

Association Announcement

1997 ANDREI BORISOVITCH VISTELIUS RESEARCH AWARD



Gerhardus Jan Weltje

It was about 2 years ago when one of my colleagues—a sedimentologist—put a book entitled *Provenance and Dispersal of Sand-Sized Sediments* onto my desk and said it would be of interest to me. It was the thesis of Gert Jan Weltje, and it was the subtitle which caught my attention, *Reconstruction of Dispersal Patterns and Sources of Sand-Sized Sediments by Means of Inverse Modelling Techniques*. I was fascinated by the thorough description of the history of the endmember-modeling problem and by the mathematical formulation improved

upon by Gert Jan with new ideas and computer programs for its solution. He fully utilizes the results of famous predecessors working on the topic and still has enough scientific vigor to formulate new approaches and put them into an applicable form.

Taking initial endmembers from Q-mode cluster analysis or fuzzy clustering, Gert Jan develops a robust iterative procedure which modifies the endmember composition in each iteration cycle until an "optimal" endmember matrix is obtained. Convergence of the algorithm is controlled by suitable error terms and a great flexibility of the modeling process is ensured by interactive choice of cut-off values for these parameters. After a mathematically satisfactory mixing model has been reached, its validity can only be judged by the modeler if the solution is also geologically feasible.

The major part of Weltje's publications is devoted to the application of the new methods to problems in sedimentology, provenance studies, and basin development. The inverse modeling approach is applied for relating observed compositional variation of sedimentary basin fills to a minimum number of sediment sources whose (palaeo)geographic locations can be predicted on the basis of spatial mixing patterns. The model was evaluated by applying it to modern beach sands of the northern Adriatic coast of Italy. In a similar way, a mixing model of tectonically controlled compositional evolution and sediment dispersal was used to study the thrust-wedge evolution of the southern part of the Calabrian-Peloritan Arc (Italy) and examine the lithological variation of Pliocene turbidite systems on Corfu (Greece).

Gert Jan Weltje tries to familiarize students and colleagues with new mathematical methods beyond the well-established multivariate statistics available through various software packages that are often used as black boxes. During the last years, he has established a small group of young geologists who utilise mathematical methods in a way which Vistelius would have appreciated: more explanatory than descriptive. Gert Jan's critical attitude toward the statistical mainstream in geology may slow down the growth of his working group, but those who dare will learn a lot from him, and about him—including his good sense of humour and his serious attitude when a project must be finished—during night shifts, if necessary.

Gert Jan's enthusiasm for mathematical geology and his successful application of inverse modeling techniques to a broad range of geological problems made him a favorite for the 1997 IAMG Vistelius Award, with its stipulation that it "shall be presented to a young scientist for promising contributions in research in the application of mathematics or informatics in the earth sciences."

Weltje received his PhD in Sedimentary Geology from the University of Utrecht, The Netherlands, in 1994. His dissertation was the culmination of a series of research projects on quantitative sedimentary geology and numerical modeling. His interests were already put on track when he got his Sec-

ondary School Certificates in Doetinchem, The Netherlands, with A-levels in mathematics, physics, chemistry, and biology, an ideal prerequisite for studying geosciences. His principal subjects during his studies were stratigraphy, micropalaeontology, sedimentology, and exploration geophysics. In 1988, Gert Jan earned his MSc in Earth Sciences at the University of Utrecht.

From 1989 to 1994, Gert Jan Weltje worked on various research projects: stratigraphy, structural geology, paleoecology, and seismic data processing in northern and southern Italy (Calabria) and Spain, and he developed numerical-statistical provenance techniques for reconstruction of basin-fill histories and evolution of source areas. During this fruitful period, he also worked as a geological consultant for various oil companies and taught undergraduate-level courses in sedimentology, petrology, and fieldwork methodology. Gert Jan is a member of the IAMG, the Society of Economic Paleontologists and Mineralogists, and the Royal Geological and Mining Society of the Netherlands. These memberships give him sufficient opportunity to meet colleagues, present lectures, and discuss geological or mathematical problems. Language is no problem because he is fluent in Dutch, English, German, and FORTRAN.

Since 1997, Gert Jan Weltje has been Assistant Professor of Mathematical Geology [sic!] at the Delft University of Technology, The Netherlands, and works also with the National Geological Survey (NITG-TNO). He is making further improvements on his unmixing algorithms and working on process-response modeling of sedimentary systems, and on microscale modeling of sediment texture and composition for prediction of petrophysical properties using stratal geometries and sedimentological and geophysical constraints.

Hopefully, there is enough time left over to play with his two small children and to devote himself to his hobbies: music, literature, and—last but not least—gastronomy. Ischia and Italian cuisine is a fine environment for celebrating the Andrei Borisovitch Vistelius Research Award.

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