

What is qualitative science?

We live in a science-based culture dominated by measurements, graphs, statistics and calculations. The more we think in terms of quantity, however, the more we value the richness of qualitative experience which we seek for in nature, in our food, in the arts, in religious experience and in human relationships as an inwardly fulfilling, yet elusive antidote to our obsession with numerical accuracy. In the end, most of us would choose quality over quantity. But qualitative experience seems at first to be the antithesis of scientific objectivity. Is there—can there even be—such a thing as qualitative science?

1. What are qualities?

We generally distinguish between good quality and poor quality when we judge almost anything: shoes, tools, even education and human relationships; food, water, soil, etc. Man-made products are of good quality when they are well made, durable, and fulfill their intended purpose well. Water is of good quality when it is uncontaminated and fresh and optimally fulfills its life-sustaining role. An apple is of good quality when it is of a crisp, firm consistency, is moderately juicy, and has a somewhat sweet and slightly tart taste. In this sense we might say that the quality of something depends on the degree to which it realizes its full potential.

But we also use the word to distinguish between, for example, the distinctive qualities of different colors, sounds, or smells, of different kinds of fruit, or of different medicinal herbs. Snowdrops, daffodils, and tulips are all spring flowers, yet each has its distinctive quality. Dogs and cats are both carnivores, yet in their form and behavior they too exhibit very different qualities. In this sense different qualities denote different potentials.

We also speak of human qualities such as integrity or kindness, arrogance or selfishness. These are inner, moral qualities that are no longer sense perceptible. However they manifest in a person's facial expressions, words, gestures, and actions.

One might say that qualities manifest the essential nature, or innate organizational principle of things as it comes to expression in a more or less potent and complete way in the phenomenal and physical world.

Quality judgments are based on our experience of things and how we feel about them. If there is to be a qualitative *science*, however, it cannot be based on subjective personal reactions or preferences. And yet if it is to be a science of *qualities*, it must involve our human experience and feelings. A prerequisite of a qualitative science is therefore not only a highly sensitized and perceptive sensorium but also a highly

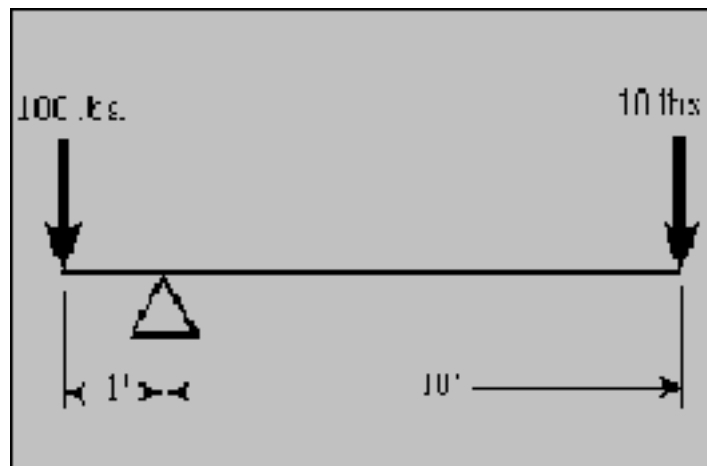
cultivated, versatile, empathetic feeling capacity that has transformed its subjective experience of personal or acculturated likes and dislikes into an objective capacity to perceive qualities as they are.

2. How would a qualitative science differ from modern quantitative science?

One might say that modern science began with Galileo, who said: “Measure what is measurable and make measurable what is not measurable.”

All scales of measurement consist of identical abstract units—quantities—that can be placed into mathematical relationships.

These relationships can be formulated with great accuracy. This is especially evident in the realm of mechanics. Thus, for example, there is a mathematical relationship between the forces at work in a balancing beam or lever:



$$100 \times 1 = 10 \times 10$$

Qualities themselves cannot be measured. Measurements are abstractions; qualities are by nature concrete and experiential. Whereas measurements and quantitative analyses, if done carefully, are always exact and can be expressed in exact mathematical terms, qualities can only be directly experienced and expressed in terms that somehow convey, or point to, this experience. This is a major reason why, wherever possible, qualities have been eliminated from the exact sciences.

In materials science, the specific weight, hardness, tensile strength, malleability, melting point, electrical conductivity, etc., of physical substances can be measured. All such measurements, however, are indications of the qualities of a substance. Chemical reactions reveal aspects of the innate qualities of substances. A distinctive attribute of iron or steel, for example, is that it oxidizes, i.e., undergoes a burning

process, when it comes in contact with oxygen. This happens when a thin layer of iron oxide, or rust, forms on its surface. When an axe is sharpened on a grinding wheel, however, tiny fragments of steel fly into the air and immediately ignite as sparks. The iron in our red blood cells is essential for absorbing oxygen in our lungs and transferring it to our muscles. When the chemical reactions involved in these processes are reduced to an abstract quantitative formula— $\text{Fe}_2 + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3 + \text{heat}$ —our understanding of the processes gains a certain accuracy but loses its concrete, experiential, qualitative nature. Rust formation, sparks, and the activity of iron in our blood are qualitatively different manifestations of iron oxidation.

Colors, tones, smells, tastes, and warmth or cold are sense-perceptible qualities that arise in connection with physical conditions. Tones arise in connection with vibrating material and are propagated through space by mechanical airwaves. Depending on how they are produced, tones can evoke feelings that range from the painful to the sublime. A pure fifth is heard when two frequencies reach the exact ratio of 3:2. Yet this ratio tells us nothing about the quality of the interval. Tones are experienced through a highly developed organ—the ear—and speak directly to our feelings. A similar relationship exists between color and electromagnetic oscillations and between smell or taste and specific chemical substances. In each instance, an intimate relation exists between a sense perceptible quality and a physical substrate.

Qualities play a vital role in the arts. The arts are human creations and are deeply bound up with human sensations, feelings and emotions. Much has been written about the qualities of various musical instruments, of different keys, and different musical compositions. In the arts, sense perceptible qualities become mediators or bridges between the world of the senses and a dynamic world of soul-spiritual experience.

3. An early prototype of qualitative science

Mainstream science has lost sight of the phenomena-centered science that was pioneered around 1800 by the great creative poet Johann Wolfgang Goethe. At a time when modern science was just about to plunge into materialism, he developed fundamental aspects of a scientific method that leads to a holistic and qualitative understanding of nature.

In botany, he developed his view of the metamorphosis of plants, a morphological approach based on exact imaginative participation in the metamorphosis of individual plants throughout their life cycle. To Goethe, with his strong imaginative capacities, it soon became clear that there were often transitional forms between seed leaves and fully developed foliage leaves, between these and sepals, between sepals and petals, and between petals and stamen. By recreating the sequence of developing organs in his imagination, he came to see the development of plants as a continuous transformation of one and the same organ. This leaf-like organ

metamorphoses throughout the life cycle of an annual plant, expanding from the seed leaves into the vegetative leaves, contracting in the sepals and flower bud, expanding a second time in the corolla, contracting in the stamen, then expanding a third time in the fruit, and finally contracting in the seed. The continuous sequence is never realized in the actual plant but remains a potential that sometimes reveals itself in unusual intermediate forms. For Goethe, metamorphosis was not only nature's way of creating the various organs of individual plants but also her way of creating the immense variety of plant families and species out of a formative potential that he called the *Urpflanze* – sometimes translated as the “archetypal plant.”

While Goethe's dynamic morphology is phenomenological and requires active inner imaginative participation, it is not yet qualitative. The fact that the organs of the blossom are metamorphosed leaves or that lilies are specific manifestations of the archetypal plant tells us nothing about the particular qualities of blossoms or lilies.

Goethe does venture into qualitative science, however, in his greatest scientific work, his *Theory of Colors*. In the sixth and final section of this very extensive and thorough study of color, a section entitled “the sensory-moral effects of colors,” he investigates the qualities of colors and color combinations. In introducing his method of inquiry, he writes in § 763:

In order to experience these particular effects optimally, one must surround the eye completely with one color, for example in a room of one color, or by looking through colored glass. One thus identifies oneself with the color; the color attunes the eye and mind with itself so that they are in unison.

“In unison” means that one's inner experience becomes one with the particular dynamic or quality of the color. We are reminded of the ancient philosophical principle: “Like knows like.” We are quite aware of this in our human relationships. For example, when someone self-righteously calls someone else a liar, the response may be: “It takes one to know one!” Indeed, it is true that in order to be able to recognize a quality, one must have something of it in oneself. To recognize a wide range of qualities calls not only for a heightened sensitivity but also a wide range of inner experience. In his “Verses in Prose,” Goethe writes of qualitative science:

There is a delicate empiricism which identifies itself intimately with the object and, in doing so, becomes the actual theory. This heightening of our spiritual capacity, however, belongs to a highly cultivated age.

Empirical perception is only the first step. It needs to “identify itself intimately with the object,” i.e., one needs to deepen, enliven, and thus inwardly unite with one's empirical experience. In order to become scientific knowledge, this experience then needs to be compared and contrasted with a range of other qualities in its field. Finally the lawfulness inherent in these experiences and their interrelationships needs to be formulated. This entire cognitive process never separates from the

qualitative experience. The thinking involved never becomes abstract. Instead it penetrates and illuminates the experience. It remains a “feeling understanding”¹ throughout. Finally the lawfulness, the “actual theory,” arises out of this heightened experience.

In Goethe’s color circle the six primary and secondary colors are arranged in such a way that neighboring colors blend one into the other and opposite colors are complementary. Green is at the bottom of the circle; magenta, or pure red, at the top. Inherent in this arrangement are fundamental dynamic relationships between the colors—relationships that include, indeed in a sense culminate in, their “sensory-moral” qualitative aspects. Goethe characterizes yellow as warm, expansive, and cheerful or major in mood; blue as cold, receding, and sad or minor in mood. When yellow intensifies to gold, orange, and red, it grows in strength and power as it darkens. When cyan intensifies, merging into royal and Prussian blue, then into violet as it darkens, it takes on increasing inwardness. Where the red and violet merge at the top of the color circle, a pure red appears that inclines neither toward orange nor toward violet. When lightened, it becomes magenta. In this pure red the restless intensity of the orange-red and violet attains a sublime quality which Goethe characterizes as “ideal satisfaction.” By contrast, green is achieved through the passive mixing of yellow and blue, and he characterizes its effect as “real satisfaction.”



Thus through his “delicate empiricism” Goethe discovered a complex of lawful, theoretically transparent interrelationships between the qualities of the colors of the color circle. In doing so, he established a prototype of a qualitative science.

Recently, as the importance of quality has become more widely recognized, the need for a qualitative science has increased.

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¹ A formulation of Rudolf Steiner’s borrowed from his lectures on color.