it mean when the Chance of Knowledge is expressed as  $C(K) = 0\%$ ? When  $C(K) = 0\%$  it means the event will not happen, it cannot happen because it would violate one or many other discovered theories of nature.

### **All Knowledge is History**

There is a curious thing about knowledge, it can only happen in the past. It takes time for information to reach us. Information does not travel through space instantaneously. This is true for every human sense; though some are faster than others are. Sight is the quickest because light travels incredibly fast, but it still has a maximum velocity, 186,000 miles per second. Hearing may be our next quickest sense, because sound travels at Mach 1 at sea level, roughly 0.2 miles per second, but that means our sight is 930,000 times faster, almost a million times. Smell is probably the slowest, this due to the Brownian motion of gas molecules, affected by humidity, temperature and particulate density. Touch and taste are very quick, almost the speed of light, but they require one to be in direct contact to make a perception, which limits their utility in minimizing danger. The point is that none of these perceptions is instantaneous: they all take time. Sight might seem to be instantaneous, but if the source of our curiosity is far removed, such as an airplane, planet or a star, then we will perceive it only as it was sometime in the past. Even if something is right in front of our nose, we cannot truthfully say that we perceive it as it is: we see it in the past. This is Einstein's principle of relativity. Even inside the brain, when one neuron communicates with another, they do not communicate in the same frame of reference; both are in the past with respect to each other. Imagine what this means, if we want to talk seriously about a person who knows all things. Using our words carefully, is it possible to know something in the future? No, it is not. This comes from the meaning of the word 'know'. To say 'I know' means it already happened and I saw it, but that is not possible for events in the future. That would be similar to insisting that one also equals two. That would be literal nonsense. Only if you decide to abuse the meaning of words can such a thing happen, and then one must explain the reason for the abuse. Instead, why not use the words exactly for what they mean. Rather than confuse, speak clearly. Dr. John Archibald Wheeler, a great physicist, once said that to understand something pursue it to its absolute limits without changing the meanings of any words. This is the means to explore and the path to knowledge. If something is knowledge, we say it is **determined**, meaning it is in the past, it has already happened. Something not determined may not happen, ever. This brings us to the question: 'can we, by our actions influence the future?' This is not a superficial question. Can you determine an event? Select a simple one. Can you

move a small object; say a coin or a penny? Yes, you can even turn it over and set it down on a flat surface.

### **To Know is to Determine?**

Humans debated determinism throughout history. It was much on the minds of influential thinkers, for example the so-called founding fathers of America, when pondering what form of governance was best. Every society has its founders, people who attempt to frame the debates of their time. In the case of America's founders, determinism and free will were much on their mind. Free will was something they valued, because it showed whether someone possessed honor, through the choices they made. They called the ability to make choices free will. Consider this with a critical mind. If there is a person who knows the future, it must be because they have seen it happen, in the past. That means it is already determined. Otherwise, it is not knowledge, and in that case, things may change. If there is such a person, then humans and all other living things have no free will. No matter what they may be accused of doing wrong, they could always say, it was not my fault. Philosophically, determinism has always been the enemy of free will, from the sage philosophers of ancient Greece to modern times. Someone cannot know the future and allow us to have free will. It is a contradiction of critical thoughts and logic. In science, we say these things are mutually exclusive. One cannot do both. Oh, we could mess with words and make things very confusing, but why do that when our purpose is to achieve clear thinking?

These are simple words and concepts, and philosophers spent a great deal of time on these issues in the 18th century. [See Reading 2 in Module 2 of this course. -LINK]

### **Profits, Free Will, and Determinism**

There are fascinating consequences or ramifications to these issues, and they are relevant to business in a profit motivated world. Profits have not always been viewed as a good thing, at least not in all societies. In many historical societies merchants were tolerated as necessary but on the edge of morality. In early Christianity vows of poverty were the model of virtue because coveting was a sin. In Europe and America this was true until the industrial and economic revolutions. In future readings we will learn about the history of profits and ethics and morals. Generally speaking morals come from traditions in a society. But societies change, sometimes they even revolt and express their freedom with a new set of moral values. To do this they must renounce or amend their old moral code, and create a new one. This can be tricky, since morals are often connected to a divine being. If there is a being who knows the future, then the future is determined and we are blameless, but in that case we have no free will which means we merit nothing. It appears the only way we can possess free will is if the future is unknown. If a being knows the future, then you cannot determine the position of a penny. If you argue that there is a being who allows you to exercise free will, some would say that is nonsense because it would imply a limited being, or a little-god: but then to many people that would be no god at all. Some might try to argue that there is free will and a being who knows all things, which would abuse the meaning of words. If you force thinkers to use other words, it would not change the contradiction. So, here is the contradiction: determinism excludes free will. Indeterminacy does not.

At this moment, perhaps take a break from the reading and watch this eighteen-minute video. It is a Tex-talk about some of the issues that arise whenever we try to become critical thinkers, namely when to use it and when to not use it. Humans have a terrible tendency to avoid using critical thinking whenever it makes us nervous: such as when confronting things that seem to require our unquestioned loyalty. The very idea that someone requires our unquestioned loyalty is suspicious, and should always be considered a good reason to pursue the matter with lots of questions. Remember the old saying " . . . suspicion invites curiosity. "-E.G.Engl. Questions about the video will appear in the homework and tests, and you may wish to refer to it in the online discussion. Here is the link to the video--->[Link \(Links to an external site.\)Links to an external site.](#)

Students often wonder (at first) why such things need discussion in a "foundations of Business" course. The answer is actually simple. It is not feasible to separate critical thinking from ethics and morals, anymore than we can separate it from philosophy or science. One could pretend they have no connection, but it would be a pretense nevertheless. Consider the question: should important decisions which affect all of society be left to private interests? What if those private interests are selfish, or even malicious? Scarcity of a vital necessity such as food is a great danger to elderly people on fixed incomes, but the same scarcity is a perfect time to raise prices outrageously because there is no where else for buyers to go. Needs and ambitions do not mix well, but both are subjects worthy of investigation with critical thinking. Critical thinking is the tool we need to balance important but sometimes conflicting forces, such as the freedom

necessary for business to function and needs of we the people. [Note: These issues will be discussed at length in the next reading about the Physics of Business]

## **The Universe of Uncertainty and Indeterminacy**

The physicist Heisenberg won the Nobel Prize for demonstrating that all things are **indeterminate**, or uncertain. In fact, the harder one tries to determine something, the more indeterminate it becomes. This is the Uncertainty Principle, which caused the young Einstein to quip, "God does not play dice". Once he understood the principles of Heisenberg's quantum mechanics, he said I guess he does. For centuries, humanity discussed and warred about these issues without the tools to discover the answer. We can no longer use that as an excuse to avoid the discussion. The truth is knowable, even of these issues.

## **Conservation of Information in an Uncertain World**

Let us talk about our sense of time. Perfect knowledge can only happen of events in the past. It is not possible to know events which have not happened. Even if they happened, we cannot know it unless we see it, and that kind of information can only travel at a finite speed, the speed of light. Even if it is something that we may see: it may take a very long time for the information to reach us. Since all events happen at a distance, and since information travels at the speed of light, all knowledge is of the past, there is no knowledge of the future. For a person to say they have knowledge of future events would violate many experimental discoveries of science based on empirical evidence. Of course this does not stop scientists from trying, because a missed opportunity is a type-two error. All human knowledge rests between two extremes, every possible thought or perception or belief, every dream or feeling stands between "not possible" on the left and "already happened" on the right. We live our daily lives in the realm of probabilities and chance. Twenty-first century Theory-of Knowledge is the product of human intellectual struggles spanning thousands of years, combining Albert Einstein's Theory of Relativity, and Erwin Schrodinger's Theory of **Conservation** of Information, as well as Heisenberg's Theory of **Uncertainty**. They were men of the twentieth century CE, but the struggle did not begin with them. In all the literature of Western Civilization, the first to record the question "what is real?" seems to be Parmenides of Elea (a city on the southern tip of the Italian peninsula). Parmenides wrote two thousand five hundred years ago. Parmenides simply wanted to know how to open the doors of the Temple of Knowledge. What a profound question!

## **Parmenides Poem Still Haunts Us Today**

He expressed it in an exquisite poem about a dream wherein he walks in a wood at night and hears a sound over his shoulder of rustling gowns and the soft tamp of approaching hooves; he turns and sees a flaming chariot drawn by flaming-winged horses, bearing a man who beckons him to step into the chariot. The chariot carries him to a grove of trees on a very high mountain, and in the grove, there stands a temple with solid bronze doors, but they are locked. The being whose eyes have wings of light at the temples, speaks, ". . . these doors will only open if you lay aside your pride, arrogance and presumption." Upon entering, he discovers knowledge is vast

and terrifying, beautiful and disconcerting, and all the people he loves, his city and country are utterly insignificant. Parmenides' poem raised so many questions that philosophers addressed books to him from across the ancient Mediterranean world, Plato among them. In more recent times others tried to explain what Parmenides saw inside the Temple of Knowledge, among them Henry David Thoreau. Parmenides himself made it very clear that the incidents described in his most famous poem were not to be taken literally, he never wanted readers to believe the incident actually happened. It was not a vision from on high. It was a poem, he created those images, to evoke questions. That is the power of language in good hands. Many readers do not use critical thinking when reading things, especially fiction or poetry: their comments give the impression that Parmenides was trying to say it really happened. No, he was not. In that case, what are we supposed to learn or gain from experiencing the poem? Whether it happened or not is beside the point. Then what is the point?

### **The Greatest Question Known**

The point is, "WHAT IS THE NATURE OF REALITY?" This is the fundamental question of science, knowledge, of wisdom, truth, the Cosmos. From the poem we gather that Parmenides was convinced that most people are incredibly stupid, dull witted numbskulls wandering from one meal to the next, from their job to their bed, and back again. The very few people who do "Open the doors" are usually shocked when they come out. Why are they shocked? There are several answers. Answer number one: when someone grows up in a society that believes in many things without questioning them, but then actually look inside the Temple of Knowledge to see if they are real, the answer is a shock, there is no evidence for many things taken on trust and confidence. "Ouch!" This does not mean they absolutely cannot be real, but it does mean the standards of evidence are very high, even for things we are raised to accept as true-without-question, and that means people should use the words "I know something" with great care, not casually. Truth two: when you grow up thinking man is important, . . . you go inside to check, but then discover man is not important. Truth-three, truth four, . . . etc. According to Parmenides, it is the nature of reality to shock us, because we have been raised to not-look at nature objectively, but instead through clouded, even superstitious eyes. Well, someone who does that is likely to see imaginary things everywhere, and perhaps forget that they are imaginary. Remove whatever causes the bias in your perception, or, to speak poetically, take the glasses off. Open the temple doors and you will see that nature is quite different from how you were raised to imagine it.

### **Business Happens in the Real World**

Some of you are already puzzled or even shocked by this course. Some think, "What does this have to do with business?" Please stay with me. Do you imagine for a moment that business happens in a place other than the real universe, other than the one we live in? As far as critical thinking (or science) can tell, it does not. In fact, such an idea is nonsense (recall what the word nonsense means). To understand business one is wise to understand reality first. The boundaries of business are set by nature, the laws of the Cosmos, science. Oh certainly deception plays a role in business, a great one (you shall see), but the games of business happen here in reality, which has its own rules, the laws of nature as we understand them. Deception also plays a great roll in biology and the competitions among species over finite resources. One business may be bound by tradition to think in some nonsensical way, but if a competitor is not held back by such

a thing, it will give the latter advantages, strategic ones, room to maneuver (to speak metaphorically). All business is a struggle to compete, following all the laws of natural selection. Evolution is a fact, and understanding how it works gives one an advantage in business.

### **Preparing for the Real World of Business Communication**

Nonsense is such a good word, not used often enough. To prepare for the real world of business it is essential to become comfortable using professional language. Do not be shy. Here we go. Practice: say it aloud in your room, say "nonsense." Pretend I am listening. Say "nonsense." I did not hear you! Again! With emphasis now: say "nonsense!" Practice it. Let it roll off the tongue, become comfortable using it. Enunciate. When someone uses silly arguments, or says something ridiculous, help them. Give them the benefit of your education by politely saying, "Pardon me, but that is nonsense." Let me hear you say it aloud: "Pardon me, but that is nonsense." It opens the way for you to explain what you mean. After you say it, offer to help them see things as you do. There is nothing rude or impolite about this. Many of the problems encountered in Business can be attributed to our shyness and reluctance to speak our mind, especially when people are spouting nonsense. This applies to everyone. How pleasing it would be to say to a presidential candidate, "Pardon me, but that is nonsense." Nonsense is a useful euphemism for another word, used very often in executive business meetings, "bull----." Students flock into college, wandering in search of some discipline or profession allowing them to maximize future income and minimize current costs: they want to make lots of money, with the least amount of mathematics or science. We know this from surveying students. Imagine what happens when students (with parents watching over their shoulders) begin their first homework assignment, in what is perhaps their first college course in business: and they come across questions about the universe, and questions about distinguishing what is real from what is not real. Hopefully a parent would say, "... this is jolly good ..." or "... I like this, carry on ...," or "... I couldn't agree more." Nevertheless, people try to compartmentalize life, trying to force their brain to think in two ways: critically and non critically. Any neuroscientist will say, "... in the long run living with two mental standards is not healthy." This is why Parmenides poem haunted Plato, Aristotle, and perturbs scholars today. It is natural to have fears, but some fears are imaginary. Open the doors of the temple. Reality awaits on the other side. The ancient philosophers had such fun with this! Some expanded on Parmenides with poems of their own about people who came out of the temple wrenching their hair out, then jumping off the nearest cliff. Others created stories about people who came out of the temple with knowledge, and then used it (according to their story) to build machines to fly to the moon: yes that is in a story two thousand years old. Ever since the days of Parmenides it has been customary among critical thinkers to refer to their own work as "... opening the temple doors," or "looking behind the veil".

### **The Age of Critical Thinking**

The twenty-first century is an age when people fearing truth try to shout it down. And yet, at no time ever has the hunger for truth been so great! This conflict between those who seek and those who fear truth may be resolved during the life of the present generation. Truth does not bow to this or that, it simply is what it is. Critical thinking is beautiful and recognizes one ethic: speak truth. Threats from authority mean nothing to critical thinkers, for truth is the ultimate authority.

Sensitivity must not impede the pursuit of knowledge, and political correctness must not stand in the way of education.

[Critical thinking] . . . has an autonomous right to express its views fearlessly and objectively, without interference from church and state. It must avoid clouds of fears and hopes, desires and aversions. It must discern objects clearly and shun intellectual mist. It must dispel myth and dissipate absurd fables. The world of scientific research is wholly independent.”<sup>21</sup>

---

## Notes and Bibliography:

1. Literacy is one of the primary goals of this course. To achieve literacy one must expand their vocabulary. All words in italicized fonts are vocabulary words. Such words will frequently appear as the subject of exam questions. [add a redirect to reading]
2. There is only one authority, and that is reality.
3. The struggle to deal with reality and perception is ancient, and the quest for reason continues to this day. See the following: metaphysics, ontology, monism, skepticism, agnosticism, transcendentalism, Hegelianism, idealism, pragmatism, instrumentalism, materialism, existentialism, Thomism.
4. Its efficacy.
5. Philosophy can also speculate on truth in matters purely in the mind. A truth in this sense is not expected to have any relevance to physical perceptions.
6. There is always some delay of time and space between an event, and the experience of the event, which takes place in the mind. This is referred to as non-simultaneity. If humans could actually experience something at the exact same time as the event they are observing, it would be simultaneity. Yet no person can actually experience simultaneity. Simultaneity and non-simultaneity are now scientific facts.
7. Excerpted from The American Heritage Dictionary of the English Language, Third Edition.
8. "The mind is its own place, and in itself can make a Heaven of Hell, a Hell of Heaven." A famous line by Satan, in book 1 of Paradise Lost, by John Milton (1608–74), English poet. The Columbia Dictionary of Quotations.
9. This model is the basis for testing all hypotheses. The same model is used in other courses such as "Business Statistics One and Two." Students in those classes spend much time solving problems scientifically.
10. Man's knowledge is finite.
11. Although we assume that man invented tools, it is possible that tools invented man: or at least affected human evolution, mentally and eventually physically. Discoveries are sometimes made accidentally. The discoverer sees the benefit of something and systematically employs it as a new tool. Is it possible the very first tools were invented in this way? This is not only possible, modern science now thinks this is probable. Agriculture is an example. It has certainly caused an evolution, or even a revolution in civilization: and agriculture may be one of those inventions which happened by accident. Another example is the domestication of dogs and turkeys by certain tribes of Native Americans. There has long been a question of whether man domesticated the dog, or dogs the man. Maize domestication is another example of a plant developing a symbiotic relationship with man, until ultimately man settles down to a life determined by the plant.
12. Knowledge is synonymous with information, acquired through study or experience.
13. Plato emphasized the supremacy of the mind, whereas Aristotle defined the nature of reality. Socrates was perplexed by humanity's limitations, finite-ness, especially death: and he speculated much about the mind living on after death, the soul. It was Epicurus who said the perceptions of man could be tricked, leading to misunderstanding of the Universe. Therefore, the senses cannot be fully trusted. They must be integrated with each other, and with those of other people. This is why Epicurus said Women must be admitted to education, and to all discussions of Philosophy.
14. The Encarta® Desk Encyclopedia.
15. Cicero is perhaps the most famous writer of antiquity. Though he is not considered a philosopher, he is considered the master of rhetoric. Students of this course will read an excerpt from one of his writings.
16. The methods used in Socratic philosophy to reveal truth through disputation.
17. See "Man and Machine", by Mohandas K. Gandhi.
18. Capitalism, the social economic ideology of self-interest, privacy of land and capital, and buyers and sellers meeting in free markets.
19. This is because modern business is exploitative, centralized, globalized, and practiced in America.

20. Students are never required to accept something they do not wish to, but they should be able to explain what a scholar said, or explain something that science accepts. In a homework question asking for a student's opinion, full credit is possible even if the student does not accept something being discussed. Be able to express yourself clearly. Test questions will be about facts from the readings. Tests will not require the student to pretend to accept or reject something against their conscience.
21. Sir William Lawrence, MD, FRS, Surgeon and Anatomist, 1819. From "The Age of Wonder", 2016 by the Folio Society.
- The Columbia Dictionary of Quotations is licensed from Columbia University Press. Copyright © 1993, 1995, 1997, 1998 by Columbia University Press.
  - The American Heritage Dictionary of the English Language, Third Edition Copyright © 1992 by Houghton Mifflin Company. Electronic version licensed from Lernout & Hauspie Speech Products N.V.
  - The Encarta® Desk Encyclopedia Copyright © & ® 1998 Microsoft Corporation.

### Your assignment.

- **PART A:** Ten Vocabulary words. As you read the text above select 10 vocabulary words (minimum). You select the words new to you, or words used in a way new to you. List each word and then a definition that fits the usage of the word. Look up the definition in an academic dictionary (such as Oxford or Miriam Webster's New Collegiate, but not Google.) Then write the definition **IN YOUR OWN WORDS**. Select as many vocabulary words as needed to fill up the requirement of 10.
- **PART B:** Answer the following questions. Remember to follow the style guide at the very bottom. Do **NOT** retype the question.

**Homework questions (Open a WORD document and type you answers in WORD or some other text-software. Check the spelling and grammar. Save it in WORD. Then come here to Canvas and CLICK SUBMIT ASSIGNMENT in this reading, and paste the text of your homework in the text box.**

1. Why does business seek to hire people with critical thinking skills?
2. Give one example of a Type 1 Error in business.
3. Give one example of a Type 2 Error in business.
4. Describe what it means when someone says "the probability of knowing" equals 0/1 or zero.
5. Charles Darwin is the father of modern biology. Explain briefly his discovery of error prevention in evolution.
6. Sigmund Freud is the father of modern psychology. Explain briefly his diagnosis of human social errors.
7. Heisenberg is one of the fathers of modern quantum mechanics in Physics. Explain how his discovery affects our ability to determine the future of something.
8. Briefly outline the contradiction between Determinism and Free-will.
9. How would you explain Critical Thinking to a friend? (Do not say, "think outside the box." <--that is a metaphor and the style guide says avoid metaphors. Only complete sentences will count as an answer. No fragments. This goes for all homework questions.)
10. Explain what Rhetoric is.
11. Explain what Dialectic is.
12. Explain what Reason is.
13. Why is nonsense such a problem in Business?
14. Describe why it is not possible to know something in the future?

15. What are the benefits of being calm and dispassionate in seeking the truth?
16. Who was Parmenides of Elea, and what was his dream poem about? This question can be answered without doing any reading other than this reading. You do not need to look up the poem online.
17. If you were Parmenides, describe your feelings about whether or not you have the courage to open the doors to the temple of reality. Do you? This question can be answered without doing any reading other than this reading. You do not need to look up the poem online.