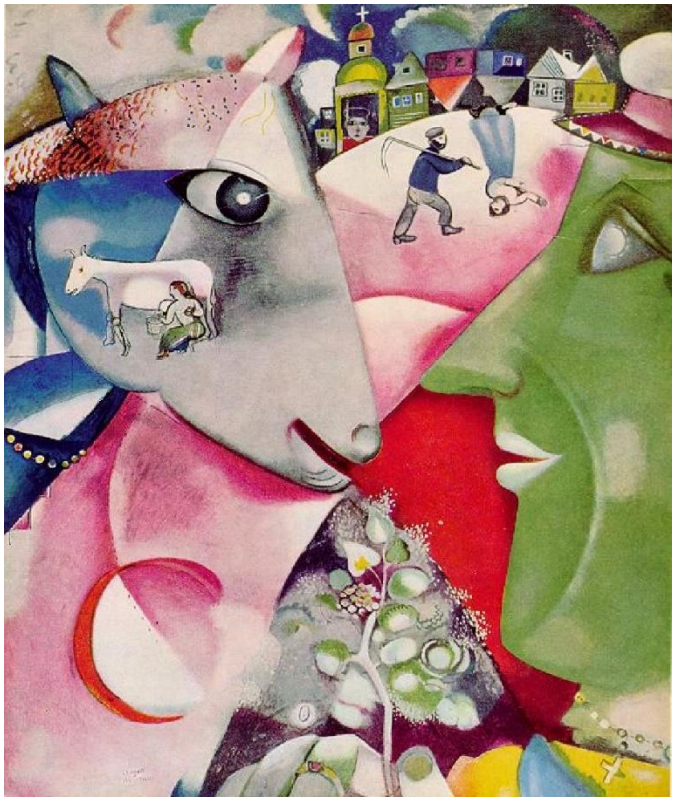
Visions of Reality



("I and the village" by Chagall, 1911)

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About the Author

Larry Zaleski was born and raised in New Jersey. Larry went to Lenape High School, and holds BS and MS degrees in Biology from Northern Arizona University. He has worked primarily within the federal government in biologically oriented programs within the Departments of Commerce (as a high-sea's biological technician), Department of the Interior (with the U.S. Fish and Wildlife Service Division of Law Enforcement), and Agriculture (as an inspector, officer, and trainer). Over 30 years Larry held various training posts within USDA's Animal and Plant Health Inspection Service at their Professional Development Center in Frederick, MD. These include instructional designer, project leader, supervisor, and senior training specialist. Larry has written technical manuals, and managed, designed, developed and delivered e-learning and classroom courses for a wide range of scientific, technical, and managerial topics. He retired October, 2015, and with his wife, Mary, lives in Hagerstown, MD where he indulges his hobbies of birding and astronomy.

Please join me…

Introduction

People hold many world views. A world view consists of the totality of one's societal knowledge and point of view (World View, 2019). It is shaped by a person's life experience such as where they live, parental guidance, religious background, education, and daily encounters. These experiences result in our perceptions – what we think is true.

Perception is the process of obtaining, interpreting, selecting, and organizing information. Naturally, no two people perceive the world in exactly the same way. This is because we interpret information through the lens of our individual experience (Perception, 2019). While everyone thinks their perception is reality, perception and reality are different (Figure 1).

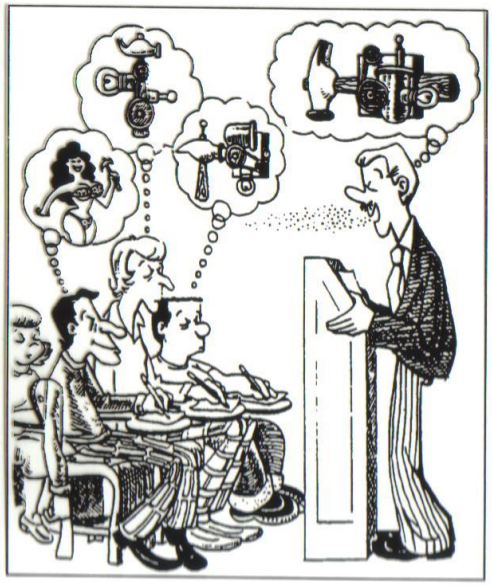

Figure 1. Perception and reality are different.

Unlike perception, reality is the aggregate of all that is real, all that exists. Reality is the totality of the universe, known and unknown, as opposed to what is merely imaginary. More precisely, reality is the physical, biotic, and emotional universe.

There is a second and more limited conception of reality called objective reality. Objective reality is the collection of things that we are sure exists independently of us – the observable universe. Everyone is able, in principle, to verify every aspect of objective reality and anything that cannot be verified in this way is not part of the objective reality (Vaccaro, 2019). Unlike reality, objective reality is 'assumed' to exist, and is thought to be essential if we hope to develop a meaningful, shared perception of the world.

How we perceive the world is important because if we thinks something is true, we behave as if it is true. We use our perception of truth, right or wrong, to predict the future and guide our actions. And actions have consequences.

Examples of perceptions that do not conform to objective reality are numerous: If, for example, we believe that vitamin C prevents the common cold (it does not[1]), we likely take large doses resulting in possible kidney stones, nausea, and diarrhea.

And if we believe the moon landings were a hoax (they were not[2]), then we will likely lack faith in news media, government and other institutions, and most Americans will view us as a kook.

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[1] Vitamin C prevents colds no better than a placebo. However, regular consumption of 200 mg daily may reduce a cold's duration by eight percent (https://www.webmd.com/cold-and-flu/cold-guide/vitamin-c-for-common-cold#1).

[2] NASA's Lunar Reconnaissance Orbiter has photographed the equipment and foot trails left on the mood from several moon landings (https://www.forbes.com/sites/startswithabang/2018/12/12/heres-your-proof-that-we-landed-on-the-moon-steph-curry/#68c49ba949d9). Additionally, the Russians admit losing the moon race (https://www.nytimes.com/1989/12/18/us/russians-finally-admit-they-lost-race-to-moon.html)

The current national situation illustrates the relative power of subjective vs. objective reality:

- Hyper-partisanship – the lines are drawn
- Conspiracy theories – making claims without evidence, and then acting on them
- Denial of objective fact – living our fantasies
- Political and social gridlock – inability to address economic, social, and environmental problems

These issues raise many questions. Can a belief be justified and true, yet still not count as knowledge? Is there a way to balance inflexible conviction with skepticism? How can we judge if our perceptions are accurate? And does knowledge permit prognostication?

In this paper, I will discuss how we got this way and possible alternatives. The topics include:

1. How we know what we know
2. The nature of evidence
3. Challenges to the concept of objective reality
4. How we Predict the future

How We Know What We Know

When we are born our minds are a clean slate. Aside from instinctive knowledge provided by genetics (of which we are largely unaware), we know nothing of the external world. Yet somehow, over time, we learn. But where does this information come from and is it accurate? To answer these questions, let's begin by looking at the ways we know.

The Ways We Know

There are, in fact, only five ways of knowing (Schmitz, 2012), which are described in Table 1.

Table 1. The ways we know.

The Way of Knowing	Description
Informal observation	When we casually observe events and information without systematically evaluating its accuracy.
Selective observation	When we only pay attention to events that match our prior conclusions – we see only what we want to see, ignoring contrary evidence, and assuming no other patterns exit.
Overgeneralization	When we assume the existence of a broadly applicable rule based on a single or limited observation or experience.
Reliance on Authority	When our beliefs about what is true are shaped by a source that we believe to be knowledgeable and trustworthy such that contrary evidence is rejected.
Research methods	When we apply an organized and logical method to learn about the universe, one that separates fact from assumption and evaluates accuracy.

How Things Go Wrong

The brain is like a sponge, it soaks up information both right and wrong. Each '*method of knowing*' has its strengths and weaknesses in this regard, and all are capable of generating perceptions that are either accurate or mistaken. They are not, however, created equal.

1. In the case of *Informal observation*, we obtain information quickly and with little effort, but without considering its context, applicability, and accuracy. Consequently, sometimes it's right and sometimes it's wrong. Without systematic checking, mistakes are possible and even likely.

2. S*elective observation* often occurs when we apply "common knowledge," which is a belief that is widespread in our social network.

   For example, many people believe that '*only children*' (those without siblings) grow up spoiled and possess poor social skills. However, sociological research shows that there is no consistent difference between '*only children'* and other children (Schmitz, 2012). In practice, when we see a nasty '*only child*,' it confirms our view, but when we see one who is well behaved, we blow it off as an exception that proves the rule. When using selective observation, we see only what we want to see.

3. *Overgeneralization* occurs when we apply one or a few observations to an entire class, resulting in stereotyping. For example, a boyfriend or girlfriend lies to us, so we conclude that all boyfriends or girlfriends lie.

4. Acquiring information from *authority* goes wrong when experts expound beyond their expertise, presenting opinion as fact. Because we hold the authority figure in high esteem, we might accept his or her inaccuracy as fact and subsequently reject the truth.

   One example was when Linus Pauling, the two-time Nobel Prize winner in chemistry, inaccurately claimed that vitamin C cured the common cold, torn retinas, snake bite, and more (Thielking, 2015). Another is, when prominent religious leaders such as Oral Roberts, William Branham, and T. L. Osborn (Three Prominent Faith Healers, 2019), erroneously claim the ability to cure a wide range of ailments through prayer augmented by faith-based rituals (Faith Healing, 2019).

How Things Go Right (Usually)

Applying *research methods*, in contrast, more reliably provide accurate information (assuming we are honestly searching for the truth). This is because when using research methods we collect and evaluate observations and data systematically to assess their accuracy. Systematic procedures include:

- Making multiple observations
- Experimenting when appropriate
- Referencing multiple sources and viewpoints
- Separating fact from opinion
- Analyzing data logically

Further, the conclusions reached are open to skepticism and falsification. Research methods provide the best tools for distinguishing between subjective and objective reality. While mistakes are possible, research methods are more reliable than the rest.

The methods of knowing vary in quality, as do the conclusions reached from them. But all encounter data, which is used as evidence.

The Nature of Evidence

Evidence is not created equal. Rather, evidence exists along a continuum of reliability. More reliable evidence is called "hard evidence" and less reliable evidence is called "soft evidence." This concept is illustrated in Figure 2.

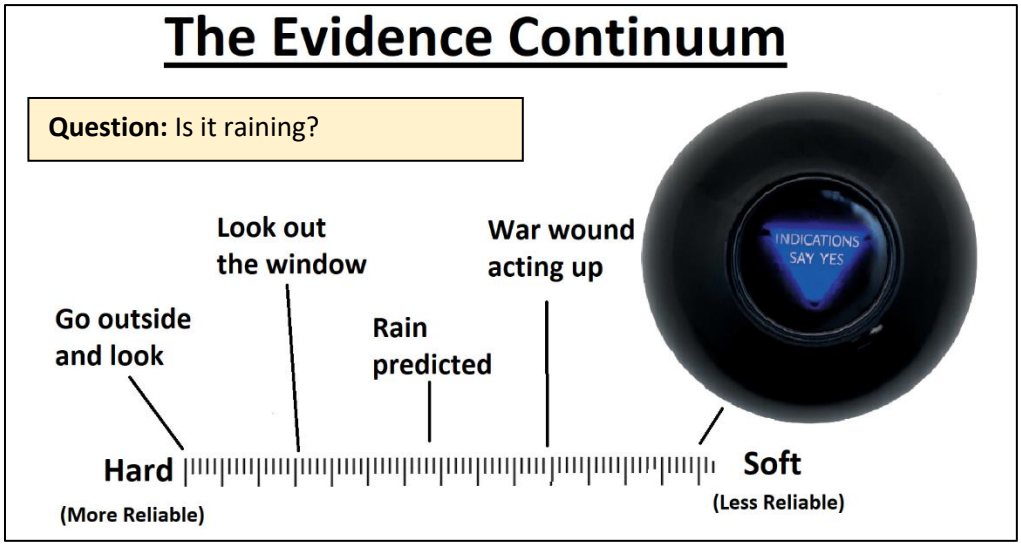

Figure 2. It is useful to think of evidence as existing on a continuum from "Hard" evidence (more reliable) to "Soft" evidence (less reliable) (Harless, 1991).

Even seemingly hard evidence, however, can be corrupted and lose reliability depending on how it is acquired. Reliability is reduced if one or more of the following situations apply:

- **Bias –** In scientific studies (and everyday life), bias means departure from randomness (BMJ Best Practices, 2019). Failure to conduct random sampling – where each unit has the same chance of being sampled – tips the scales damaging reliability (Figure 3). Bias is equivalent to '*selective observation*.'

  

  Figure 3. Bias can tip the scales making evidence unreliable.

  Personal bias such as racial profiling, religious preference, nationalism, and political views reduce reliability when they influence sampling or analysis. Evidence must be independent and stand on its own merits, and not tainted by the observer. Bias often results in '*cherry picking,*' causing a departure from randomness.

- **Imprecision –** Imprecision is caused by small sample size resulting in '*overgeneralization*' (Figure 4). Observations must be sufficient in both number and consistency to generate enough data to resolve the situation.

- **Inconsistency –** Inconsistency results when the evidence, itself, is contradictory (he said she said).

- **Indirectness –** This occurs when we inappropriately apply evidence obtained from one population to another. For example, managing women's health based on studies of men.

Figure 4. Conclusion: "House cats are bigger than dogs." Imprecision (small sample size) can result in overgeneralization.

Because evidence varies in both quantity and quality, we have to evaluate it carefully. Some evidence is so soft, scarce, and unreliable that it cannot be considered evidence at all.

Challenges to the Concept of Objective Reality

In recent decades there have been growing challenges to the concept of objective reality. These come from three sources:

1. Physics and Neuroscience
2. Metaphysical Philosophy
3. Popular media

Physics and Neuroscience

Physics: Objective reality is the fundamental concept behind the scientific method[3]. However, at the atomic level, "quantum objects behave as if they were created by the mere act of observation." If, for example, you open a box and see an atom, you might suspect that the atom was there before you opened the box. But both theory and experiments show that at the atomic scale you would be wrong (Kaszlikowski, 2020). Additionally, quantum particles can exist in two contradictory states at the same time, depending on who is observing them.

But in the macro world in which we live, no one doubts, for example, that the moon is orbiting the earth whether or not we are viewing it, or believes that we can make it '*pop into existence*' just by looking (Figure 5).

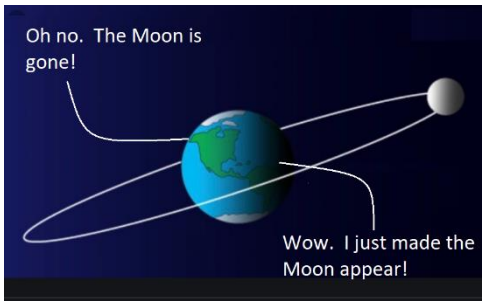

Figure 5. Few doubt the existence of the Moon even when it is out of sight or believes that you can make it exist just by looking. But at the atomic scale, reality is different.

[3] Scientific method: Refers to ways to investigate phenomena, get new knowledge, correct errors and mistakes, and test theories. (https://simple.m.wikipedia.org/wiki/Scientific_method).

Classical physicists believe that objects should always behave the same. And at the macro scale they do, but on the atomic (or quantum) scale they do not. Is light a wave or a particle? And why are quantum results only probabilities? (Sutter, 2019).

Neuroscience: Further, no one can be certain that their perceptions are real because perceptions are not reality. Instead, our brains form an imperfect recreation of reality assembled from across its various regions where different aspects of what we sense are processed, producing an image of reality good enough for survival, but vulnerable to error (Quora Contributor, 2017; King, 2017).

Our perception can be altered by drugs, disease, injury, misinterpretation, and magnetic fields. Reliance on bad information hurts, too. Of course, once a brain has been returned to health, or misconceptions corrected normal perception reapers (Does Objective Reality Exist, 2019; Burnett, 2013). And practically speaking, if our perception differs substantially from reality, we would soon die – "That oncoming train is all in my head." Those whose brains produce highly unrealistic perception survive only because society protects them.

Finally, we use our experience to interpret what we see. Placing my hand behind my back, for example, would not cause you to think I lost an arm, but a young child might. Still, anyone might misinterpret events that are beyond their experience or due to illusion, and frequently do – thus the need for skepticism[4].

Metaphysical Philosophy

Seizing on the findings of physics and neuroscience, some metaphysical philosophers have challenged the concept of objective reality. Metaphysics is the study of existence and the nature of things that exist. There are two main branches: The first, "*realism*," says that reality exists independently of our mind, but unlike objective reality, it also says that reality exists independent of our conceptions and perceptions – our perceptions are not reality (Khlentzos, 2016). The second branch, "*idealism*," says that there is no mind-independent reality, or that none can be known ('so no need to look both ways before crossing the street') (Metaphysics, 2019).

The views of the "metaphysical realists" – that we cannot accurately perceive reality – seem to be substantiated by Neuroscience. And the views of the "metaphysical idealists" – that reality exists in the mind – seem to be substantiated by quantum physics.

The main weakness of metaphysical arguments is that science continues to advance (forward march), despite metaphysical views, while metaphysical philosophy remains in place (mark step march), its only new ideas come in response to scientific advances.

It appears, however, that metaphysics is correct in the sense that science is not reality, science is a method to search for truth – producing an approximation of reality. Finally, the proof-of-concept for the '*philosophy of science*' and '*objective reality*' is the existence of an advancing, science-based technology. Metaphysics has no equivalent.

[4] Skepticism is a practical method of *suspended judgement*, *systematic doubt*, or *criticism* (https://simple.m.wikipedia.org/wiki/Skepticism)

Popular Media

We all know Mark Twain's famous quote: "A lie travels halfway around the world while the truth is putting on its shoes." But tellingly, Mark Twain never wrote or said that. It was originally penned by satirist Johnathan Swift centuries before Twain lived (Choksh, 2017). This bit of commonly held misinformation illustrates our modern dilemma: False information spreads faster and reaches more people than the truth (Vosoughi, et al. 2018). This has always been the case, but the advent of social media, cable television, and propaganda-news have thrown gasoline on the fire.

Studies show that false news typically spread to between 1,000 and 100,000 people, whereas truth rarely diffuses to 1,000 people (Vosoughi, et al., 2018).

Fake news and misinformation are everywhere. Cable networks televise documentary-like programs on Ancient Aliens, In Search of Bigfoot, the Loch Ness Monster, Ghost Hunters, the alleged Project Bluebook Cover up, government conspiracies, and Alien Abductions. Web sites, books, and movies repeat these false-common-themes (Figure 6). Sadly, repetition, the very feature that makes us learn, imbeds both true and false information into our brains.

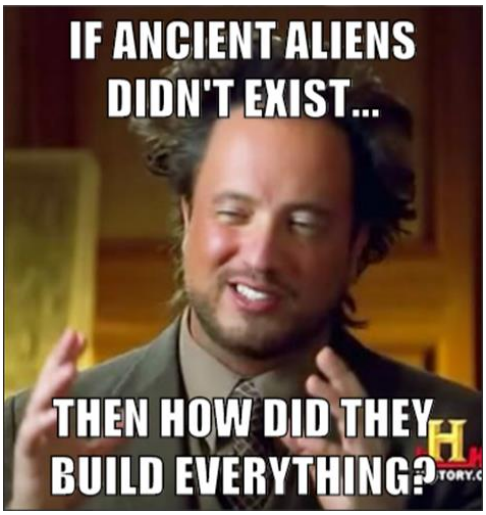

Figure 6. The logic and durability of misinformation.

Consequently, many come to believe they know what aliens look like, that the pyramids are alien communication devices, that ghosts can be detected by infrared cameras, that the Moon landing was a hoax, and that Roswell was a government cover up.

Many Americans are Superstitious, young people more than older people (Moore, 2000). One-third believe houses can be haunted, 16 percent claim to have entered a haunted house, and nine percent claim to have seen a ghost (Bowman, 2009). There are at least 87 paranormal organizations in Maryland, six in Hagerstown alone (Maryland Paranormal Societies). Interestingly, they often claim reliance on scientific – not metaphysical – evidence ([Four] 4 State Ghost Society).

Finally, the denial of evidence is now routine. It was pioneered by the tobacco industry, which hired consultants to dispute scientific findings, discredit research, do television interviews, and publish conflicting reports. Using these tactics, the tobacco industry set the standard for creating confusion, which is now copied by other harmful industries and lying politician to deny evidence (Heath, 2016).

We are barraged with nonsense, usually encountered *casually* on popular media. Legitimate science and publications, proper research methods, and legitimate news organizations are outgunned.

How We Predict the Future

Everyone faces pressures and problems that require attention. To address problems we unconsciously create mental models, which are ordered assumptions about complex systems (Meadows et al., 1972). Our assumptions are shaped by our perceptions, which we use to view reality and predict the future (Figure 7). This commonplace human trait is so ingrained that we barely recognize it. There are three categories of prediction:

1. Superstition and mythology
2. Heuristic models, and
3. Formal modeling


Making predictions for 2020

New Year's Day is a great time to set some goals and think about what might occur in 2020. I much prefer the idea of setting goals instead of making New Year's resolutions. If you break a reso-

George Michael

she could be "forced" to run

Figure 7. Local columnist makes New Year's predictions (Michael, 2020). Generally, these are the result of heuristic mental models or just guessing.

Superstition and Mythology

Our desire to know and look ahead coupled with our poor understanding of natural process leads to superstition and mythology. Here is a short list:

- Ichthyomancy – divination by interpretation of fish entrails (Figure 8)
- Chromniomancy – divination from interpreting the sprouting behavior of onions
- Palm Reading – divination by reading the lines on the hand
- Astrology – divination by position of the planets, sun, and moon

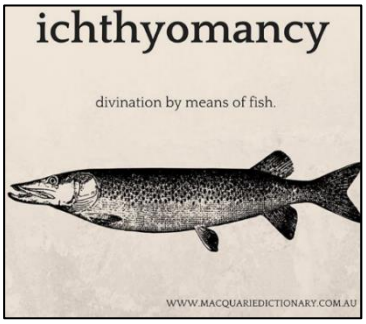

Figure 8. Divination by the interpretation of fish entrails, a classic example of mythology.

Someone who is superstitious and accepts *soft evidence* would likely seek such methods. Mythological predictions are typically couched in general terms, so are open to broad interpretation. Consequently, believers can verify predictions with almost any outcome.

Heuristic Models

Each of us predicts our future every day. We do this by constructing mental models of reality consisting of heuristics (rules of thumb), which permit fast, intuitive, and often correct decisions. We expect children to oversleep, anticipate how long it takes to drive to work, and how Uncle Ben will behave at parties. Someone who combines their intuitive mental models with *selective observation* might soon believe in their personal clairvoyance.

Humans make several types of heuristics:

- Mental maps: Turn left at the third stoplight, then turn right…
- Behavioral models: Don't lend money to cousin Ed, he'll lose it on the ponies
- Economic models: A penny saved is a penny earned
- Class recognition models: Don't touch snakes (they can hurt you)

My favorite and most useful heuristics, which I learned from my former instructor and mentor, Joe Harless (Human Performance Technology, 2020), are:

- The best predictor of future behavior is past behavior
- Watch what they do, not what they say
- Look before you listen

These are words to live by.

Formal Models

The problem with Heuristics is that they are inadequate when dealing with complex problems. The human brain is limited in the number of variables it can handle to four or five (Cowan, 2000). Science and technology, however, have devised methods to overcome human limitations called formal models such as roadmaps and mathematical models – the latter using computers and incorporating feedback loops (Figure 9).

Figure 9. Hurricane forecasting using competing computer models (before the innovation of the sharpie). Forecasting is usually accurate, but not precise.

While not useful for quick decisions, mathematical models provide a new perspective. Like other methods, mathematical models are abstractions, but they have two advantages. First, their assumptions are precise and are open to both inspection and criticism. Second, computer simulations permit accurate tracing of the process, and comparison of predictions with reality. This combination permits improvement no matter how complex the problem (Meadows et al., 1972).

Armed with computers and mathematical models, practitioners can apply the best current knowledge to solve complex, long-term, and global problems with ever increasing accuracy. Examples include weather forecasting, flight simulation, stealth design, war games, and environmental impacts. Someone preferring organized and logical methods, those that identify both facts and assumptions, and that evaluate accuracy, would likely use formal models.

But when formal models, based on research and empirical[5] evidence, threaten moneyed interests, the tactics of denial often prevail, at least in the short run (Lavelle, 2019; The Limits to Growth, 2019).

[5] Empiricism: A theory stating that knowledge comes only or primarily from sensory experience, (https://simple.m.wikipedia.org/wiki/Empiricism).

Conclusions

Based on the information presented, several conclusions seem warranted:

1. Humans do not perceive reality. We perceive an imperfect recreation of realty that is good enough to enable survival, but vulnerable to error, hence the need for skepticism.

2. Science is not reality. It is a method of searching for truth resulting in an approximation of reality.

3. Based on its unchanging nature, the utility of metaphysics is limited.

4. Objective reality is an assumption, but based on the continuing success of science and its offspring, technology, it is the best we have and the best we are likely to get.

5. Purveyors of popular media and fake news are overpowering objective realty and truth to the detriment of humankind.

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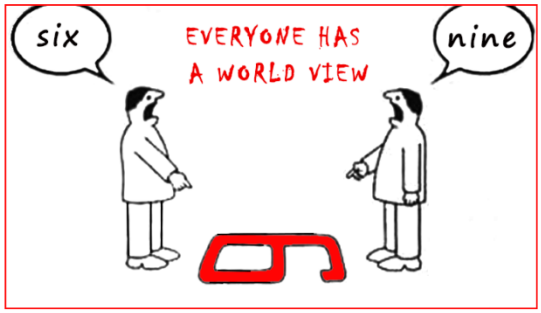

Figure 10. Mathematical precision! -- Welcome to Wonderland.