(FY91 AASERT), RECEPTIVE FIELD NEURAL NETWORK ANALYSIS OF COLOR CONSTANCY AND COLOR CONTRAST

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13. ABSTRACT (Maximum 200 words)
Color constancy, or the ability of the visual system to perceive color independently of the ambient illumination, was investigated in the context of a biologically-based neural network. In particular, the role of retinal adaptation and higher level visual operations in mediating color constancy was investigated. The study incorporated properties of individual cells and how they combine to make complex color and spatial operations. The neural network simulations indicate how early visual stages complement each other to compensate and maintain relatively constant color perception under conditions of varying illumination and spatial context in the image. The network takes advantage of several mechanisms in the human visual system, including retinal adaptation, spectral opponency, and spectrally-specific long-range inhibition. This last stage is a novel mechanism based on cells which have been described in cortical area V4. All stages include non-linear response functions.

The model emulates human performance in several psychophysical paradigms designed to test color constancy and color induction. We measured the amount of constancy achieved with both natural and artificial simulated illuminants, using homogeneous gray backgrounds and more complex backgrounds, such as Mondrians. On average, the model performs as well or better than the average human color constancy performance under similar conditions.

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Courtney, Susan, M., Finkel, Leif, H., Buchsbaum, Gershon, "A Multi-Stage Biological Network Model for Color Constancy and Color Induction", International Conference on Neural Networks 1996 (submitted)

B. Researchers:

Faculty:

Buchsbaum, Gershon
Finkel, Leif, H.
Graduate students, Thesis title; and present position:

Courtney, Susan, M., (Ph.D.) Retinal and Cortical Contributions to Color Constancy and Color Induction in a Multi-Stage Network (1993). Presently, Postdoctoral Fellow, NIH.

Fan, Lawrence (M.Sc.) Research area: "Properties of Illuminant - Reflectance products and their relevance in Color Constancy." Accepted position with consulting company in computing and pharmaceuticals.

Hsu, Andrew (Ph.D. Candidate), "Signal processing in the primate retina: An ideal observer model." Graduation expected 9/96.

C. Honors:

Buchsbaum, Gershon, Elected Fellow of the Optical Society of America
Buchsbaum, Gershon, Elected Fellow American Institute for Medical and Biological Engineering

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No patents or new inventions were created.

Gershon Buchsbaum