

## **Keynote Bob Stickgold**

### *Sleep-Dependent Memory Processing and EMDR Action*

The unique efficacy of EMDR in the treatment of PTSD is thought to result from changes in brain/mind state induced by bilateral sensory stimulation, but the nature and specific consequences of these changes remain unknown. The possibility that bilateral stimulation induces a brain/mind state similar to that of REM sleep is supported by studies showing that sleep facilitates forms of memory processing arguably necessary for the resolution of trauma. Such studies, along with direct studies of the impact of bilateral stimulation on memory and emotional processing, and dismantling studies identifying the requisite features of such bilateral stimulation for effective trauma processing, will eventually lead to an understanding of the neurobiological basis of EMDR.

Post-traumatic stress disorder (PTSD) is classified by DSM-IV as an anxiety disorder. While this may be a clinically appropriate designation, from a mechanistic perspective it may be more appropriate to treat PTSD primarily as a memory disorder. On a most basic level, PTSD develops when memories of traumatic events, encoded during an actual trauma, fail to be processed normally over time. Such normal processing acts over days to months to reduce both the intrusiveness of the memory and the affect associated with such recall, and to integrate the memory into the individual's larger network of related memories to provide a meaningful and accurate understanding both of the event and of its implications for the individual's future. When this processing fails, PTSD results.

In 2002, we have presented a model of trauma processing, and of EMDR, proposing that the unique benefits of EMDR's bilateral stimulation result from its ability to activate normally sleep-dependent memory processing, which has broken down in the face of overwhelming trauma. This model was based on relatively recent findings of a role of sleep in normal memory processing. Since then, a rich and rapidly growing literature has demonstrated that sleep plays a critical role in the natural, automatic, and unattended processing of memories, across days, months, and even years. But it is now clear that this processing is more sophisticated than the simple "memory consolidation" originally proposed. Instead, sleep-dependent memory processing also results in the identification, integration, and enhancement of those aspects of memories calculated to be most important. It is these more complex forms of sleep-dependent processing that are presumably in play in normal trauma processing.

If the bilateral stimulation of EMDR alters brain states in a manner similar to that seen during REM sleep, then there is now good evidence that EMDR should be able to take advantage of sleep-dependent processes, which may be blocked or ineffective in PTSD sufferers, to allow effective memory processing and trauma resolution.



**Robert Stickgold** is an associate professor of psychiatry at Beth Israel Deaconess Medical Center and Harvard Medical School. He received his B.A from Harvard University and his Ph.D. from the University of Wisconsin, Madison, both in biochemistry. His early research was on bacterial cell wall synthesis and bacterial DNA replication. He had post-doctoral fellowships at Stanford Medical School in neurochemistry (with Eric Shooter) and at Harvard Medical School in neurophysiology (with Stephen Kuffler) before becoming an assistant professor of physiology at the University of Massachusetts Medical School. He subsequently left this position to work in the private sector for several years, before taking his current position at Harvard, where he has been since 1990. He has published two science fiction novels, and over 100 scientific articles. In the last several years, he has had

two papers in *Science*, two in *Nature*, and three in *Nature Neuroscience*. His work has been written up in *Time*, *Newsweek*, *The New York Times*, *The Boston Globe Magazine*, and *Seed Magazine*, and he has given invited talks around the world, including Brazil, Sweden, Switzerland, Japan, and The Netherlands. He has been a guest on *The Newshour with Jim Leher* and NPR's *Science Friday* with Ira Flato several times. His current work looks at the nature and function of sleep and dreams from a cognitive neuroscience perspective, with an emphasis on the role of sleep and dreams in memory consolidation and integration. In addition to studying the normal functioning of sleep, he is currently investigating alterations in sleep-dependent memory consolidation in cocaine addicts and in schizophrenia and PTSD patients.