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space. It is an illusion, due to the way our vision works.

Tiny muscles adjust our eye to the distance to a viewed object. The strain of these muscles enables the brain to approximate distance. The better our training and experience, the more accurate our approximation. In addition, by comparing the sizes of the images on the retina with stored data about their sizes on “close-up”, the brain works out additional information about distance. Having two well-functioning and coordinated eyes provides an in-depth, three-dimensional image of the world. It also increases our ability to assess distances visually. Thus we may distinguish distances to objects that are 10 and 11 kilometers away.

The limit, beyond which nobody is able to distinguish distances to objects by unaided vision, is 20 km. Thus everything farther, by single, tens, thousands and billions of kilometers, is perceived at this “one for all” distance, as if **projected on a spherical screen** of a 20 km radius, with our eyes in the center of this imaginary screen or sky.

Chapter 2. WHY OUR PRESENTATIONS MAY DISAGREE WITH THE NATURE OF THINGS

2.1. Why Our Observations May Disagree With Nature. The nonexistence of the so clearly visible sphere of the sky leads to the conclusion that things are not necessarily as we see them, mainly because of the limitations in our vision. The abilities of other senses are also limited. As a result, our perceptions of things do not necessarily reflect their nature.

All we know, true and false, reaches our cognition and imagination through our senses, mostly from seeing (includes reading, TV, movies), hearing (includes listening!), touching, smelling, and tasting. Each of our senses has limited ranges of **sensitivity** and **reliability**.

For example, we see all bodies that are far above and away, at the same “one for all” distance of 20 km, as if they were projected on a spherical screen of a 20 km radius, with our eyes in the center of this imaginary screen or sky. As a result of this projection, some of the stars seen at the same spot of the sky, thus considered belonging to one *constellation*, may be many times farther from us than other stars of this same constellation. Hence the belief in constellations as groups of neighboring stars is based on an illusion, due to the way our vision works.

As another example, we are unable to perceive electrons and nuclei, of which atoms consist. Nor can we perceive single atoms or single molecules, even those consisting of many atoms. We can only perceive sufficiently large bodies of atomic matter, and we perceive them as being smooth, **dense and continuous**.

However, it is very well known in science (since Rutherford's Experiments, 1911) that the nuclei and electrons in atoms are far apart from one another. In relation to the radius of the atom, they are several times farther apart than are the sun and planets in relation to the radius of the solar system. The combined volume of the nucleus and the electrons in an atom is a millionth of a billionth (a quadrillionth) part only of the volume of the atom. As a result, the volume of an atom is a hundred times more "rare", more "empty" or "space like" than the volume of the solar system.

The distances between any two neighboring nuclei in atomic bodies are a hundred thousand times larger than the radii of the nuclei. Hence, all atomic bodies, including ourselves, are very rare networks of nuclei and electrons. In their fine structure (sub-microstructure), they are not dense as perceived but highly diluted, not continuous but incredibly **discrete**.

Discrepancies between our observations and the nature of things may be due not only to the limitations of our senses, but to our upbringing, experience, character, mental abilities, etc. They are also influenced by our prejudices, beliefs, convictions, wishes and **needs**. Hence, we may be seeing, hearing, smelling, etc, what we think, want, or need to, not reality.

2.2 Why Our Interpretations May Disagree With Nature. Interpretations of our observations, experiments, and of natural phenomena are usually adjusted to fit our needs, perceptions, theories, prejudices, and beliefs. They may thus be unreal, illusory, or just plain wrong, even if they "work," i.e., serve our immediate needs, as did the Ptolemaic Model. Hence, we find what we expect or want to find, not only in our loved or hated ones, but also in describing Nature, up to Feynman's presentation of Nature as an absurd (in his book *QED*, Ref. 3).

Life adjusted us to overcome its hardships and dangers. Thus our thinking developed not to create comprehensive in-depth explanations of observed phenomena but to respond to our immediate needs, to provide quick answers to WHY questions and even quicker solutions to problems faced. We also worked out habits to transfer, **extrapolate and generalize** these answers and solutions upon most, if not all other problems, on

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everything everywhere. Tired, unable to, or afraid of solving problems, we developed the scholastic habit of leaving them to the leaders of the crowd.

We tend to treat statements and conclusions made by ordinary people with more than reasonable criticism and doubt. But conclusions based on linguistic, philosophical, or mathematical acrobatics are accepted, often the easier the less comprehensible they are. We accept conclusions made by an "authority," even on topics that are beyond this person's expertise.

Models and theories developed from such approaches are scholastic. No matter how great their credibility and how good their immediate results, in the long run they reach dead ends, lead to errors, even to disasters, if applied to people.

2.3. Scholastic Habits and the Four Horse Rule. Aristotle in his *Mechanics* wrote that velocities are proportional to driving forces, that "*Obviously, four horses move a carriage four times faster than one horse.*" This statement, call it **The Four Horse Rule**, is a result of scholastic reasoning. It survived in science until the Newton era, but seems right to many scientists even now. To see that it is wrong, one should not depend on reasoning alone.

In reality, there are **velocity limits** to each animal species, to each kind of vehicle, and to each propulsor, under any given conditions. The velocity limit of a horse on a good track is about 15 m/s. Thus, if one horse moves a very light chariot with a velocity close to the limit, then the addition of any number of equally good horses does not increase the velocity of the chariot at all! If one horse cannot move a heavy carriage (velocity is zero), and four horses can, then they move the carriage not four times faster, but infinitely faster.

Nowadays the four horse rule appears in sayings that a forty horsepower engine will move a car or boat four times faster than a ten horsepower engine. This is wrong, as can be shown by considering the limiting velocities of such vehicles. Nevertheless, this rule can be artificially supported by the formula $P=Fv$, in which the power P is equal to the force F multiplied by (or *times*) the velocity v .

There is no infallibility nor magic in this or any other formula. Any formula is just a short-hand notation of a wordy rule. However the formula does not show the applicability limits of the rule nor the limitations of the physical magnitudes involved. Thus, if one is enchanted by the "beauty" of a formula (as was P.M.Dirac, e.g.) and ignores the wordiness