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From Anthropometry to Anthrodynamics: A Bridge through Anthromathematics

Syed Arif Kamal[¶] and *Samira Sahar Jamil*
SF Growth-and-Imaging Laboratory, the NGDS Pilot Project and Anthroamthematics Group,
Department of Mathematics, University of Karachi, Karachi 75270, Pakistan; [¶]profdrakamal@gmail.com

Fig. 1. Height (*a*, *c*) and mass (*b*, *d*) measurements of a 10-*year*-old boy (*a*, *b*) and a 7-*year*-old girl (*c*, *d*)

'Anthropology' became a quantitative science as 'anthropometry', which was given the rigor 3-*year* ago as 'anthro-mathematics', defined as the mathematics of human body sizes, forms, proportions and structures. The term was first introduced on March 22, 2010 by the speaker during *the First National Conference on Mathematical Sciences* held at University of Karachi. 'Anthrodynamics', derived from anthromathematics, with ideas from biology, computer science, mathematics and physics, powered through dynamical-system analysis, was introduced on April 10, 2013 during a seminar in FUUAST entitled 'Anthromathematiocs: Mathematics of the Third Millennium'. Third-millennium challenges required that the sciences of *anthropology* (study of human being) and *anthropometry* (measurement of human being) be transformed to *anthromathematics* through ideas from mathematics, *e. g.*, mathematical equations employed to approximate human body form (*analysis* — formulae for surface area and volume of human body), discrete structures recognized in the anatomy and the physiology of human body (*algebra* — brain death defined, mathematically, through study of group structure), invariance under deformations discovered (*topology* — spinal column deformed because of scoliosis, kyphosis or lordosis, studied by static and dynamic models), properties of numbers studied (*number theory* — numbers giving height, weight and other anthropometric measures) as well as inferences analyzed (*logic* — upper limits of optimal weight-for-height). There has been a long-felt need to apply the power of mathematics to the study of structures (anatomy) and functions (physiology) of the human body. Jenkins in 2008 described kinship of anthropology and mathematics. Notable contributions include solutions of childhood obesity, height and mass measurements to least counts of 0.01 *cm* and 0.01 *kg*, respectively, preparation of a detailed manual for obtaining anthropometric measurements (Fig. 1), putting forward concepts of optimal mass as well as quantitative estimates of obesity/wasting as well as tallness/stunting both of them expressed as percentage. The author spent over 30 *years* in the area of modeling of the human organs and 3-D bioimaging before, formally, launching the subject in 2010. The work included modeling of global-electrocortical activity (covariant, generalized coupling, covariant-generalized coupling), modeling of the human heart as a system of standing waves, 3-D-modeling of the human spinal column (static, dynamic, crystal-structure-based). Facilities available in the SF Growth-and-Imaging Laboratory operated by Anthromathematics Group, University of Karachi include stereophotogrammtery (moiré-fringe topography, rasterstereography), video analysis as well as software to generate growth-and-obesity profiles of children. Fig. 2 shows the linkages of various branches of mathematics evolved from 'anthromathematics'.

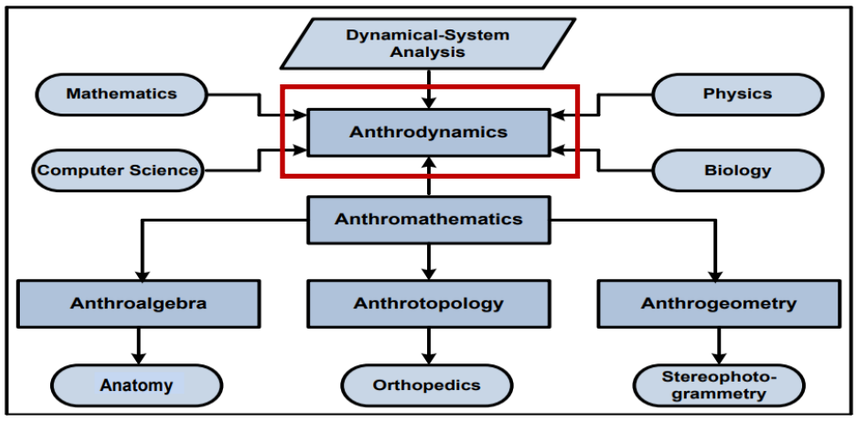

Fig. 2. 'Anthrodynamics' evolved from 'anthromathematics'

Keywords: Estimated-adult *BMI* • Growth-and-obesity modeling • Height measurement to least count 0.01 *cm* • Mass measurement to least count 0.01 *kg* • Optimal mass
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[¶]PhD (Neuroscience); MA, Johns Hopkins, Baltimore, MD, United States; MS, Indiana, Bloomington, IN, United States; Head, Anthromathematics Group; Project Director, the NGDS Pilot Project; Director, the SF Growth-and-Imaging Laboratory, University of Karachi; Ex-Convener, Subject Committee (Mathematics) and Member, Subject Committee (Physical Education, Health and Sport Sciences), NTS Pakistan • *paper mail*: Professor and Chairman, Department of Mathematics, University of Karachi, PO Box 8423, Karachi 75270, Sindh, Pakistan • *telephone*: +92 21 9926 1300-15 ext. 2293 • *homepage*: https://www.ngds-ku.org/kamal