

UNIVERSITY OF CALIFORNIA, LOS ANGELES

MEDICAL IMAGING INFORMATICS GROUP

BE 224A PAPER REVIEW #1

Paper Review:
The Medawar Lecture, 2001
by Richard L. Gregory

Author:

Nicholas J. Matiasz

Instructor:

Prof. Ricky Taira

Submitted:

2014-01-21

Summary of the 2001 Medawar Lecture

The primary thesis of the 2001 Medawar Lecture [1], by Richard L. Gregory, is that the processes of image *perception* and image *interpretation* are rarely, if ever, fully decoupled, because our knowledge of the world significantly affects the way in which our visual systems operate. In other words, what we know—or at least believe to know—constrains what we see, and Gregory therefore laments that perception and learning are often studied as separate phenomena. This paper is divided into two complementary sections: the first addresses the concept of *knowledge for vision*, and the second addresses *vision for knowledge*.

The first section describes various ways in which both our physiology and knowledge affect our perception. Stating, “we do not know by introspection what knowledge we use for perception,” Gregory draws a distinction between conscious (explicit) understanding and unconscious (implicit) knowledge, and further highlights the entanglement of our eyes and brains. He later presents the dichotomy of explicit and implicit knowledge with the categories of *conceptual* and *visual*, respectively.

Examples of unconscious or implicit knowledge are often illuminated via illusions, which occur when our perception comes into conflict with facts that we hold about the world. Gregory presents many examples of these illusions in turn, including those derived from bottom-up signals (e.g., jaxxing, retinal rivalry, and local drifting), and those derived from top-down knowledge (e.g., familiarity blindness, constancy, and pseudo-parallax). Gregory is careful to differentiate illusions from *optical* illusions, which he defines specifically as “disturbances of light between the object and the eyes.” It is by studying illusions, or “perceptual departures from physics,” that we can understand with greater subtlety the inner workings of our perceptual systems because they help us to distinguish physical phenomena from perceptual phenomena. Confusion remains as to whether some of these illusions result from errors that are either physiological (bottom-up) or cognitive (top-down) in nature.

An aspect of the human visual system that gives researchers access to its design is the concept of stability—also called constancy. Our visual system achieves this stability by compensating for certain changes in the visual field, often to normalize perception. However, these visual compensations are not always appropriate given the physical context of the perceived phenomena. When the brain enforces these corrections at inappropriate times, the result is often a perceptual error that is in some way the opposite of the phenomena that is usually corrected. An example of this process is the *Ouchi illusion*, in which the orthogonality and differing spatial frequency of channels in the visual field can give the illusion of motion. An example of this illusion can be seen in Figure 1.

In the second part of this text, Gregory discusses the complementary idea of using vision as a means for gaining knowledge about the world. Despite vision’s obvious utility for a variety of human pursuits, Gregory points out an interesting fact: “Inputs [i.e.,

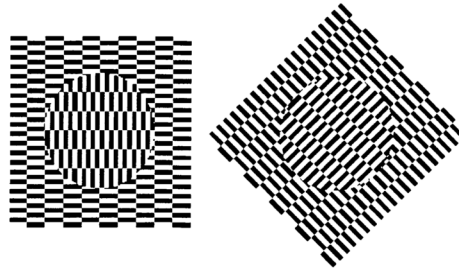


Figure 1: Ouchi illusion

visual appearances] can inhibit imagination.” This idea highlights an subtle tension that pervades our daily experience—namely, that we need prior knowledge for our vision to be meaningful, and yet we so often rely on our vision to further our knowledge about the world. In addition to the dichotomy of conscious-vs.-unconscious knowledge, Gregory describes visual knowledge with two categories: *specific* knowledge, which always refers to a certain object in the world, and *rules* (e.g., *perspective*), which describe sets of objects and can be applied in a variety of circumstances. The rules that an individual forms throughout life therefore depend on the dynamics of this vision-knowledge interplay.

Outline of the 2001 Medawar Lecture

- Part I

1. Knowledge for vision
 - Outline evolution
 - Ancient and modern streams of brain processing
 - Seeing pictures
 - Knowledge
 - ‘Physiological’ and ‘cognitive’
 - Ins-and-outs of vision
 - Illusions
 - Classifying illusions
2. Non-sense
 - Total (bottom-up) blindness
 - Agnosia (top-down blindness)
 - Neglect
 - Blindsight
3. Instability
 - Border locking?
 - After-effects
 - Jazzing
 - Eye movements
 - Auto-kinetic effect
 - Self-movement and object-movement
 - Motion parallax
 - Stereoscopic vision
 - Pseduo-parallax
 - Portrait eyes
 - Reverspectives

- Part I (continued)

4. Contrast
5. Confounded ambiguity
 - The Ames Room
6. Flipping ambiguity
 - Wire cube
 - Hollow face
7. Distortion
 - Physiological distortions
 - Cognitive distortions
8. Grouping
9. Glass effect
10. Impossible
11. Fiction
 - Filling-in
 - Phantasms
 - Peeriodic table

- Part II

1. Vision for knowledge

References

- [1] Richard L Gregory. The medawar lecture 2001 knowledge for vision: vision for knowledge. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 360(1458):1231–1251, 2005.