



Karachi Medical and Dental College

DEPARTMENT OF COMMUNITY HEALTH SCIENCES

Anthromathematics in the Service of Community Medicine

Day & Date: Wednesday, June 6, 2012

Time: 1230h-1330h

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Venue: Lecture Hall No. 2, KMDC, Block L,
North Nazimabad, Karachi 74700.

Prof. Dr. Syed Arif Kamal

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Anthromathematics may be defined as 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. Third millennium challenges require that the sciences of *anthropology* (study of man) and *anthropometry* (measurement of man) be transformed to *anthromathematics* through new ideas from other disciplines, in particular, mathematics, *e. g.*, approximating form of human body by mathematical equations (*analysis* — formulae for human body surface area and volume), recognizing discrete structures in human anatomy and physiology (*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 doctors, which could improve the quality of health care offered to the local communities unable to bear the high cost of medical care, at the same time addressing third-world-health-care challenges. These included growth-and-obesity profiles of children, determination of heart size and shape from PMI, screening of trunk deformities, in particular, scoliosis, as well as posture and gait analysis using moiré fringe topography and rasterstereography. Available facilities consisted of stereophotogrammetry, video-analysis system as well as height and weight measurements to accuracies of 0.01 cm and 0.01 kg, respectively.

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

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Research Ethics: All studies involving measurement of human

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beings initiated after *Institutional Review Process* and conducted in compliance with ethical and human-rights standards applicable in the region.

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, Department of Orthopedic Surgery, Malmö General Hospital, Sweden and the Aga Khan University Medical College, Karachi. In the academic year 1979-80, he implemented scoliosis-monitoring project at the Section of Pediatric Orthopedics, Department of Orthopedic Surgery, James Whitcomb Riley Hospital for Children, Indianapolis, USA. He is a referee of *Clinical Biomechanics* (Elsavier), *Optics and Laser Technology* (Elsavier), *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 30 years. He had an opportunity to lead teams in 15 different capacities, with progressively increasing responsibilities. He has 122 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 coördinates 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 the International Center for Chemical and Biological Sciences, the Aga Khan University, Dow University of Health Sciences, the Nishter Medical College Multan, Frontier Medical College, Abbottabad, the Abdus-Salam International Center for Theoretical Physics, Italy and Harvard Medical School, 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 keynote speaker in 3 conferences, invited speaker in 11 conferences, session chair in 9 conferences and panelist in 2 conferences. On November 4, 2010, he shared his life-long achievements as Guest Scientist in the Pakistan Academy of Sciences Karachi Chapter Program.