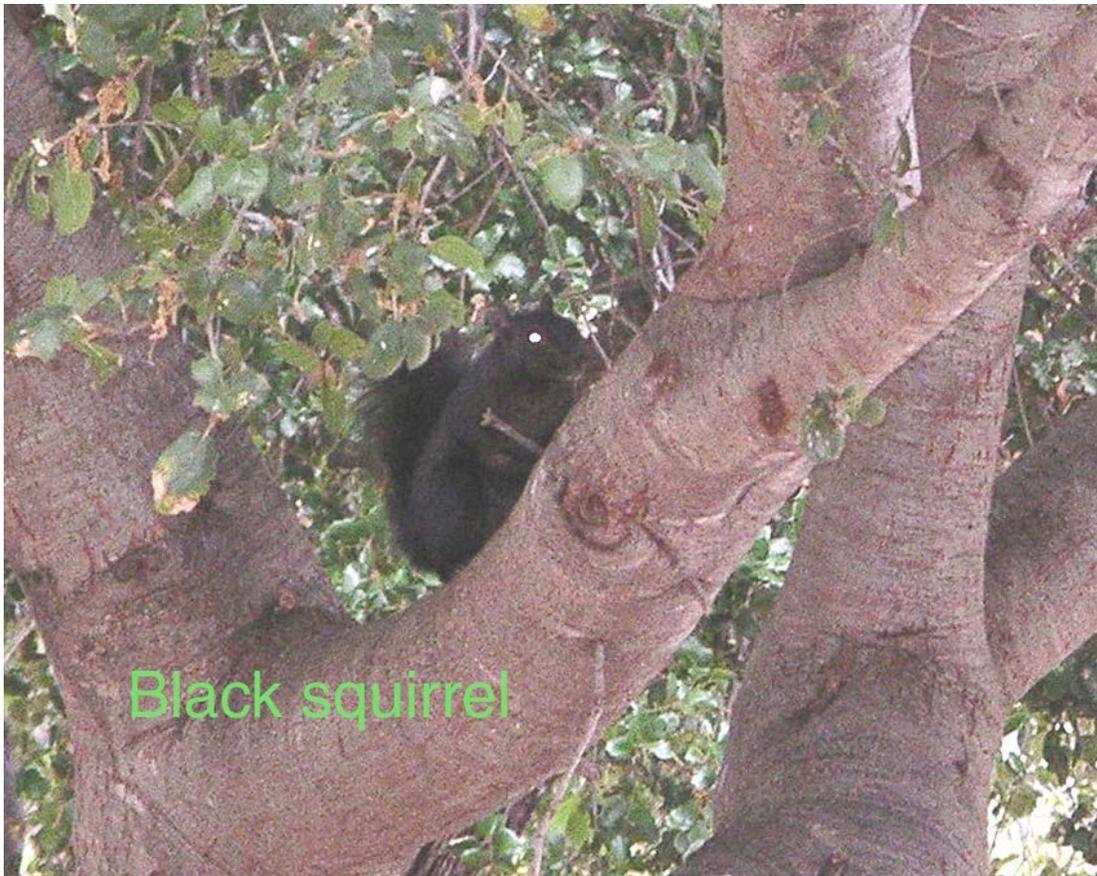
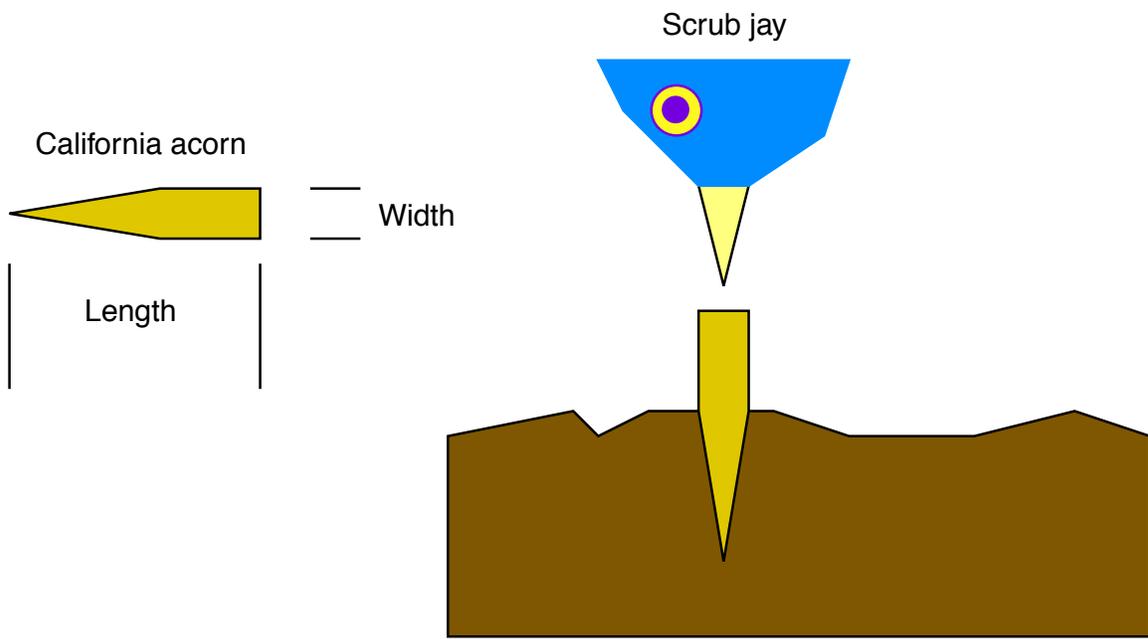


## Do it yourself evolution project with acorns

**Motivation:** There is evidence for evolution in all biology. The objective here is to see the affects of evolution for yourself. We will also see that ecology is complicated when viewed in any detail. Jays collect acorns and bury them point first by pounding on them with their beaks. The jay later finds and eats most of the acorns, but some get missed. This serves to plant the acorns often in fresh soil. Squirrels do the same thing in the eastern United States. Stanford University has planted numerous eastern oaks on campus, including near Governors Avenue. Tree squirrels (black and gray are the same species, *Sciurus carolinensis*, I give Latin names so the curious can search the Web.) are not native to the Bay Area. Most of the native oak trees predate their arrival. In any case, the introduction of squirrels is too recent for them to affect evolution of local oaks.

**Project:** California acorns are bullet-shaped with pointed ends. This is an obvious adaptation for being planted by jays. Eastern acorns are round and evolved for being planted by squirrels. The top of California the acorn may be thicker to withstand pecking but this is harder to measure than shape. We will measure native and eastern acorns to see difference in acorn shape.





Ground squirrel

The ground squirrel (*Otospermophilus beecheyiis*) is native but does not plant acorns.



Find an oak tree near Mitchell with acorns on it on or the ground. Try for one that looks like it grew in the wild rather than being planted by humans.

Now measure the length and width of 5 acorns. If you are working in a group, do not all use the same tree, if possible. Record the measurements

	length	width	ratio(l/w)
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
averages	_____	_____	_____



Now repeat with a pin oak (*Quercus palustris*) at Governors Avenue. [This is a medium acorn year, so who may not be able to find any. If so record date, and note that none were found. Measure ratio of 1 acorn in photo.]

	length	width	ratio(l/w)
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
averages	_____	_____	_____

Do you see the expected differences between eastern and native oaks?



We now get into more complicated aspects of evolution and ecology. There are two common jays in the Bay Area. The scrub jay (*Aphelocoma californica*) lives at low elevations like around the campus. The Steller's jay (*Cyanocitta stelleri*) lives up in the hills. The scrub jay is larger and has a larger beak than the Steller's jay. One might expect that the acorns in the hills have evolved to be narrower than the acorns in the lowlands. (The class took limited measurements in 2004. A clear trend is not evident. We will check out acorns at Jasper Ridge and you may want to look for yourself at high elevation in the Santa Cruz Mountains.) There are three obvious complicating factors. (1) A larger acorn can grow a more vigorous seedling, so there is selective pressure for the acorn to be large when this helps. (2) There is a native tree squirrel (*Sciurus griseus*) at high elevations that also plants acorns. (3) The acorn woodpecker (*Melanerpes formicivorus*) eats acorns but does not plant them. It stores them in granaries in tree trunks and tree limbs. It can store only acorns that it can fly with. It makes holes of this size. It is of advantage for an acorn to be too big for woodpeckers. We will measure woodpecker holes on the trees on Panama Street to check things out.



Find tree on Panama Street. Measure diameters of 5 holes, record, and average

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Average

Did you see native acorns that were larger than this?



Acorn woodpecker with acorn in beak on granary tree.