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This Week's Citation Classic™

Hubel D H & Wiesel T N. Receptive fields, binocular interaction and functional architecture in the cat's visual cortex. *J. Physiol.—London* **160**:106-54, 1962.
[Neurophysiology Laboratory, Dept. Pharmacology, Harvard Medical School, Boston, MA]

The paper describes the responses of single cells in the cat's primary visual cortex to visual stimulation, the manner in which cells that respond to line segments of a given orientation are grouped into columns, and the degree to which the inputs from the two eyes converge upon single cells. The cortical column is interpreted as a relatively autonomous unit in which afferents from the lateral geniculate body converge on simple cells with a particular receptive field orientation, and these in turn converge on complex cells having the same orientation. [The *SCI*® indicates that this paper has been cited in over 2,070 publications since 1962.]

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I am sure Torsten Wiesel will agree that we enjoyed writing our 1962 paper more than any other, not only because we felt we had an interesting story to tell, with a rich assortment of physiological findings, but also because the things we had learned about the physiology of the cells (responses to oriented stimuli, a hierarchical ordering, a columnar grouping) all fit together conceptually like a Chinese puzzle: the columns were the regions in which the transformations leading to more complex, binocularly driven cells occurred. In writing the paper, we tried to convey some excitement and enthusiasm in the face of a set of scientific conventions that seem sometimes to force writing to be heavy, pompous, devoid of aesthetic appeal, purged of all humor, and jargon-ridden. Of course, we were beginners and couldn't afford to risk avoiding altogether the passive voice! The popularity of the paper (if citations are any index) suggests that our attempts to make it readable may not have failed entirely.

A few matters of fact: the work was done partly at the Wilmer Institute and Johns Hopkins and partly at Harvard Medical School. Without Stephen Kuffler's constant interest and enthusiasm, but also the complete scientific freedom he gave us, the work would never have been done. Perhaps one moral is that mentors should support young associates but scientifically let them sink or swim. In most laboratories, Kuffler's name would have been on the paper, but the idea surely never entered his mind, nor ours! While on the subject of authorship, I should mention that the order of our names was alphabetical, as is always so in *Journal of Physiology* papers. No one was the senior author, and I apologize for any artificial advantage having an early surname initial may have conferred. We had ultimately to switch journals to convince such people as deans that we were equal partners.

Anecdotes concerning the experiments are recounted in our Nobel lectures.[1,2] The 1962 paper was as important as any, I suppose, in winning us a Nobel Prize, but another factor was our steady, tortoise-like productivity of one paper per year on average, over a two-decade period. It's perhaps a lesson to the clinicians who tend to publish more like 20 papers a month—faster than I can *read* literature. In responding to ISI®'s request to mention awards, it seems only fair to mention the first, the Jules Stein Award, in 1971. One rarely receives a major award *after* the Nobel Prize!

1. **Hubel D H.** Exploration of the primary visual cortex, 1955-78. *Nature* 299:515-24, 1982.
2. **Wiesel T N.** Postnatal development of the visual cortex and the influence of environment. *Nature* 299:583-91, 1982.