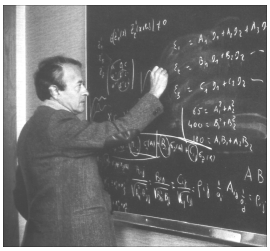
PROFESSOR GEORGES MATHERON (1930-2000)



The scientific community is saddened to learn of the death of Professor Georges Matheron on August 7th 2000. Major actor in applied mathematics over four decades, he leaves an outstanding scientific heritage, covering a wide range of domains where probabilistic tools and models are implemented. He also trained more than one generation of researchers, engineers, and teachers. His work inspires many researchers on a worldwide scale in domains of the theory and applications of random media, and of image analysis: mathematicians, statisticians, physicists, experimentalists, earth scientists, mining engineers, and also users of image analysis and synthesis.

Professor Georges Matheron created and developed geostatistics. He founded mathematical morphology with Jean Serra, and he contributed to the physics of random media. In 1968, he created the "Centre de Géostatistique et de Morphologie Mathématique" (which was split in two Research Centers in 1986), in the Paris School of Mines in Fontainebleau.

Professor Georges Matheron set out the bases of *Geostatistics* in the sixties, with a strong motivation for applications in the field of mining industry. A systematic and rational approach was followed to introduce probabilistic concepts for solving estimation problems connected with the global or local evaluation of resources from partial knowledge [1,2]. In the early works, both non stationary (through "transitive methods") and stationary models were introduced into the field of linear geostatistics. A class of linear estimators (the term kriging was coined by himself to honour the mining engineer D. G. Krige) was conceived [1,2,6] for local interpolation of data. It was later applied to the filtering of noise in images, and generalized to optimal decompositions of any set of data into various scales. A general class of non stationary models was proposed, the intrinsic random functions [7], and techniques of simulations (involving among others conditional simulations, which respect available data) were initiated. To solve non-linear estimation problems such as the prediction or the interpolation from available data of local probability distributions, models, based on bivariate distributions and inspired from multivariate statistical data analysis, were developed under the terminology of disjunctive kriging [9]. This heuristic but nevertheless rigorous approach was extended to models of change of support [12], which provide a prediction of distribution functions of phenomena observed at different scales.

Professor Georges Matheron also took a decisive part in the birth and the development of *Mathematical Morphology*. Working on the description of porous media and on the prediction of their permeability for the oil industry [3], he laid out the basic operations of mathematical morphology in its deterministic and its random versions. At that time, he conceived and studied one of the most famous models of random sets, the Boolean model, which regularly reappears in various branches of physics. The mathematical theory of random sets, initiated in [3,5], was completed and published in English [8]. This seminal book also contains a study of various classes of random sets (indefinitely divisible, semi Markov, stable for union), an axiomatic construction of the physical notion of granulometry, and a characterization of increasing set transformations, which are the seeds for useful operations: in his theory of morphological filters [13], based on a combination of lattice algebra and topology, he gives the structure of new classes of non linear filters which are widely used in image processing. This approach was extended to a more general framework , with his work on compact lattices [15-16].

In the field of *Physics of Rrandom Media*, he first developed a general methodology for the composition of permeability at different scales through homogenization [3,4]. This approach, based on perturbation techniques, can be applied to any physical process involving a conservation law and a linear constitutive behavior, such as thermal, electrical, or elastic properties. A theoretical study of the genesis of the permeability of porous media was made, proving the existence and the unicity of the solution of the Navier equation for random closed sets, and providing useful upper bounds for some random media [11]. Important results were obtained at that time about the dispersion of flows in random media. Later, he derived in a very elegant way bounds of the effective permeability modeled by random functions, and he studied the properties of geodesics in media with a random refraction index.

His work on applied probability was guided by a permanent reflection on the use of probabilistic models, mainly in applications of geostatistics. His thoughts on the epistemology of this discipline were published in his book “Estimating and Choosing” [10,14]. They give a deep insight into the practical implementation of probabilistic models in general.

The power of the mathematical tools developed by Professor Georges Matheron is the fruit of his immense talent, of his sound understanding of the physical background which was always the starting point of his work, of a permanent feedback between theory and practice, and of a strongly interdisciplinary approach. The fields of applications are still extending in many practical domains: image simulation and analysis by computer enable us to obtain data in biology, materials; on a different scale, models are used to simulate mineral ore deposits, oil reservoirs, or even astronomical data. Finally they provide sources of textures to encode or to generate artificial images. Illustrations and a continuation of his work appear in many publications, and in scientific meetings organized in geostatistics and in mathematical morphology.

Professor Georges Matheron, who graduated from the Ecole Polytechnique and the Ecole des Mines (he belonged to the “Corps des Mines”), had an extensive Knowledge in many fields of mathematics, physics, history and philosophy. It was always a stimulating experience to discuss these topics with him.

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DR. IVAN KREKULE (1934–2000)

It is with deep sorrow that we announce the death of Dr. Ivan Krekule (*16.6.1934, †27.8.2000), a prominent Czech scientist and member of several international professional societies and editorial boards. In spite of his long-term serious illness, he has never abandoned his hard-working and exhausting style and has never ceased to be a source of energy and encouragement to all his colleagues. His death came as an unexpected shock to all his colleagues, friends and family.

Dr. Krekule was a major figure of Czech biomedical engineering and his pioneering activities in promoting biomedical engineering had an international impact. He was a founding member of the Advisory Board of the IEEE ITAB conference series, a member of the International Program Committee of the Engineering in Medicine and Biology Society annual conferences and a member of the Editorial Boards of the IEEE Transactions on Information Technology in Biomedicine and of the Czech journal Lékař a technika (Physician and Technology). For many years he was actively engaged in spreading and developing health care technologies in Eastern Europe. Thanks to his initiative, several partnership programmes between the Engineering in Medicine and Biology Society and the Czech BME Society came into being. He was a member of several other professional societies, including the International Society for Stereology, the Czech Society for Cybernetics, the Czech Society for Biomechanics, etc.

Ivan Krekule graduated at the Military Technical College Brno in 1957 and earned his Ph.D. degree in technical cybernetics from the Czech Technical University Prague in 1973; his thesis dealt with the development of a digital computer for the processing of electrophysiological data. This was followed by the construction of a long row of special-purpose devices, hardware and software for medical practice and research concerned with data processing in electrophysiology and neuroscience, computer analysis of ECG, EMG and EEG signals, analysis of autoradiograms, psychophysiological data, radial maze technique, etc. He was famous for finding smart unconventional solutions based on analogue, digital and other approaches.

For 37 years he worked at the Institute of Physiology of Academy of Sciences of the Czech Republic, where he held the position of Head of the Department of Biomathematics for the last 11 years. The formation and development of this department endowed with the first confocal microscope in the Czech Republic was his last great project which he, unfortunately, could not see completely through. Even so, under his leadership it achieved wide national and international recognition.

He preferred to work in a team and he was extremely good at it. Nearly all his papers are headed by a long line of collaborators, he used to team up with young people offering them support in all possible ways. Already in the early seventies, he correctly recognized the importance of automatic image analysis and stereology for biological research. Even in those strange and difficult times under the former regime he managed to invite countless specialists from abroad to give lectures in Prague and created a circle of people interested in image analysis and stereology. He succeeded then to persuade the Czechoslovak Academy of Sciences to establish the first Laboratory for Image Analysis in Czechoslovakia equipped with the Leitz-TASS analyser. In the list of his publications, a long series of papers on image analysis can be traced, devoted to interactive processing of image data, Fourier analysis of microphotographs, software for semi-automatic image input, various possibilities of computer graphics in treating and enhancing data, particle analysis, etc.

Dr. Krekule took part in many conferences and symposia; his contributions can be found in all ISS International and European Congresses held in the last 25 years. He chaired the 6th European Congress for Stereology in Prague, 1993, and was a co-editor of the corresponding proceedings issues of Acta Stereologica. He also initiated and co-organized two Summer Courses on Stereology held in Skalský Dvůr (1986, 1993) as well as International Colloquia on Stereology and Image Analysis (1976, 1981, 1988, 1999).

His scientific achievements are certainly remarkable but perhaps more lasting and influential are his contributions to the establishment of the community of people interested in his favourite fields. He knew well how to bring people of different age and professions together and he was always ready to become a true friend to any

of them. We all benefited from his seemingly endless energy, stream of new ideas and research projects. He was willing to help anybody using generously not only his connections but also all his time in order to promote new scientific disciplines and ideas he believed in; let us mention his efforts at the international recognition of the Czech stereology and mathematical morphology or his contributions to the growth of biomedical engineering both nationally and internationally. He was so elegant that most of the recipients were not award about his discreet interventions. He was a gracious host to all his guest lecturers and colleagues from abroad who could always count on his personal care, deep understanding and ability to solve even their most peculiar problems.

Dr. Ivan Krekule will be long remembered not only by his friends and colleagues but also by all who met him at least once and enjoyed his unique personal charm.

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