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Willis and the cortical neuron

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On the quatercentenary of his birth, it is appropriate to celebrate the writings and discoveries of the British neuroanatomist Thomas Willis (1621–75) about the cerebral cortex and its connections.¹ Willis observed that complexity in the convoluted surface of the cerebrum, with continuity of the underlying structures, accounts for differences in memory, imagination, and intelligence among species. In mammals and fishes that act mainly by instinct, the convolutions of the cerebral cortex are relatively under-developed. The corpus callosum acts as a “market place” so that “every impression coming this or that way, becomes still one and the same”.² Willis also noticed that the internal capsule is atrophied in people who have been long paralysed. He saw the decussation of motor tracts in the medulla and named the pyramids through which the fibres of the pyramidal tract, originating in the motor cortex, pass. Three centuries later, Cajal beautifully drew the pyramidal cortical cells (appendix).

Willis understood that sensations involve the refinement of crude impressions into perceptions. He argued that crude impressions are initially represented as instincts in the medulla. Next in this ascending hierarchy, the awareness of a sensation is dependent on information reaching the striate body, where the ‘animal spirits’ —according to Willis’ own terminology—that convey crude impressions are sifted, as if passing through a lens, and projected onto the corpus callosum. Phantasies are processed in the fornix, and the awareness of a sensation is stored in the cortex as a retrievable memory. But this sequential processing of a sensation might stall at any level and be turned back, and reflected, triggering an involuntary movement.

Thus, the founder of clinical neuroscience understood the anatomical principles of the way in and the way out of the cerebrum, and the complexity of perceptions and responses dependent on its many convolutions and connections.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

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