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An Hypothesis to Account for the Renewal of Outer Segments in Rod and Cone Photoreceptor Cells

The scientific method is often said to consist to of three steps: observation, hypothesis, and experimentation. In the August 2008 issue of **Investigative Ophthalmology & Visual Science**, Prof. **Barry Winkler** of the **Eye Research Institute** provides an outstanding example of the scientific method at work. He starts with two observations: 1. the outer segments of the rod and cone cells of the **retina** are constantly renewing themselves (at a rate of about 10% per day), and 2. these cells are deficient in the molecule **glutathione** (GSH), an important cellular **antioxidant**. Next comes the creative part of science--formation of the hypothesis--which he summarizes in the title of his article: **An Hypothesis to Account for the Renewal of Outer Segments in Rod and Cone Photoreceptor Cells: Renewal as a Surrogate Antioxidant** (Volume 49, Pages 3259-3261). He proposes that "the renewal of outer segments serves as a surrogate antioxidant for GSH and that the exceptional vulnerability of photoreceptor cells to certain toxic chemicals is linked to the deficiency in GSH in outer segments as a reductant, a detoxicant, and as an enzymatic cofactor. It is suggested that this deficiency of GSH is not damaging to outer segments under normal conditions, because renewal serves to replace any damaged molecules before they increase to detrimental levels. However, when photoreceptors are stressed, the renewal of outer segments alone is not capable of overcoming the higher rates of oxidizing and detrimental chemical reactions, and the health of the entire photoreceptor cell is at risk." The final step is to test this hypothesis experimentally, and Winkler is gearing up to perform these crucial experiments in his laboratory.

SUMMARY
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