



PICTURE PERCEPTION PROJECTS  
JOHN M. KENNEDY

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FRSC, Professor of Psychology of the University of Toronto, with a distinguished rank from June 1 in his Wiko year, which he celebrated at Villa Walther in a goodly company of Fellows. A student of perception, he does for pictures and touch what Louis Braille did for words. This requires theories of elements (line and contour), the major geometries of perception, especially perspective, and the use of pictures as literal and metaphoric vehicles. He was President of Psychology and the Arts (Division 10 of the American Psychological Association), and editor of *Metaphor and Symbol*. In 2002, the *New York Times* declared that his work on perspective “changed the way we think” and *The Times* listed his ideas about touch and pictures as one of the top ten ideas of the year. Prize-winning documentaries on his work include CBC’s (2008) and G. Antipli’s (2001, given a NY Film Festival award). B.Sc. Queen’s Belfast, Ph.D. Cornell, he taught first at Harvard and thereafter at Toronto. – Address: Department of Psychology, University of Toronto, 1265 Military Trail, ON M1C1A4. Canada. E-mail: kennedy@utsc.utoronto.ca

The Wissenschaftskolleg has been a most amiable place in which to be curious about pictures. Would you like to see some? Please fasten your seat belt!

E. W., a woman from Augsburg who has been blind since infancy, uses some perspective (Kennedy in press), e. g. drawing a landscape (Fig. 1). Her work may be a developmental advance on sketches by blind people unpractised in drawing (Kennedy 2009; Kennedy and Juricevic 2008).



*Fig. 1. Pina, August 11, 2008, by E. W. Rock pinnacles in a desert in Australia, decreasing in size up the page, showing distance, with bushes, wiry trees and sand. The top middle vertical bent line portrays a breeze.*

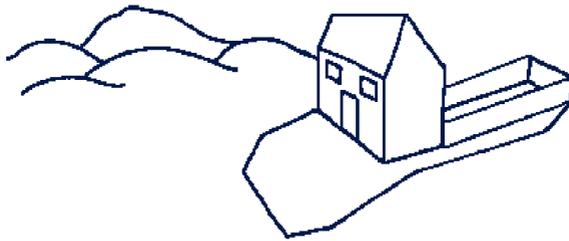
E. W., originally from Japan, visited Wiko and was welcomed by many Fellows, especially Toshio and Noriko Hosokawa, and we all recognized E. W.'s inventiveness with what may be pictorial metaphors, e. g. in Figure 2 she showed thoughts and sighs.



*Fig. 2. The afternoon, the wind, May 27, 2006, by E. W. Around the steaming coffee cup are tropes, perhaps, for thoughts. The bottom middle zigzags are sighs.*

Teacher Elke Zollitsch, from Passau, strongly encourages E. W. to use her own initiative. Like philosopher John Krois, I believe E. W.'s self-taught work is a big step in the history of illustration from rock art in the Drakensberg, S. A., to the present.

E. W. uses a raised-line drawing kit. For her, as for the sighted, line depicts the edges of physical surfaces, not purely visual borders – shadows and the like. Of interest, lines often show concave corners in which foreground continues behind a foreground edge, I realized this year. If a wall stands on the ground, the foreground surface continues behind the wall's base (Fig. 1). If E. W. is my Wiko 1 work, this is Wiko 2.



*Fig: 3.* A line depicts a surface edge, e.g. at a concave corner where a ground surface continues under a garden wall. On the ground a shadow is outlined, but the qualia of shadows are not perceived.

My Wiko 3 realization is that line depicts wires, cracks, rails, ruts and steps using its 2 contours and the width between the contours. Cave artists discovered this to show mouth lines and horns. Pictures of horns (sharp carets  $\wedge$  in form) use the exterior contour of the line to show a pointed horn's tip. The thicker the line the further the interior contour is from the horn's tip.

As Bruno Olshausen said, lines do not depict shadow borders – brightness and darkness. The Berlin School of Gestalt emphasized that a line can be dotted, with no brightness or colour to the imaginary filament joining the dots. Wiko 4 is a model for bevelled ends of lines in a circle, which do have brightness effects (Fig. 4).

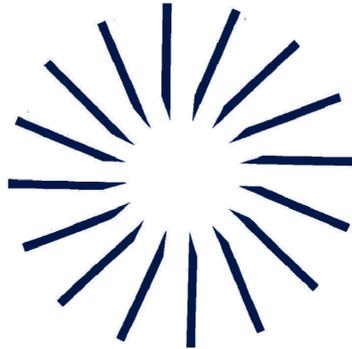


Fig. 4. What a halo should be. Bevels at ends of lines induce sunny brightness.

Holk Cruse's brain group might accept that the brightness comes from neural cells sensitive to a receptive field shaped like an O. The cells fire if one side of their O receptive field is brighter than the other. They exaggerate the brightness difference a little. Along a bevel a lot of these would fire, a OOOOO-shaped group that could fire a higher-order cell. The higher-order cell is saying "lots of increase in brightness here!"

In Wiko 5, work using perspective illusions (Hammad and Kennedy 2009; Hammad et al. 2009), Fig. 5's cubes were oscillated so the higher cube became the lower one, and back again. Whether static, as in Fig. 5, or oscillating, you cannot tell the size of the 2D acute and obtuse angles in the quadrilaterals depicting the top surfaces of the cubes. The quadrilaterals contain 3D information biasing perception of the 2D angles on the picture surface towards the 3D right angles they depict. Hence, as R. Arnheim said, artists using perspective cannot see their own drawings correctly.



Fig. 5. Cubes in perspective. In the lower figure the large quadrilateral's 4 angles look similar. But this is quite false. They are 20 degrees different.

In Wiko 6 (Bhasin, Kennedy and Niemeier in prep.), as befits Axel Meyer’s Darwin Year group, Fig. 6’s profiles seem happier in expression as features get higher and mouth angles more acute. The height effect may be metaphoric.

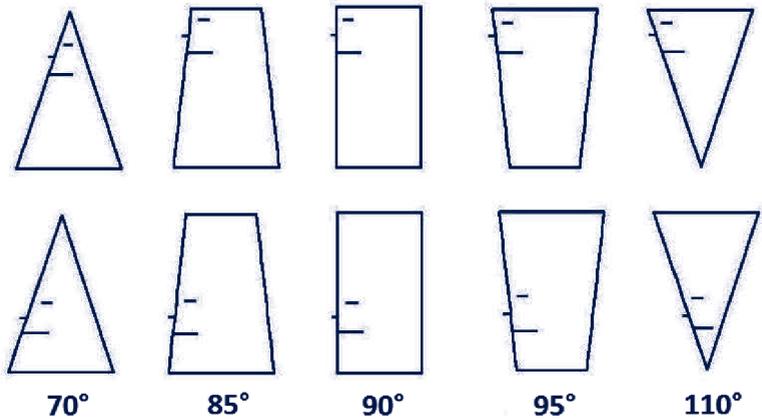


Fig. 6. Feature height and mouth angle change faces from cheerful to sad.

For Wiko 7 I tested vision’s approximation to perspective with Fig. 7 (Juricevic, Kennedy and Abramov 2009).

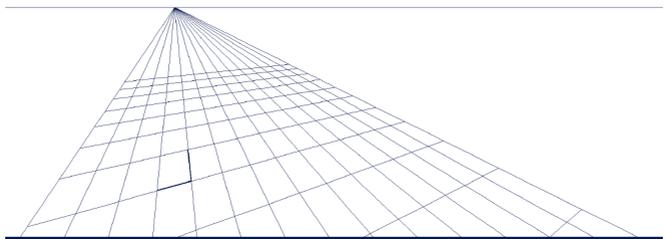


Fig. 7: Perspective picture of square tiles on a piazza. From the correct vantage point the highlighted tile looks rectangular.

Observers looking at Fig. 7 from the correct vantage point use angles to find shape, e. g. the proportions of the tile with the thick line. For any ratio of the angles subtended by the tile's sides, the greater the angle of the tile from the nearest point on the picture, the larger the tile, but the rate of change of the proportions is slower than it should be geometrically. I believe vantage points and perspective are also used in haptics. With M. Wnuzcko, I am now asking people to point to far-off objects, first visually-monitored and then blindfolded.

Encouraged by Jim Conant's take on sceptics, Wiko 8 is about internalization (Kennedy and Vervaeke 2008). Is internalization of action mental representation? Alas, like vision-is-pictures-in-our-head theory, internalization assumes representation. It does not provide it. Indeed, solving the problem of induction from action and perception is impossible in an unconstrained world. Rather, vision is possible because its only borders are luminance borders and chromatic borders, under monocular, binocular, static and kinetic conditions. In constrained environments there is lots and lots of information within this limited set of borders. They specify the world, and perception relies very effectively on this highly reliable information.

Wiko 9 is about brain imaging and face recognition. Sui, Liu, and Kennedy (2008) used EEG imagery and found differences in brain responsiveness I simply do not understand between active and passive exploration of pictures of faces.

Wiko 10 is a wager about brain imaging. In blind people, the erstwhile visual areas of the brain are not turned off. Likely they are recruited for spatial tasks including drawing in perspective. The language and planning areas may be more lit up if the drawing involves metaphor. I have circulated this bet to colleagues interested in imaging.

Wiko 11 is a 100-page draft of an introduction to Perception, entitled "Eye and Mind".

Wiko 12 is a proposal for a museum exhibition of pictures by the blind.

The seatbelt sign has been turned off. Caution: Items in the overhead compartment may have shifted. For certain they did in mine. But my purpose is not to prove my theories, but to improve them. This intensive Wiko year helped me solve problems that puzzled me for decades, and introduced quite novel ones.

## References

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