

The invention of the wheel

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The question of how the wheel was invented has never been answered. The most intuitive theory is that the wheel derives from moving large stones on rollers. However, sleds are more practical because they don't need re-feeding rollers from back to front of the load as it progresses. The Egyptians used sleds, not rollers, to transport huge stones. In any case, hauling stone blocks up on ramps in pyramid construction the massive pieces on rollers would have risked rolling back down if some ropes slipped or broke. Wheels added to sleds carrying stones weighing upward from 2-3 tons would have not only brought problems with wheels getting stuck in ruts, but such loads would have instantly crushed wheels made of wood. Due to this great weight, axles would meet extreme resistance to rotation in their slots. As sleds have convex bottoms, they can be turned, whereas a setup with rollers is not so easily rotated. We can see that the notion of rollers being the source of wheeled transport is not very convincing.

The potter's wheel has also been considered to be a possible source of wheeled vehicles. Unfortunately, first, the apparatus has to be turned on its side, and second, the kick wheel is much larger than the turning wheel, so even if the contraption was rolled on the ground, it would be lopsided and would roll in a circle. The top, or shape forming disk of a potter's wheel taken separately could be rolled turned on its side, but the rotation of a single wheel would not easily suggest the concept of a wagon or chariot. This is another idea for the invention of the wheel that appears to be intuitively likely, but which suffers on examination, fig. 1.

However, inventions can be accidental, as with x-rays, radiation, penicillin, saccharin, teflon, just to name a few. There is a kind of activity where axle and wheel would immediately come about without anyone wishing to invent anything. Jewelry making certainly precedes wheeled transport. Prehistoric people made ornaments of various kinds and they were even able to cut and drill hard semiprecious stones. Some of the most commonly found archeological objects are necklaces and bracelets and these are largely made of beads, fig. 2. Beads come in various sizes and shapes, and one of the common ones is the disk, either flat or doughnut shaped. In any case, they always have a hole in the center through which they were strung. These objects are none other than small wheels. Only the axle has to be added, fig. 3.

A person working at jewelry and bead making would be handy and creative with materials and would experiment with them. Humans, and especially children play with objects. Suppose a craftsman's child whiled time away toying with beads lying around in the work area. Sooner or later, as we all would, he or she would poke a stick through the hole in some bead. Such action is innate in us. Chimpanzees put sticks into termite holes, and many animals push muzzle or hand into cavities to find food. Lining up beads on a stick would also come quite naturally. However, two or more beads strung on a stick can be placed on a flat surface, like the ground. Children, and even adults, are apt to roll spherical objects over a surface or around an axis, like

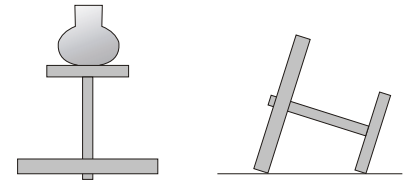


fig. 1. The potters wheel

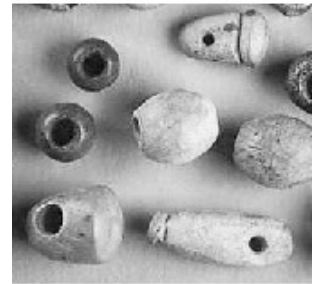


fig. 2. Prehistoric beads from Carrowkeel, Ireland
(Ref: www.carrowkeel.com)

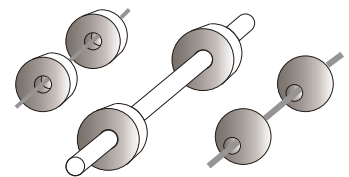


fig. 3. Stick or rod passed through beads

beads on a stick. If a flat object, a plate or board, is placed on the axle (that tightly fits the holes in the wheels), and this object is moved back and forth while pressing on the axle, the action would readily lead to the idea of using the axle and wheel in transporting loads! Building, piling things on top of each other is action common in play, and so if a second object is placed on the board this object in essence becomes a transported load, fig. 4.

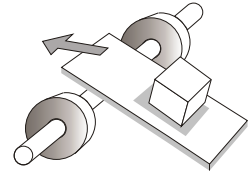


fig. 4. Primitive wheel barrow concept

There remains the fact that all these parts still have to be attached to one another in certain ways. The wheel and axle can be combined as one piece if the stick or rod tightly fits the bead hole. Then the simplest way to make the axle connect to the board or chassis, but still allow it to rotate, is to push the axle through such a material as a piece of semi-soft clay, or a basket or perhaps a gourd. Working or playing with clay, an everyday material in ancient Mesopotamia and in many other places, one could make a sufficiently large hole through a clay block and then when it is dry insert a loosely fitting axle in it. In this scenario, a board placed over a pair of wheel-axle units can lead to the idea of a four-wheeled contraption, fig. 5. The point is that wheel utilization, unlike megalith transport, could easily have been accidentally discovered when working with objects of toy and model size, and that in a place of jewelry bead manufacture models of wheel and axle were readily available.

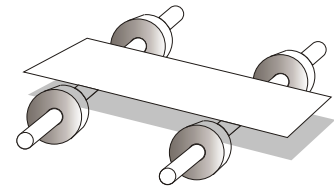


Fig. 5. Four wheeled vehicle concept

This idea is supported by the example of a wheeled toy from pre-Columbian Mexico, dated c. 1500 BC, in a culture that did not know the wheel of utility, fig. 6. (from Ekholm, Gordon F (1945). "Wheeled Toys in Mexico". *American Antiquity* 11.) (Source: <http://en.wikipedia.org/wiki/Wheel>)



fig. 6.

If the abacus historically predated wheels then it could possibly also have initiated wheeled transport. The abacus consists of counters (wheels), wires (axles) and a frame (chassis), and so it would roll if the counters extend out of the frame, that is, if counters of a larger abacus were placed in the frame of a smaller one, fig. 7. In the shop of the abacus maker loose abacus components would be in immediate reach. Assembling parts is an innate human activity, even in children, who typically play with blocks, Leggo pieces, jig-saw puzzles. Here again, an adult or a child could have while tinkering with abacus components inadvertently put together a rolling cart.

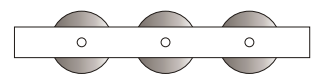


fig. 7. Side view of an abacus with oversized counters