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The biophysics of TMS-induced state-dependent phosphenes: A molecular mechanism for the visual buffer?

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Abstract: Transcranial magnetic stimulation (TMS) of some occipital areas can elicit phosphenes that incorporate the color qualities of an external stimulus. These state-dependent phosphenes can be induced following visual adaptation to a uniform color and persist for at least 91 seconds, well beyond the typical duration of a short-term memory. Additional evidence shows that TMS delivered (at various ISIs) shortly after presentation (100 ms) of colored complex patterns induces phosphenes with concurrent re-perception of clearly defined forms of the flashed image. These results suggest that rich, detailed visual information remains encoded in phosphenes well after (for 150-250 ms) visual perception has ended. Thus, they have direct bearing on a molecular mechanism that could serve as the biological substrate for Kosslyn's visual buffer and the construction of visual images through percept-phosphene binding. We review recent biophysical research that bridges the emerging literature on state-dependent TMS effects with the visual buffer hypothesis.