

# The Role of Mathematics on Human Structure

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Mr Swapan Kumar Adhikari, the author of this remarkable and unique treatise, is the Head of the Institution and Department of Mathematics, Ghusari Uchha Madhyamik Vidyalaya in Howrah, West Bengal, India. He is a Council Member of prestigious institutions like Calcutta Mathematical Society and also member of the American Mathematical Society. Through his association with orthopaedically handicapped persons who had undergone presently available orthopaedic treatment, he came to the conclusion that it is the lack of mathematical precision in orthopaedic surgery that causes orthopaedic handicap. Hence, his research "to concretise the Physiology, Anatomical consequently Surgical anomalies."

The author, in his Preface, in laying down the platform as it were for this remarkable treatise, claims to have been inspired by a statement attributed to Leonardo da Vinci, that "an investigation cannot be strictly called scientific unless it admits mathematical deductions."

In total devotional submission to this philosophy, the author then takes the reader through a roller-coaster ride of mathematical equations, geometrical deductions, and bio-mechanical and thermo-dynamic postulates, with ample support derived from a vast array of principles, theories and laws pronounced by such luminaries as Euler, Vesalius, Poinsoot, Pascal, Poiseuille, Harvey, Bohr, Gibbs, Young, to name a few. What are perhaps the additional jewels in the crown are the numerous references to historical and ancient writings of Leonardo da Vinci, Archimedes, Galileo and Descartes, laced with their philosophical musings.

Some more recent orthopaedic researchers and writers like Bombelli, Crenshaw, Punjabi, are mentioned in passing. But any mention of the works of modern 'orthopaedic engineers' like HO Thomas, Charnley, Harrington, Smith-Petersen, Willeneger, and Roaf, who have contributed to some aspects of bio-mechanical innovations, is notably absent.

The anatomical form and physiological functions of the human body are dissected, micro-analysed and reduced to mathematical formulations, in a circuitous attempt to emphasise the importance of mathematical precision in the modern treatment of disease and deformities.

There is an interesting chapter on Mathematical Explanation of Descartes' Conception of Pineal Gland and its Modern View. This little gland is postulated through its development to turn in the form of Poinsoot's Spiral Shape, ultimately

functioning as a secretory gland without "experiencing any external force" and the author then gives his mathematical deductions through Euler's theory of Rotational Motion in which the Centre of the Mass is stationary. What has Descartes to do with the Pineal Gland? His assumption was, as the Author puts it, that the "Pineal Gland is a brain structure that can act as an 'origin'. There is a neutral position for it, and depending on how and to what degree this position is diverged from, one is conscious of this or that shape and emotion". To put it another way, Descartes had said: "the arches at the place where deflection occurs often are due to sites of critically important Glands, e.g. the Pituitary, which Descartes thought to be responsible for the production of CSF, and the Testes."

The Author concludes this chapter with "Descartes being a Philosopher, Mathematician and Physiologist could guess the source of Brain and Mathematics on it; so his hypothesis was scientific."

There are similar inspirations expounded by the Author throughout the 11 Chapters dealing with the movements of the heart, cervical spine and vertebrae, shoulder joint, pelvis, hip joint, femur, and the role of ligaments in the hip joint, based on mathematical calculations. After an analysis of the shoulder joint stability in its extreme mobility, through calculations of axis of rotation, moment of momentum and shear modulus, the Author concludes that the "precept Mathematics is the mother of all sciences may be said to reaffirmed."

Perhaps the clinical value of the Author's foray into the mathematical permutation of human anatomy and physiology is in the designing of arthroplasty and implants, and in the correction of deformities with the aim of restoring mathematically perfect lengths and positions to achieve mechanically perfect function. This is indeed his objective.

If you are, like me, mathematically ill-tutored, but willing to give it a go anyway, then you could read this extraordinary book by Mr Adhikari additionally for the grandeur of the English language from a citizen of a great nation formerly a colony of the British Raj, as illustrated by a sample of his statement in the Preface: "Formal conferment of thanks can in no way express my gratitude to (so-and-so).....for proof-reading and necessary ammendments in language."

Reviewed by: Dato' Dr Abdul Hamid Abdul Kadir