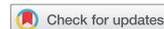




OBITUARY



## Waldo Tobler: Remembering a genius

16 November 1930 to 20 February 2018

Waldo Tobler was a genius. Very few people are, far fewer than the normal proportions banded around, but Waldo was one. He appeared to greatly dislike being singled out in this way, but now he is dead it has to be said. Unlike many geniuses he is most remembered for his affable manner, his very kindly smile, the remarkable longevity of this academic life, his great academic achievements and – much more importantly – for being very kind, especially to strangers. A generation of scholars who received his collected works on floppy disc (later on CD) is evidence for his commitment to engage with other scholars. He made no distinction between the hierarchies in academia and gave young scholars the same respect and attention as senior academics, acting as a mentor and source of inspiration to many of them. Understanding and discovery were his real aspirations.



His most simple of discoveries are most often quoted, ‘Tobler’s law’ and ‘Tobler’s walking rule’, but behind such simplistic truisms, there was a mind that was constantly producing ideas that others, including the vast majority of his colleagues, rarely understood at the time. It is lucky he was such a patient man or else he could have become exasperated.

One of Waldo’s earliest papers was entitled ‘Automation and cartography’ and was published in the *Geographical Review* (Tobler, 1959). He was at the forefront years before his contemporaries, but his great modesty meant that few initially noticed – and none resented. Through the 1960s he quietly produced what would become seminal papers, the first on computer animation, on medieval mapping, on the mathematics of mapping and on filters and the inverses (in *Geographical Analysis*) – touching on what we now know as spatial smoothing and sharpening – and about the methodology behind everything from optical character reading to, eventually, automated face recognition. He began all this with a wonderful PhD thesis on map transformations (Tobler, 1961). Waldo did modern cartograms first, and the way they are still made today is essentially his method; admittedly with a few very clever tweaks that speed things up considerably and mean that we are on the verge of real-time complex map transformation; when any map morphs in any way you want, as you watch it.

With most inventors, it is possible to say that if they had not done it someone else would have stepped in shortly afterwards and filled their boots, or even that someone else was actually inventing the same things at the very same time because it was actually the next obvious step to take. You cannot say that about Tobler. There was no one else at the same time doing anything at all similar and many of his ideas remain to this day to still be taken forward because they are still too innovative for our times. Waldo operated as if he had come from the future. His ideas about the (imaginary still to be visualized economic) winds that move migrants around the USA and the transformation of time to morph it into space have not yet been taken very far forwards. In 1971 he was one of the first, and possibly still the only, human geographer to have a paper published in *Nature* on archaeology (Tobler and Wineburg, 1971).

Tobler’s most productive year was 1973. In a paper published in the *Annals of the New York Academy of Sciences* that year he showed how the districting problem of the USA, and anywhere else in the world, could be solved (Tobler, 1973a). This was done by simply putting a hexagonal grid over an equal population density map and then re-projecting those hexagons back into real space to create a set of districts that fairly defined each of equal population. Imagine if his ideas had been taken up – no more gerrymandering in US politics! In *Geographical Analysis* that year he demonstrated completely new forms of mapping (Tobler, 1973b). And in a collected work, he explained how the geometry of our imagined mental maps could be better understood (Tobler, 1973c). And then, for a further five decades he just carried on publishing. Keith Clarke has written about this later period in his obituary of Waldo published in *CaGIS* (Clarke, 2018).

We have said very little about his family and friends, about where he came from and much about what he was like. It was a beautiful sunny spring afternoon in March 2016 that one of the authors last met Waldo in the modest house a ten-minute drive away from UCSB's campus where he and his wife Rachel lived. Under the citrus trees in his garden, his mind was sharp as ever, passionately discussing his ongoing appetite for advancing cartogram techniques and going into minute details of the underlying maths. And yet he had a very genuine personal side that he was willing to share with people around him. Speaking about his Swiss roots, his life in the US and his travels leaves a memory of him with a warm smile on that March afternoon. Here, at his home, he was the most modest and down-to-earth person who showed his greatest appreciation of the little things in life, such as the birds buzzing around the citrus trees. His curiosity to engage with the world around him was never-ending. For those who want to know more about the most unusual geographer, Sandy Thoits has written more about his private and personal side in the local *Noozhawk* newspaper (Thoits, 2018).

We have written this note to point out that his genius was well recognized in Europe and hope that the points we make lead to some research students out there – just starting off – to go back to those original 1970s papers and draw up the new boundaries of the USA that future elections should be held on, to determine the economic winds that blow migrants into, across and out of the USA – their strength and direction, and then the change in that human climate over time; and to look into where Waldo only just began to look, at the mapping of time and space brought together.

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Dorling, D. and Hennig, B. D. (2018) Waldo Tobler: Remembering a genius, *The cartographic Journal*, 55: 3, 303-304, 10.1080/00087041.2018.1507181