

wise stressful events.⁶³ The facilitation of GABA inhibition of amygdala projection cells by serotonin is modulated by cortisol.⁶⁴ Serotonin's ability to facilitate inhibition by exciting GABA cells thus depends on the binding of cortisol to receptors located on amygdala neurons. Cortisol is elevated in a variety of psychiatric disorders,⁶⁵ and cortisol increases the intensity of fear reactions.⁶⁶ Drugs like Prozac may reduce exaggerated fear and anxiety in psychiatric disorders by enhancing the ability of serotonin to facilitate GABA inhibition in the presence of elevated cortisol.

The fear system thus nicely illustrates the basic elements of neural transmission in the brain and its regulation by modulatory chemicals. We will build upon these points at various times in later chapters.

ARE SYNAPSES ENOUGH?

My emphasis on the importance of synapses in brain function is not intended to minimize the role of other factors. For example, the rate at which a cell fires spontaneously is a function of certain electrical and chemical characteristics of the cell.⁶⁷ These are called intrinsic properties to distinguish them from extrinsic influences from other cells mediated by synaptic transmission and modulation. A cell's intrinsic properties, which may have a strong genetic component, will greatly influence everything that cell does, including its participation in synaptic transmission. But because psychological and behavioral functions are mediated by aggregates of cells joined by synapses and working together rather than by individual neurons in isolation, the contribution of the intrinsic properties of a cell to mental life or behavior occurs only by way of the role of that cell in circuits. While synapses themselves don't account for everything the brain does, they do participate crucially in every act or thought that we have, and in every emotion we express and experience. Synapses are ultimately the key to the brain's many functions, and thus to the self.