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in the West African Craton: From Field
Observations to Modelling

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Tribute to Professor Théophile Lasm: a generous man, in every way



Professor Théophile Lasm with his students



On 15 July 2018, travelling from Abidjan to an official teaching and coaching mission at Péléforo Gon Coulibaly, University of Korhogo in northern Côte d'Ivoire, Professor Lasm had a tragic and fatal accident on the public highway.

Born on 3 May 1969 at Treichville, Théophile Lasm was from Akradio, Dabou, in southern Côte d'Ivoire. He went to primary school in Akradio and continued his secondary studies at the modern high school of Dabou, where he obtained the Scientific A level in 1990. He began graduate studies at the Faculty of Science and Technology of the National University of Côte d'Ivoire (currently Félix Houphouët-Boigny University of Cocody-Abidjan) and obtained a BSc degree in Geology in 1993. In 1994, he received an MSc in Science and Technology, option Earth Sciences.

In 1995, with a grant from the Ivorian government, he continued his studies at the University of Paris Sud (Orsay, France). A year later, he received his Diploma of Advanced Studies in Hydrology, Hydrogeology, Geostatistics and Geochemistry of Waters at the University of Orsay, France. In 2000, under the supervision of Professor Moutmaz Razack, he was awarded a PhD in Sciences of the Universe (option: Hydrogeology) from the University of Poitiers in France.

His thesis aims to contribute to a better knowledge and understanding of discontinuous reservoirs of the Precambrian basement of Côte d'Ivoire. He was particularly interested in the characterization

of geometric properties of fracture networks and the hydraulic and hydrodynamic properties of fractured reservoirs in the Archean domain of western Côte d'Ivoire. His research on the geometric and hydrodynamic characterization of fractured reservoirs was continued and amplified during his post-doctoral research. The goal was to enable efficient and effective management of groundwater resources.

Recruited in February 2001 as an Assistant at the Laboratory of Hydrogeology in the UFR Earth Sciences and Mining Resources of the University of Cocody-Abidjan (now Félix Houphouët-Boigny University), Professor Lasm continued to work on reservoirs of the basement. Before his sudden death, Professor Lasm had focused his research on the numerical modelling of flows and transport of solutes and masses in aquifers: tracing, hydro-dispersive parameters, numerical simulation, connected and disconnected clusters, transfer time and pollution.

Professor Lasm's focus was on quality and sustained work, resulting in his distinguished academic and professional career. In fact, in just 13 years of impressive work, he progressed from his first university degree in 2001 to the highest rank in the section of research teachers of the African and Malagasy Council for Higher Education (CAMES) in 2013. Thus, he progressed from a position of Lecturer in 2001, to Senior Lecturer in 2005, Associate Professor in 2010 and Full Professor in 2014.

In terms of teaching, he taught on a continuous basis courses in the various disciplines of geology: petrology, topography, cartography, hydrology and hydrogeology as well as applied computer courses. In addition, he was in charge of the practical courses (DEUG II) of the Chemistry–Biology–Geology section and the Bachelor of Natural Science Teaching at the University of Cocody-Abidjan. From 2001, Professor Lasm was also asked to teach at two other universities: Nangui Abrogoua University of Abidjan and Péléforo Gbon Coulibaly University of Korhogo. From 2012, he became the Director of the Laboratory of Science and Technology of Water and Environment in the UFR of Earth Sciences and Mining Resources.

In 2005, Reine-Cynthia Metchro became his wife and had two children: Yohan, born in 2002, and Samuel, born in 2013.

Professor Lasm was a scientist of value and quality who had a rich academic career. His scientific output includes more than fifty scientific articles and some thirty papers at symposia and congresses. In addition, he has been a reviewer in several peer-reviewed journals since 2008. He was a member of the IGCP638 Scientific Committee, ‘Paleoproterozoic Birimian geology for sustainable development’ and, from March 2008, of the International Association of Hydrogeologists (IAH) and, from August 2009, of the Geological Society of Côte d’Ivoire (SGCI).

Professor Lasm contributed to the training of many students and particularly to the supervision of Master and PhD students, with 5 PhD theses and more than 25 Master dissertations under his supervision and in co-leadership. He participated as a jury member in 20 doctoral theses and in about 60 Master’s degrees. His students are now recruited as research teachers in several Ivorian universities: Félix Houphouët-Boigny University of Cocody-Abidjan, Nanguy Abrogoua University, Péléforo Gon Coulibaly University of Korhogo, University of Man.

The research activities of Professor Théophile Lasm focused on a number of noteworthy research areas.

1. Fracturing and geometrical characterization of fracture networks

The subsoil of Côte d’Ivoire is mainly composed of 97.5% basement and, as a result, most of the water resources are contained in the aquifers formed by the fractured basement. Better management of these resources requires a good knowledge of these aquifers and thus the geometric properties of fracture networks. The resources are located in three aquifer levels that are: alterites, fractures and faults. The

most stable reservoirs are those of cracks and faults because of their depth. These aquifers are formed by several phenomena, including weathering, tectonics and superficial decompression. It should be remembered that the study of fracturing was until recently only very fragmentary.

Knowledge of fracturing promises better control of the groundwater resources. The works carried out under this theme include linear cartography by satellite imagery (images and radar), geometric characterization and simulation of fracture networks.

2. Water resources and climate variability

The management and exploitation of groundwater resources require a better knowledge of the hydraulic properties of aquifers, which control the groundwater flow.

Achieving reliable hydrogeological parameters is one of the major challenges in groundwater modelling. Groundwater resources are available but they are unevenly distributed throughout the country. These resources are poorly known both in terms of their hydrochemical and isotopic properties and their functioning (hydrodynamic properties). These resources are not immune to periods of climatic variability (dry, wet and intermediate periods) that have succeeded each other in our regions over the last four decades. Rainfall, volume of water infiltrated for recharging underground aquifers, and flow of rivers have experienced disturbance of varying significance.

3. Geostatistical estimation

Transmissivity is an intrinsic parameter of aquifers and is determined by the interpretation of pumping tests. It describes the general ability of an aquifer to transmit water and is the most important parameter needed for resource management of underground water. It often varies strongly and shows spatial fluctuations over large scales because of the heterogeneity of the aquifers. The pumping tests available are often few, which does not allow analysis and estimation of the distribution of this parameter over large areas using conventional methods. The use of geostatistical techniques (kriging, co-kriging) makes it possible to estimate this parameter over the whole field of study with better precision.

Professor Lasm’s most relevant scientific publications

Yao, K.A.F., Salze, D. *et al.* 2016. Cartographie de la vulnérabilité à la pollution des aquifères dans une zone minière: cas de la mine d’or d’Afema (Sud-est de la

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