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Tobler, Waldo

Michael Batty
University College London, London, UK



Biography

Waldo Tobler (1930–2018) was born in Portland, Oregon of Swiss parentage. He grew up in Seattle, but at the beginning of World War II, his father who was a consular official in the Swiss Embassy, moved to Washington DC. At the end of the war, the family returned to Bern in Switzerland where Waldo joined the American Army. He learnt several new languages including Russian and he was in the one place where he could begin to indulge his lifelong interest in maps. On his discharge from the Army, he returned to North America, attending the University of British Columbia as an undergraduate. In 1957 he went to the University of Washington, Seattle where he joined one of the most select groups of Ph.D. students that has ever existed within geography. Almost single-handedly, they led what came to be called the "Quantitative Revolution." Under the tutelage of Bill Garrison, Waldo with his Ph.D. student colleagues Brian Berry, Richard Morrill, Duane Marble, John Nysteun, Arthur Getis, among others, laid out the ground work for a generation who began to use mathematics and the scientific method in the construction of a grand theory. This tied location theory to social physics providing, along the way, powerful theories that would enable rigorous transformations of the way space could be ordered, articulated, and visualized.

Out of all this came spatial analysis and geographic information systems as well as demographic, economic, transportation and many other models of the urban and regional system. Computers were key to making these developments possible. Waldo's early work was on map projections and cartograms and the skills that he built up enabled him to develop many different transformations of the way one could construct and project maps, color them, and visualize them. Drawing on concepts from classical physics, in particular models of fluid flow, one of the central concepts he developed was the idea of representing vectors of movement between places defining what he called "interaction winds." This tied his work to spatial interaction models and in this sense he thought about how such models might be built for a world of flows between places, which, as we know, are largely asymmetric. Waldo of course being a cartographer, was one of the first to produce rapid visualizations, and in one of his path-breaking papers (Tobler 1970), he introduced a dynamic

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model of the Detroit region, which made extensive use of early computer graphics using storage tubes and I had the privilege of seeing the model in action when I visited him in Ann Arbor in 1974. The paper describing the model not only introduced cellular automata modeling into the geography but also coined what has come to be called Tobler's Law. In the paper, the model he developed was based on the key spatial principle that ". . . everything is related to everything else, but near things are more related than distant things." It was almost a throw-away-line but it quickly came to be enshrined as his "Law."

His first appointment after his time in Seattle was at Michigan where he was a faculty member from 1961 to 1977. He did great work on cellular automata, flows, and on statistical map generalizations and variances during these years. When the new department of geography was resurrected at the University of California at Santa Barbara (UCSB) in 1979, he moved to join that august group where he spent the rest of his academic career. There he developed many interesting and, often it would appear, idiosyncratic mathematical and statistical applications based on patterns and flows. But for me, his great work during these later years was his focus on migration. He resurrected Ravenstein's Laws and I am the proud possessor of a copy of his enlargement of Ravenstein's famous map of migration flows from the 1881 British census. Waldo digitized, enlarged, colored the vector flows by hand, and the map hangs in my office in University College. He knew I was interested in this as after I went to America in 1990 to the National Center for Geographic information and Analysis, which was headquartered at UCSB, we talked a lot about our interests in visualization, cellular automata, and how we might get computers to make sense of all this. In fact, I first met Waldo in 1974 much earlier when he came to the University of Reading to look me up, on spec so it seemed, while he was in the UK at a conference in Nottingham. In fact, he was really visiting Peter Hall who on the day in question was nowhere to be seen. I could have never imagined him coming to see me. He was one of the greats whose papers I had read but who I simply assumed in those far off days, I would never meet. But I had published a paper called "Spatial Entropy" in the journal *Geographical Analysis* that year and he was intrigued. It so happened that I was just about to depart to spend a year at the University of Waterloo. I then visited him and Gunnar Olsson at Ann Arbor in Michigan that same year, not far away from Waterloo, thence traveling with them to the North American meetings of the Regional Science Association in Chicago. It was a baptism of intellectual fire.

I last saw him at Keith Clarke's house in Santa Barbara in February 2013 and then in that same year in April at the Annual Meetings of the Association of American Geographers in Los Angeles. He told me he was not going to travel any longer to meetings and our paths did not cross again. He was, in fact, the founder of analytical cartography. He was one of the first geographers to be elected to the National Academy of Sciences but he was recognized most for being what one might call an "academics academic," a very learned man with a subtle sense of humor, some might almost say "wicked" at times and a conviction in his research that was bolstered by his many other interests. These ranged from hiking in the lowlands of California to the Swiss Alps, from classical music to a wide interest in everyone else's academic indulgencies. He was a colleague who would give his time to talk to anyone who took an interest in his work and he would always reciprocate. A giant in the field.

Bibliography

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