James Jurin (1684–1750): A pioneer of crowding research?*

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Motivation

- Crowding not acuity is the most basic limitation to peripheral pattern vision (Pelli) ... and that's even the case within the fovea.
- Crowding is extremely simple to demonstrate.
- Why was it overlooked for so long???



Claudius Ptolemy (90–168): Knew about peripheral vision.

"What is seen by the central rays on the visual axis is seen more clearly than objects at the side." (translated from Lejeune, 1956, p. 20)



Alhazen (965–1040): Used words as stimuli on his perimeter, so was very close (if he had compared his results to single letters, he would have had it!).

"The experimenter should then gently move the strip [with a word written on it] along the transverse line in the board, ... and, as he does this, direct his gaze at the middle strip while closely contemplating the two strips. He will find that as the moving strip gets farther from the middle, the word that is on it becomes less and less clear..., the word that is on it decreases in clarity until he ceases to comprehend or ascertain its form. Then if he moves it further, he will find that the form of that word becomes more confused and obscure." (Ibn al-Haytham, translated in Sabra, 1989, pp. 244-245)





Sketch of the eye

Sketch of a blur disk at c







James Jurin (1684–1750):

(a) Distinguished perceptual from physical blur (perfect vs. distinct vision)

- "10. Vision perfectly distinct, or Perfect Vision, is that, in which the rays of a single pencil are collected into a single physical, or sensible [i.e. sensitive] point on the Retina."
- "11. Vision imperfectly distinct, or simply Distinct Vision, is that, in which the rays of each pencil are not collected into a sensible point, but occupy some larger space upon the Retina, yet so as that the object is distinctly perceived." (Jurin, 1738, p. 116)

(b) described crowding situations

- "The more compounded any object is, or the more parts it consists of, it will, ceteris paribus, be more difficult for the eye to perceive and distinguish its several parts." (Jurin, 1738, p. 150)
- "173. [...] For instance, it is somewhat difficult for the eye to judge how many figures are contained in the following numbers, 1111111111; 1000000000. But if we divide the figures in this manner, 11111,11111; 10000,00000; so as to constitute several objects less compounded, we can more easily estimate the number of figures contained in each of those numbers; and more easily still, if we thus divide them, 1,111,111,111; 1,000,000,000." (Jurin, 1738, p. 150)
- "175. [...] For instance, the hour I. upon a dial plate may be seen at such a distance, as the hours II, III, IIII, are not to be distinguished at, especially if the observer be in motion, as in a coach ... (p. 151)

William Porterfield (1696–1771): Clearness of peripheral vision is a "vulgar error" – but (like everybody else) he ascribed it to acuity.

Jan Evangelista Purkinje (1787–1869): Employed his perimeter to determine the dimensions of the visual fields. But he did not assess peripheral acuity, or crowding.

Wilhelm A. Korte (1892–?): Described 1923 crowding-like phenomena Holger Ehlers (1936/1953): Described crowding as is done today Stuart & Burian (1963): Studied crowding in amblyopes Herman Bouma (1970): Established linear critical-distance rule Strasburger et al. (1991): Brought Bouma's rule to the attention of the vision community