ON THE NERVOUS MECHANISMS OF PLANTS

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Science has under-estimated plants. Neurons, a large brain, and the ability to rapidly move are widely regarded as requisites for intelligent and adaptive behaviour. The sessile, slow-moving plants lack these structures and capacities. Nonetheless, plants share neural homoplasies with animals, including a simple form of nervous system and integrative centres or root-brains. Plants employ long-distance electrical signals (action potentials) transmitted via phloem tissues, and local electrical signals (variation potentials) when responding to the environmental exigencies to which they are captive. Evidence is growing that plants possess distributed swarm intelligence, embodied cognition, and purposive, intentional behaviours. Sir J. C. Bose (1858-1937) was a pioneer of this field. He invented unique instruments for measuring bioelectric potentials and for quantifying subtle movements of plants. He concluded that plants have a form of nervous system, and coordinate responses to the environment through electrical and hydraulic signalling. He identified pulsatile rhythmic oscillations in electric potential, turgor pressure, contractility, and growth as motifs elemental to plant behaviour. He recognised that phenotypic plasticity is the key to the adaptive behaviour of plants. He regarded plants as possessing simple intelligence, memory and purposeful behaviours. On the centenary of the establishment of the Bose Institute, this article reviews Bose's legacy in the field of plant signalling and behavior — a legacy that continues to grow— and situates his work in the context of current research.