Bi-stable neural state switches.

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Public Summary:

Scientific Abstract:
Here we describe bi-stable channelrhodopsins that convert a brief pulse of light into a stable step in membrane potential. These molecularly engineered probes nevertheless retain millisecond-scale temporal precision. Photocurrents can be precisely initiated and terminated with different colors of light, but operate at vastly longer time scales than conventional channelrhodopsins as a result of modification at the C128 position that extends the lifetime of the open state. Because of their enhanced kinetic stability, these step-function tools are also effectively responsive to light at orders of magnitude lower intensity than wild-type channelrhodopsins. These molecules therefore offer important new capabilities for a broad range of in vivo applications.