YOGA AND THE HUMAN BRAIN
Understanding the Relationship Between
Asanas and the Sensory Motor Cortex of the Human Brain

A Workbook Designed By
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A cortical homunculus is a physical representation of the primary motor cortex, i.e., the portion of the human brain directly responsible for the movement and exchange of sense and motor information (namely touch: sensitivity, cold, heat, pain etc.) of the rest of the body. The resulting image is a grotesquely disfigured human with disproportionately huge hands, lips, and face in comparison to the rest of the body. Because of the fine motor skills and sense nerves found in these particular parts of the body they are represented as being larger on the homunculus. A part of the body with fewer sensory and/or motor connections to the brain is represented to appear smaller.

The cortical homunculus is a visual representation of the concept of "the body within the brain" that one's hand or face exists as much as a series of nerve structures or a "neuron concept" as it does a physical form. This concept relates to many neuro-biological phenomena including "phantom limb" and "body integrity identity disorder". Freud describes the cortical homunculus as an anatomical analogy of the ego: the homunculus "stands on its head in the cortex, sticks up its heels, faces backwards, and...has its speech area on the left-hand side."

Dr. Wilder Penfield used a similar image to depict the body according to the areas of the motor cortex controlling it in voluntary movement. Sometimes thought to be the brain's map of the body, the motor homunculus is really a map of the proportionate association of the cortex with body members. It also reflects kinesthetic proprioception, the body as felt in motion. It plays a central role in phantom limb phenomena and their opposite such as the disappearance of body members from conscious perception with certain types of brain damage. Like the sensory homunculus, the motor homunculus looks distorted. For example the thumb which is used in thousands of complex activities appears much larger than the thigh with its relatively simple movement. The motor homunculus develops over time and differs from one person to the next. The hand in the brain of an infant is different to the hand in the brain of a concert pianist. This kind of difference is open to introspection. Most people can flex and extend the end of their thumbs fairly easily, but relatively few can make analogous movements with any of their other fingers. The difference is due to differences in the functional organization of associated areas of the brain.