Jiro Hamada (2008): Excitation and Compound Inhibition in Lightness Illusions (in Japanese), Tokyo: Kazama Shobo. ISBN 978-4-7599-1698-0. 115 pages, 42 figures. ¥ 4,725.

The psychophysical study of lightness perception dates back to the pioneering work of the Austrian polymath Ernst Mach in 1865, who specified the significance of short-range effects or border contrast ("Mach bands"; Ratliff 1965). These studies were complemented by the German physiologist Ewald Hering in his *"Lichtsinn"* (1878/1920) by studies of long-range effects or area contrast (Békésy 1968). A century later, sensory neurophysiology remarkably confirmed the striking contrast phenomena revealed by these studies which nicely correlated with the antagonistic interrelations between excitation and inhibition of neural activity (Jung 1973). The introductory chapter of Hamada's book gives a precise description of the models by Békésy and Ratliff that are based on Mach's and Hering's psychophysical findings and complement them by related neurophysiological data. Grounded on these models, Hamada developed his own multi-stage model of lightness processing with its four stages: excitory-inhibitory transduction, response gradient extraction, edge detection, and information reduction (a first version of it was already published in 1976). This model was tested by computer simulations in its power to predict border contrast phenomena.

In the following chapters (3 to 8), Hamada presents a rich body of his carefully obtained psychophysical findings on various lightness phenomena (the well-known illusions by Craik and O'Brien with its variants by Cornsweet as well as by Ehrenstein with its novel variants by Hamada and Nakahashi). By this, the consistency of Hamada's model is further tested and modified. As is a standard procedure in studies of perceptual phenomena, context effects are established by measuring perceived changes of the test field in dependence of physical changes of the inducing field. Yet, Hamada measured both the perceived changes in lightness of the test field and of the inducing area. By this he revealed a strikingly new effect: A general decrease of apparent lightness as compared to a corresponding uniform reference field. This "paradoxical lightness decrease" cannot be explained by neural excitation and inhibition alone. Therefore, Hamada proposed a new kind of inhibition which is nonantagonistic and possibly added as a compound effect on the traditionally distinguished antagonistic inhibitory and excitatory changes of neural activity. This nonantagonistic inhibition allows also to explain asymmetry effects occurring in the perception of black and white (or light and dark). Thus, in Hamada's theory nonantagonistic or compound inhibition is of prime importance.

Some other researchers have established models of lightness perception assuming further factors besides that of excitation and inhibition. For example, Gilchrist and coworkers, since 1999, have proposed a refined anchoring theory of lightness perception, in which local and global frameworks interact: The area with the highest luminance in visual field assumes the function of an anchor of the global framework (Gilchrist 2006). It is tempting to compare the roles played respectively by the global framework in Gilchrist's model and the global decrease in lightness in Hamada's model. Moreover, Bressan (2006) has revised Gilchrist's model and replaced it by her double anchoring theory, assuming that the luminance ratio may be related to the highest luminance as well as to the surround luminance as anchors of lightness perception.

So far, Hamada's well-documented global loss of lightness (see also Hamada & Ehrenstein 2008), but also the observations made within (double) anchoring theories, lack a firm linking to neurophysiology. Tentatively, the compound model of brightness perception (Hamada 1995) links antagonistic and nonantagonistic processing stages to the distinct functions of neurons in the visual cortex (area V2), where von der Heydt and Peterhans (1989) discovered "foreground-background cells" and "brightness cells": Whereas "brightness cells" integrate inputs from end-stopped receptive fields in a *contrast selective* and *symmetric* way, the "foreground-background cells" integrate the input from end-stopped cells in an *asymmetric* way, without any specificity for contrast polarity. In line with this distinction, Hamada and Ehrenstein (2008) advocated the significance of the recent findings by Qiu and von der Heydt (2005) that cortical processing of luminance differences in two-dimensional displays does not only serve to represent and to complete borders, but also to establish object formation by assigning contours to surfaces so that they specify phenomenal order in depth.
In sum, Hamada's multi-stage model should be compared with Gilchrist's and Bressan's anchoring models. A careful examination of the respective findings, statements and interrelation between anchoring models and Hamada's multi-stage model seems to be most promising.

Because Hamada reviews the essential studies of conventional inhibition up to the recent evidence for a need of revision in an easy-to-understand way, his book can be well recommended as a basic text on lightness perception. His model and careful experiments have been largely presented to specialists in a number of scholarly (English) published papers. This monograph of Hamada's work on lightness perception gives students belonging to the Japanese-communicating academia privileged access to a fascinating field of perceptual research from its early Austrian-German beginnings to its, meanwhile, truly international scientific endeavors.

Midori Takashima, Tokyo

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Midori Takashima received her Ph.D. under guidance of Kaoru Noguchi. Currently she works at Research and Development Initiative, Chuo University, Tokyo, Japan. Her research concerns visual perception, especially color illusions and amodal completion. She assisted in editing Noguchi's Psychology of Beauty and Kansei (2007).

Address: Research and Development Initiative, Chuo University, 742-1 Higashinakano, Hachioji, Tokyo, 192-9393 Japan.

E-Mail: jade-green@jcom.home.ne.jp / psy_experiment@hotmail.com