Program Note for *Of Angels and Neurones*

Of Angels and Neurones was commissioned by Tonu Kalam with funds from Carolina Performing Arts. It is based on research related to the brainwave patterns that occur during the five stages of sleep. The concept for this piece was initiated by Dr. Burt Lesnick, Chief of Pulmonary Medicine at Children's Healthcare of Atlanta at Scottish Rite, who long surmised that research related to his field might serve as source material for a musical composition. In 2006, Dr. Lesnick proposed his idea to me after hearing a performance of my orchestral work *Impressions from "The Garden of Cosmic Speculation,"* which is based on the physics-inspired and cosmology-inspired land-art of Charles Jencks. Soon after this meeting, I was contacted by Tonu Kalam about the prospects of accepting a commission to write an orchestral work for UNC's newly conceived 10x10 Project (a project in which ten composers are commissioned by the University of North Carolina at Chapel Hill, each for a different ensemble, resulting in a world premiere per year over a period of ten years). An important component of the 10x10 Project commissioning process was the proposal of a concept for the new work. Mr. Kalam was seeking something beyond simply writing an abstract piece; he was interested in the source materials and motivation for the piece. To this end I proposed to create a work based on Dr. Lesnick's research, to which Mr. Kalam responded very enthusiastically and the project was underway.

Preparations for the writing process started with Dr. Lesnick providing me with clear and abundant brainwave, sleep-pattern data. However, I found it difficult to sustain music based solely on the data; a literal reading of this data was all I could manage and the resulting musical passages were short and seemingly without potential for expansion or development in spite of the data's interestingly differentiated and dynamical patterns. Fortunately, by sheer serendipity, I was soon thereafter introduced to Dr. J. Allan Hobson, a leading expert in the field and the coauthor, along with Hellmut Wohl, of *From Angels to Neurones: Art and the New Science of Dreaming*, in which revolutionary concepts in the fields of art and science are presented. "…the autoactivating, chaotically open system of the dreaming brain provides the basis for bringing art and science together in a new, liberating synthesis. …the neurophysiology of dreaming offers a new insight into creativity and the creative process by accepting a commitment to unpredictability."[1] This brilliant exposé on surrealist art and film, characterized as a manifestation of physical, brainwave activity during sleep, provided what I earlier lacked and suggested an inspiring means to expand my piece: I used the salient features of Dr. Lesnick's charts to glean the surface details of the musical ideas, but developed them through a surrealist-inspired framework in which musical ideas (rhythms, pitches, harmonies and motives) flow to and from each other in ways that resemble the strange, chaotic machinations of dreams.

The large-scale shape of *Of Angels and Neurones* is in the form of a tone-poem with a scientific/surrealist narrative replacing the more common character-based narrative found in most tone-poems. There are seven main sections in this single-movement composition, each of which is tethered to a typical brainwave chart that correlates to a particular stage of sleep. Below is a summary of the scientific data used in the piece and the primary musical ideas that resulted from observing this data.

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[1] J. Allan Hobson and Hellmut Wohl, *From Angels to Neurones: Art and the New Science of Dreaming*, Mattioli 1885, 2005, p. 14

Stage Wake: The period prior to sleep and during the initial stages of light sleep: The relatively cyclical, smooth, broad bands of brainwave activity suggested a fugue-based exposition structure with clean lines and clear harmonic direction.

Stage I – NREM: This is the first stage of non-rapid-eye-movement (NREM) sleep. There are typically slow rolling eye movements in this stage of sleep that present a bold contrast in the data-charts to the multi-layered, fast, low-voltage EEG patterns, which are low in amplitude but densely active in frequency. I composed a broad melody for the horns accompanied by multilayered, fast and active, cyclical patterns in the strings, which derive their shape from the fast EEG activity charts and are motivically related to material heard at the outset of the piece.

Stage II – (K-Complexes and Sleep Spindles): The brainwaves in this portion of Stage II sleep are dynamic and full of sudden spikes and high energy bursts. Orchestral outbursts interrupt the smooth undulations of Stage I, illustrating the dynamic and transient nature of these dense pockets of brainwave activity.

Stage III – (Delta Sleep, SWS): The high energy bursts of the Sleep Spindles are typically ignored during this stage of charting, which is characterized by deeper, slow-wave sleep (SWS) patterns. These charts reveal several layers of deep, rhythmical wave-form activity. This is expressed musically via orchestrational and figurational layerings: string pizzicato and high woodwinds play arpeggios in tandem while longer wave-length patterns take their shape in brass and low woodwind melodies. These dance-like sections lead to a fully realized waltz with the violins carrying the primary melody.

Stage III – NonREM (Deep Sleep): This section of the piece features the strings alone in what constitutes the “slow movement” of the piece, descriptive of the slower, steadier low-frequency brainwave patterns found in this stage of sleep.

Stage IV – (High-amplitude Delta Activity): The deepest sleep occurs in this stage. The charts are full of high amplitude delta activity and are among the most consistently dense and active of the charts that I observed. These charts suggest a fast paced, energetic music; hence, a fast-paced hybrid scherzo emerges from the harmonies expressed in the previous stage. A string fugato leads to a very loud (high amplitude) climactic passage.

Stage V – REM Sleep: The REM period is characterized by low-amplitude, mixed frequency patterns creating charts that are in marked contrast to the active charts of Stage IV. I chose to express this stage of sleep with music that explores the lower-pitched regions of the orchestra and is designed to bring the piece to a gentle, slow but rhythmical conclusion.

In spite of this detailed summary, the piece is written to function as a pure piece of music replete with thematic ideas and developments by which the formal designs of the piece unfold, obviating the need to consciously match each section with the given scientific data. Originally, I was going to write a separate movement for each chart to facilitate comprehending the connection with the data, but I realized that this would likely result in a series of dry and pedantic studies. The kaleidoscopic journey that results from combining each of these stages into a single thrust requires a more comprehensive compositional approach. This ultimately produces a work that is far more resonant with the surrealist wanderings of the brain and more accurately characterizes the dynamical flow of brainwaves as they are made manifest throughout the stages of sleep.

-- Michael Gandolfi