

# *A comparison — chemistry versus psychology*

Perceptual Control Theory (PCT) holds the promise of significant improvements in social, educational, managerial and leadership practices.

This new science is based on engineering principles. It is challenging, because explanations are different from what is understood today. Here is an introduction by way of an analogy to a scientific revolution in another field.

To get a feel for the kind and quality of change the advocates of PCT expect, let us go....

## **Back to the 16th century:**

Imagine that we were born here and now study the science and practice of alchemy (named for the art of making gold and silver). Alchemy is based on practical chemistry know-how, developed by trial and error over many centuries, and incorporates astrology, philosophy and mysticism. As a science it offers descriptions, prescriptions and recipes passed down from past generations of scientists. Alchemy works, and the accomplishments are undeniable. Just look at the great variety of useful products it has given us: metals, metal plating, medicines and much more.

In the 1500's, we live in a society accepting of and dependent on alchemy, where our scientists know what they know, are proud of it, respected, and authorities on their specialty. They write the textbooks used in alchemy school (Gutenberg's printing press is a blessing), referee and edit scientific journals. We cannot imagine a different science with different ground rules, different explanations and much better results, so naturally those of us using alchemy's teachings are proud of what we know and satisfied with the results we get.

## **Fast forward to the late 20th century:**

The science and practice of chemistry is now based on clear engineering principles—what we call causal mechanisms. We have accomplished far more than was possible with descriptions alone. An alchemist transplanted directly from the 1500's, would probably say that there is nothing fundamentally new—she would see that we are still mixing chemicals—until she learned and understood the theoretical difference in the detailed explanations. Scientists can predict results and design new compounds even before they mix chemicals, because they have a carefully tested and validated theory that explains what goes on as the elements interact. When we think of alchemy, we recognize that the scientists who knew what to do in the 1500's, even though they offered what they thought were explanations, had no clear or valid understanding of the underlying processes—how chemicals bond.

We understand now that they could not know in detail why and how their chemistry worked—when it did. Their descriptions have been forgotten and we smile a knowing smile when we hear stories about their quest to turn lead into gold by mixing chemicals. We recognize that it would take more than just a few minutes to explain our causal mechanisms such as atoms and the periodic table of the elements to scientists who were not used to think that way and had never heard of them. No—that is not right—they knew all about atoms, but not in the way we do now. That prior knowledge would only have made it harder for them to hear what we say.

As a by-product of the scientific revolution in chemistry, historians studying the 16th century approaches to metal smelting, alloying etc., can understand why they were successful with some processes but had problems or failed with others.

.....