



The Ziauddin University

FACULTY OF MEDICINE RESEARCH SEMINAR From Anthropometry to Anthromathematics

Day & Date: Saturday, February 19, 2011
Time: 1100h (**Contact:** Dr. Asif Memon 021 3586 2937-9)
Venue: Lecture Hall 2, New Bldg Basement, the Ziauddin University, Clifton Campus, Karachi
Web address of this document:
<http://www.ngds-ku.org/Presentations/Ziauddin.pdf>

Prof. Dr. Syed Arif Kamal
Professor and Head, Anthromathematics Group
Department of Mathematics, University of Karachi.
Telephone: +92 21 9926 1300-15 ext. 2293
e-mail: profdrakamal@gmail.com
Homepage: <http://www.ngds-ku.org/kamal>

Anthromathematics is the mathematics of human body sizes, forms, proportions and structures. The term was first used on March 22, 2010 by the author during the First Conference on Mathematical Sciences held at University of Karachi. The challenges of third millennium demand that the sciences of *anthropology* (study of human being) and *anthropometry* (measurement of human being) be transformed to *anthromathematics* through new ideas from other disciplines, in particular, mathematics, *e. g.*, approximating human body form by mathematical equations (*analysis* — formulae for surface area and volume of human body), recognizing discrete structures in the anatomy and the physiology of human body (*algebra* — brain death defined, mathematically, through study of group structure), discovering invariance under deformations (*topology* — spinal column deformed because of scoliosis, kyphosis or lordosis, studied by static and dynamic models), studying properties of numbers (*number theory* — numbers giving height, weight and other anthropometric measures) as well as analyzing inference (*logic* — upper limits of optimal weight-for-height). An *anthropometrist* takes heights, but an *anthromathematician*, not only, measures heights, but also, determines accuracy, precision and reproducibility of the techniques used while planning the session, aligns the scale, ascertains that the surface is level, checks the equipment against agreed-upon standards at the start of each session and, finally, estimates consistency of the data collected at the end of every session. The talk, then, focused on the research opportunities for clinicians, which could improve the quality of health care offered to the local communities unable to bear the high cost of medical care. These included growth-and-obesity profiles of children, determination of heart size and shape from PMI, screening of trunk deformities as well posture and gait analysis using moiré fringe topography and rasterstereography. Available facilities include stereophotogrammetry, video analysis as well as height and weight measurements to accuracies of 0.01 cm and 0.01 kg, respectively.

Keywords: anthropometry, anthromathematics, moiré fringe topography, rasterstereography, growth-and-obesity profile, posture, gait

Conflict of Interest Statement: No potential conflict of interest was identified for this work.

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Research Ethics: All studies involving measurement of human beings initiated after *Institutional Review Process* and conducted in compliance with ethical and human-rights standards.

About the speaker: Professor Dr. Syed Arif Kamal, Professor of Mathematics, University of Karachi, obtained his BSc (Honors), MSc and PhD (Mathematical Neuroscience) from University of Karachi, MS from Indiana University, United States and MA from the Johns Hopkins University, United States as Quaid-é-Azam Scholar. He held positions at the Albert Einstein College of Medicine, United States, Malmö General Hospital, Sweden and the Aga Khan University Medical College, Karachi. He is a referee of *Clinical Biomechanics* (Elsavvier), *Optics and Laser Technology* (Elsavvier), *Proceedings of the Pakistan Academy of Sciences* and *Journal of Scientific and Industrial Research*. His research, teaching and administrative experiences in institutions of higher learning and R&D organizations span over 29 years. He had an opportunity to lead teams in 14 different capacities, with progressively-increasing responsibilities. He has 111 papers to his credit most of them in biomathematics and mathematical biology, in journals such as *Biological Cybernetics* and *Journal of Biological Physics*. His contributions to biomathematics and mathematical biology include introducing cardiac coordinates to study heart function, making mathematical models of brain, heart, spinal column and growth of children as well as study of posture and gait of children using 3-D optical imaging techniques. Some of the notable concepts put forward by him are edge-based moiré, edge-based raster, mathematical definition of brain death and anthromathematics. He has given 64 colloquia, guest lectures, presentations and seminars at various institutions of higher learning, including Air War College, the Aga Khan University, the International Center for Chemical and Biological Sciences, Higher Education Commission, the Abdus-Salam International Center for Theoretical Physics, Italy and Massachusetts Institute of Technology, United States. In addition, he has conducted 21 trainings and workshops as well as in-service and professional development courses and organized 15 exhibitions, grand seminars, seminar series and conferences. He was invited speaker in 7 conferences, session chair in 6 conferences, panelist in the 12th IEEE International Multi-Topic Conference (2008) as well as chief guest and keynote speaker in the Sindh Educational Conference (2009). On November 4, 2010, he shared his life-long achievements as Guest Scientist in the Pakistan Academy of Sciences Karachi Chapter Program.