You should give us an explanation!” The era and said into one of the microphones, the exhibit, looked directly into the cam one visitor, after being very engaged with by the lack of explanation. For instance, versions. However, there was anecdotal slower than did visitors who saw other races and talked more about what might Visitors who saw that graphic ran more this last graphic from having the feel of a results of the races. We tried to prevent which explanation seemed to best fit the happening, challenging visitors to consider conclusions and two alternates, namely, that the differences in speed were due to weight or to air resistance. With the cur- rent roads, the main possibility that visi- tors tend to test is whether the weight or weight distribution is the key factor in de- termining speed. Parents tend to co-investigate with their children. Once the parents have fig- ured out that the distribution of weight is the key variable, they often explain it to their children or race specific wheels to demonstrate it. (On some occasions, the children figure it out first and try to con- vince their parents).

We were concerned that in remov- ing air resistance as a possible factor in the race we would overly limit the inves- tigation, turning Downhill Race into something more like a planned discov- ery exhibit and leading visitors to run one or two races, read the explanation, and consider themselves done. Happily, this is not the case: often, visitors run many races—comparing various wheels, slid- ing the weights on the adjustable wheels, and listing out their ideas. As mentioned even when visitors read the explanation in the graphic, they often continue to run races to confirm it.

Younger visitors also use the exhibit as a race, watching the wheels roll the com- plete length of the track until there is a winner. Without adult supervision, they sometimes push the wheels to speed them up, trying to help their chosen wheel win the race. (They also sometimes push the wheels violently up and down the track, crushing them into each other. Over the course of two years, the edges of the metal wheels became severely mushroomed.)

Variations
The tracks are tilted at nominally 5 de- grrees from the horizontal. This is close to the maximum angle possible before the axes slip on the track rather than roll. At this angle, the wheels take between 15 and 20 seconds to roll the length of the track; this seems to be a good length of time for building dramatic tension. It would be possible to guide visitors to wheels with much less slope and have the times take about the same amount of time to reach the end, but their rotational speed would be much less, which might change the feel of the exhibit.

Reflections on What Works
It seems to me that there are three as- pects of this exhibit that make it work well. First, visitors intuitively understand what a race is; so, they immediately start using the exhibit by choosing two wheels and placing them on the track. Second, visi- tors come to the exhibit with expectations about how weight affects the speed of wheels which things move. Luckily, these expect- ations are often wrong, setting visitors up for a nice surprise that motivates them to try more races. The key idea isn’t too dif- ficult, though, and most visitors figure out what’s happening or read the explanation. Third, the activity of choosing two wheels before racing them forces visitors to make an implicit prediction about which wheel will go faster. This might be critically impor- tant for engaging visitors in figuring out the key variable that affects wheel speed. We have found in other exhibits that visi- tors often simply assimilate surprising re- sults as if they had always expected them. (Psychologists call this effect the hindsight bias.) If visitors did not have to make pre- dictions, we would encounter many cases—the might not be motivated by the results to try to figure out what’s happening.

Construction
The exhibit consists of six wheels, two steel tracks, and a plywood support sub- structure. The wheels are made of acrylic plastic, with cylindrical brass weights attached with screws. There are four wheels with fixed weights, two with small weights, and two with larger weights. There are also two wheels with adjustable weights that can be moved from the center to near the edge. The wheel axles are made of hardened and ground tool steel (0-1). The use of hardened steel makes the axles less suscep- tible to damage when dropped on the track and the wheel axles are placed into two wheels with a fairly large diameter (3/4-inch diameter by 7/8-inch long on each side), making them strong and resistant to bending. The axles are rough machined to ap- proximately 0.10 inch oversize, heat treat- ed to Rockwell C60–65, and then ground between centers to finished size. The ax- les are pressed into the wheels using a very tight (0.007-inch) interference fit. The wheels are removed using an abrasive saw and the ends finished smooth. Each track is made of two precision- ground hardened 1-inch-diameter steel rods. There are two tracks (four rods to- tal) in the exhibit. Because the wheel ax- les are tapered, the spacing between the rods cannot vary along the length of the track without influencing the speed of the wheels. The rods are very rigid (because of their diameter) and are tightly held in precision-machined aluminum blocks on each end of the exhibit. These blocks also support the plywood substructure. To help visitors get the wheels started straight and in line with each other, plastic handles are provided at the top end of each track. The exhibit is constructed with ply- wood ends and a structural plywood shelf.