**Geometry of Transform Faults crossing Seafloor Spreading Centers, Demonstration Models, Information and Credits**

These are physical models that have been made over the years in order to demonstrate the workings of mid-ocean ridge transform faults. The first paper model below was handed out to us by J.Tuzo Wilson at my very first scientific meeting, as described in the essay below.

The second paper (and cardboard) model is much easier to manipulate. I first saw this model demonstrated by Debbie Bereki in a workshop for sixth grade teachers. It has the slight disadvantage that it shows subduction at the edges of the ocean basin. This is, in fact, the situation in the south and central Pacific, but the more usual configuration has spreading between two plates that are carrying continents. It is a not uncommon misconception (that has to be confronted) that sea floor is made in the center of the Atlantic Ocean and destroyed by subduction at the edges of the same ocean basin. You can not understand how the continents drift if you have this model in your head

The third model is much more elaborate. It is worth building if it will be used in various classes over numerous years. It is a box with an open bottom and slots cut into the top. Cloth ocean floor is then pulled apart, pulling cloth strips out of the slots. The strips are weighted so that they don't pull all the way out and so that, after use, they pull the strips back into the box to reset the geometry.

*Note:* You don't need to be a carpenter to make a useable version of this model. My first version used a cardboard box; it held up for several years before it caved in from the weights. Chuck Anderson then built the wooden box version shown below and it has held up through more than a decade of hard use, though the cloth strips are beginning to fray.



Complaints, corrections, comments and, especially, suggestions for how to make these materials more useful are always welcomed: atwater@geol.ucsb.edu

**Essay about the power of transform faults**.

Here is a description of the power of transform fault models, excerpted from a piece I wrote in 2001, remembering those amazing times.

For the summer of 1965, ... I applied for and got an internship at the Woods Hole Oceanographic Institute. I admit, I was drawn primarily by the romance of the sea and ships. I didn't know enough to realize that the marine scientists were about to unleash a revolution upon the geo-world. When I saw a number of the Woods Hole staff preparing for an Upper Mantle Committee meeting in Ottawa, Canada, I asked my mentor, Bracket Hersey, if I could go too. He said "Sure. Why not?" and found me travel funds. The meeting was concentrated on the geophysics of the oceans and the various mysteries therein. The list of sessions included all the right things: mid-ocean ridges and rifts, fracture zones, trenches and island arcs, magnetic stripes. They knew what needed explaining, just not quite how to do it. Most of the major players in this small field were there and I greatly enjoyed meeting them and putting their faces and their quirkinesses to their names. The whole meeting was exciting, but the presentation that made the biggest impression on me was the one by J. Tuzo Wilson, about transform faults. Tuzo was a wonderful showman with a great twinkle in his eye. After he had explained his idea, he passed out paper diagrams with two mid-ocean ridges connected by a transform fault. It said "cut here", "fold here", "pull here". We all laughed, and I felt embarrassed (kindergarten games at this august scientific meeting?), but I took the paper back to the privacy of my hotel room and cut and folded and pulled and, wow: the light bulbs really went on in my brain. The simple geometry of the transform faults with their fracture zones holds the key to the geometry of formation of all the ocean basins - right there in that little piece of paper. I've been handing out versions of that diagram to students ever since, and urging them, after they stop laughing, to cut, fold and pull.

Atwater, Tanya, 2001, Chapter 15: When the Plate Tectonic Revolution Met Western North America, pages 243-263 in *Plate Tectonics, An Insider's History of the Modern Theory of the Earth*, Naomi Oreskes, ed., Westview Press, 424 pages.

Tuzo's presentation covered the material in Wilson, J. Tuzo, 1965, A new class of faults and their bearing on continental drift, *Nature, v. 207*, no. 4995, p 343-347.