

# Sultan Qaboos Academic Chair: Activities and Adventures during the first year of installment

By Professor Dr. Ruud J. Schotting, SQAC



I must admit that I am proud and honored to occupy the prestigious **Sultan Qaboos Academic Chair (SQAC)** of Quantitative Water Management at Roosevelt Academy/ Utrecht University. As the **SQAC** was installed September 1, 2007, we can look back at the first year of exciting and interesting scientific and educational activities. It is virtually impossible to share with you all the things I have been doing, so I would like to confine myself to some of the highlights with respect to teaching and research.

## Teaching activities

Let me start with one of the things I really like to do: teaching undergraduate and

the students. At Utrecht University, i.e. Faculty of Geosciences, I taught the first-year BSc Mathematics course (always a

at the first edition of the biannual memorial Thijs Kramer Lecture in the Kloosterkerk in Middelburg. Thijs Kramer was an important politician in Zeeland who cared much about the environment and the well being of the people in Zeeland. My role was to elucidate climate changes, hydrology and environmental issues related to Zeeland and The Netherlands. Our Commissioner of the Queen Drs. Karla Peijs opened this interesting event. Another event I certainly would like to mention is the CLIO congress "Water: source of conflict?", organized by the students of International Affairs of Groningen University. The chairman of this congress was Dr. Jan Terlouw, in my opinion, one of our finest (former) politicians of The Netherlands. I was asked to give a presentation/workshop on water management and moreover to be member of the discussion forum at the end of the day.



Professor Schotting (left), Special Professor of the Sultan Qaboos Academic Chair, and a learned colleague

graduate students. During the spring semester I have been teaching my first course at Roosevelt Academy. The topic of the course was Hydrology with subtitle "The role of water in geo-processes". I enjoyed the interaction with the Roosevelt students enormously. They are indeed exceptionally involved and motivated, which resulted in lively and high-level scientific discussions during the classes. I was impressed by both their social and scientific skills. I organized several excursions to water management-related institutions in the Province of Zeeland, which were highly appreciated by

big challenge to motivate 100 fresh Geosciences students for this somewhat dull subject!), and moreover, two MSc courses, i.e. Principles of Groundwater Flow and Environmental Hydro(geo)logy.

## Invited talks and lectures

During the last 12 months I received numerous invitations to give presentations about Hydrology and Water Management in semi-arid regions. Unfortunately, due to my teaching obligations and other academic duties, I could not accept them all. First of all I would like to mention the invitation to be one of the three speakers

## Awards for my students

On 5 December 2007 I was extremely happy to receive a letter of The Leverhulme Trust explaining that, together with my former PhD-student Dr. Bert-Rik De Zwart, we won one of the prestigious Leverhulme Technology Transfer Prizes 2007. This prize is annually awarded for outstanding transfer of high-level scientific research towards industry and applications. The prize comprised 7.000 euro for Dr. De Zwart and 63.000 euro for additional research purposes. The subject of our project was clogging of drinking water supply wells.

Early this year, two of my former female MSc students, Femke Rambags and Fransje Praagman, received an award from the Dutch Gas Industry Association (KVGNI). The high level of the thesis and the excellent applied research they conducted, both experimental and numerical, impressed the jury. The subject of their research was related to transport of natural gas (methane) due to leakage of

gas distribution pipes in the saturated and unsaturated zone in the subsurface.

#### Working visit to Oman

Due to my tight and rather demanding teaching schedule, I had to postpone my first visit to Oman as **SQAC** several times. The good news is that, at the kind invitation of Her Excellency Ambassador Mrs. Al Lawati, my trip to Oman is now scheduled in the first week of November 2008. Amongst others I hope to meet representatives of the Ministry of Water Resources and the Ministry of Environment and Climate. Moreover, I will give a lecture at Sultan Qaboos University, visit the new Shell research facility STO, and meet the new Dutch Ambassador in Oman, Drs. Stefan van Wersch. In addition, I hope to establish (new) contacts between Omani and Dutch water-related companies and research institutions. I am really looking forward to this challenging, exciting and very interesting first visit to Oman.

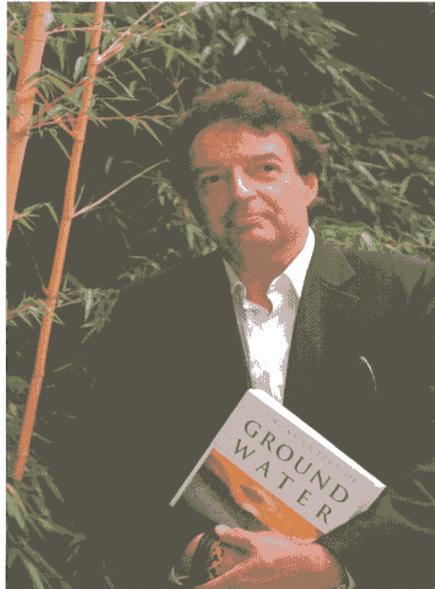
#### International initiatives

Recently I visited Jeddah, the capital of Saudi Arabia, to attend the inaugural awarding ceremony of the KAUST Global Research Partnerships (GRP). KAUST is a completely new University of Science and Technology that is being built in a coastal area near Jeddah. Less than one year ago, Utrecht University submitted a proposal called SOWACOR (SOil, WAtER & COastal Regions) in the framework of the GRPs, which was awarded by KAUST. Other awardees were e.g. Oxford, Texas A&M University, Stanford and Cornell. **SQAC** has contributed to create the proposal, is involved in the research (osmotic remediation of contaminated groundwater) and is coordinator of the educational outreach.

More or less simultaneously, together with companies like Zenitel (Belgium), Eijkelkamp Agrisearch Equipment (NL), WAVIN (NL) and PA Europe, I have submitted a proposal to improve both water distribution and water supply in Algeria. The idea is to use telemetric devices to gather water quantity related data to optimize the water management in large parts of Algeria, or preferably in the whole country. During a recent meeting with Algerian diplomats the idea of our Secretary General Rio Praaning Prawira Adiningrat to combine gas and water in one pipe with this technology was positively evaluated. In my opinion, optimizing water management in countries that include arid (desert) and semi-arid climate conditions is challenging, not only from a scientific point of view, but also because of its social/humanitarian impact.

In the framework of an internship, three of my female students have sequentially worked in Benin, Africa. The aim of the project was to find a 'simple' technique to

predict what locations are optimal for the construction of drinking water supply wells in small villages in the coastal area of Benin. The problem in Benin is that supply wells are 'randomly' constructed, implying that many wells produce saline water, or even no water at all! The stu-



*Prof. Schotting: expert on water management*

dents have chosen to use a relatively simple geophysical method to decide what locations are suitable for fresh water production.

Together with Delft University of Technology, **SQAC** is working on a proposal to find a sustainable solution for the arsenic problem in Bangladesh. Until the seventies Bangladesh relied upon surface water for drinking water supply. Due to the extremely bad quality of this surface water, many adults and children suffered from bad diseases and in many cases died. As a solution to this problem, Bangladesh decided to switch to the use of shallow groundwater as main resource for drinking water. A huge amount of tube wells was constructed, and everything seemed fine. However, after a while it turned out that the shallow groundwater contains high amounts of natural arsenic. It is generally believed that the solution to this problem is the construction of deep groundwater wells, because the deep groundwater is free of arsenic. The aim of our proposal is to investigate whether this solution is sustainable in the long term. The proposed research combines transport phenomena, microbiology and geochemistry.

#### Research activities at Utrecht University

It might also be worth mentioning the broad variety of research subjects our group is dealing with at Utrecht University. Hydrology in Utrecht and of course in Middelburg (!) is not strictly confined to studying water and water management

only. In our opinion, hydrology and water management are positioned between the broadest multi-disciplinary research areas in the world. Water management is the type of science where mathematics, (geo)chemistry, microbiology, fluid mechanics and physics go hand-in-hand. I will give you several examples to illustrate this. We study the fate of viruses in groundwater, study multi-phase flow in the subsurface (e.g. oil, gas and water), study transport of contaminants and remediation techniques and invent efficient storage techniques of thermal energy in aquifers. Moreover, we put research efforts in seawater intrusion in coastal regions, study high-concentration brine transport, and develop new theories for dynamic multi-phase flow and transport.

A completely new development is what we call "SmartSoils". This implies the modification of soil properties using natural bacteria to convert sand into sandstone or to seal leakages in subsurface water retaining constructions.

All these aforementioned subjects relate to Geosciences. I would also like to mention the new, non-Geosciences related subjects we are currently dealing with in our research group. What to think of modeling of nonlinear 'fluid' transport in babies' diapers, a question posed to us by one of the biggest diaper manufacturers in the world? Or the use of super absorbers to seal leaks in dikes. Or transport of fluids and medication towards tumors in the human brain in case of brain cancer. Or modeling porous fuel cells for future car generations. In our opinion, it is our duty to find the answers to questions that society and industry poses to us. Most of these questions relate of course to our core business: Hydrology and Water Management. But if our expertise can be useful in other areas, we are happy to share our scientific skills and knowledge.

#### Inaugural speech and symposium

I am happy to announce that (finally!) a date for my inaugural speech has been selected. The event will take place March 2, 2009 in the historical Academy Building of Utrecht University. On the same day, a symposium will be organized with speakers from Oman, Germany, the US and The Netherlands addressing scientific issues related to the activities of **SQAC**.

#### Acknowledgements

I would like to conclude by thanking all people that have supported me to make the first year of the **SQAC** a success, in particular the Dean of Roosevelt Academy, Prof. Dr. Hans Adriaansens, my dear colleague and friend Prof. Dr. Ir. Majid Hassanizadeh, the staff at Roosevelt Academy, and of course the staff at PA Europe!