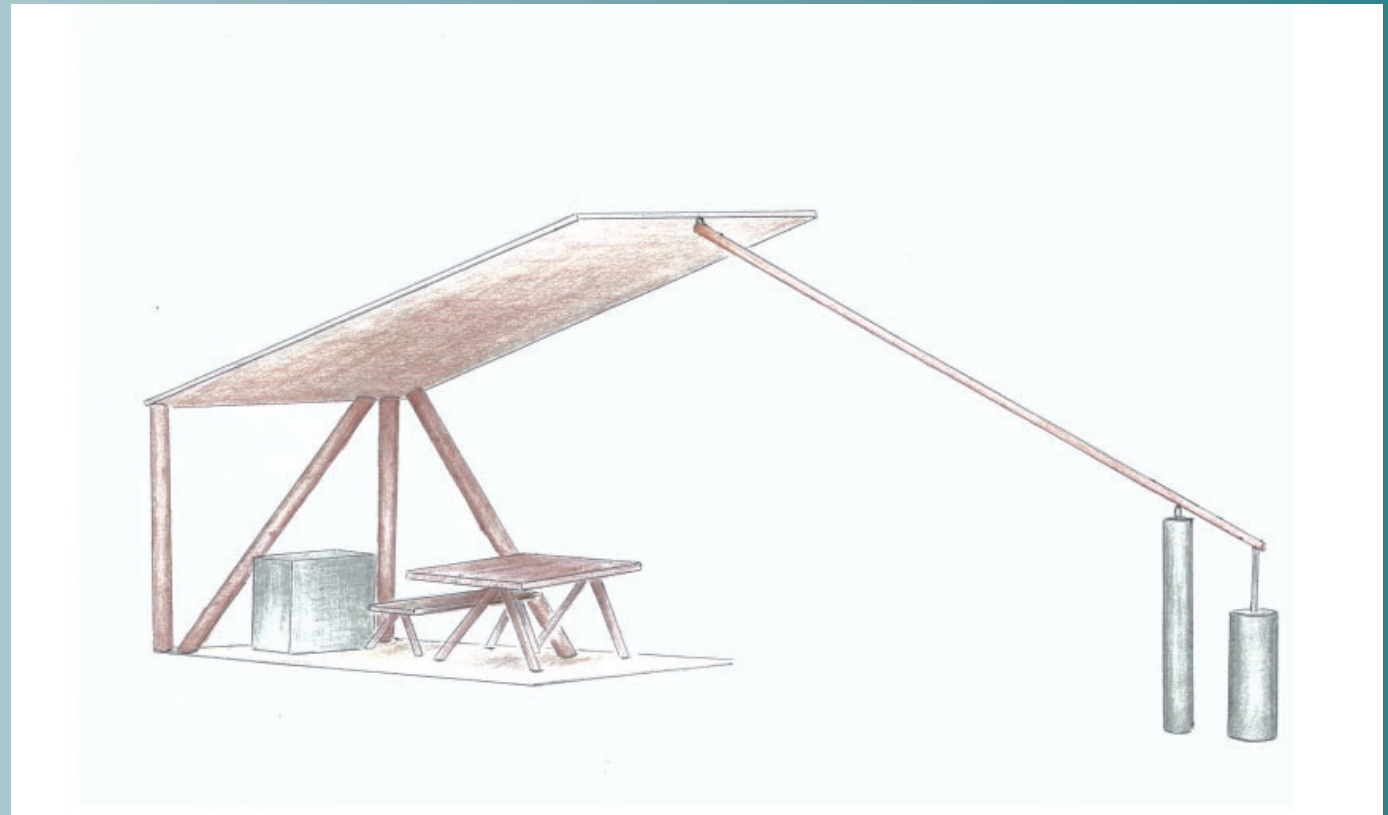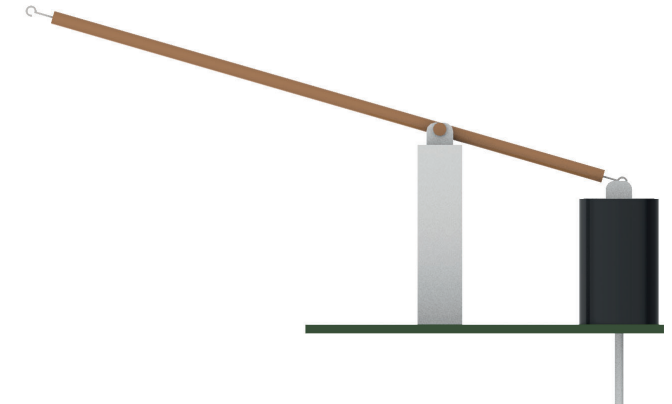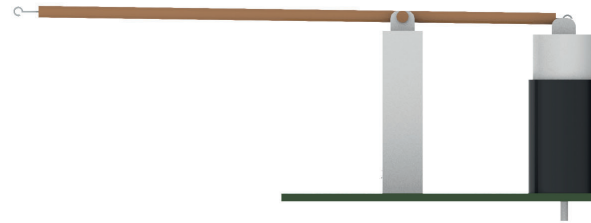Thermodynamic barbecue hut is a Stewart-Gough platform based solution for sunny days. It is essentially a shelter that uses new, innovative means to move the rooftop when sun shines inside and some shade is needed. The structure consists of five supporting legs that are joined on the floor and on the roof via spherical joints and one that changes its size – causing the ceiling to move and change its angle. The sixth leg is preferably faced on the south where it can get the maximum exposure of sunlight.

The mechanism is completely solar powered. There is a metallic cylinder containing gas (for example helium) that expands when direct sunlight heats the metal up. The cylinder is attached to a lever that has a fulcrum near the cylinder. The other end of the lever is attached to the roof, so that when the cylinder grows length, one side of the roof goes down.

Thermodynamic

barbecue hut

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Thermodynamic barbecue hut is a very modifiable concept. Our full-sized model would mostly be made out of wood, with the exception of thermodynamic cylinder and the roof. The roof would be made out of strong grid (can be wood or other durable material) and fabric that's suitable for outdoor usage. Our 1:10 scale model however consist of different set of materials. Most noticeably, the thermodynamic cylinder is implemented instead with hydraulic pistons for demonstrative reasons.

We estimate that on a really hot and sunny day the metal can heat up to 90°C. Assuming that in Finland in the summertime the temperature can sometimes at nights get close to a zero, the total growth of cylinder is over 150%. In our model the full-sized barbecue hut is 3m in height and 3x5m in width and length. That means that if the cylinder is 1m long at the smallest and 1.5m in the longest, the maximum movement of the side of the ceiling is around 21° or 1.8m.