stretch of D.N.A. turned on the paintbrush gene in the unspotted fly's wings. Once spotless, but then it had luminous spots.

13. How do we know that whales and manatees evolved from 4-legged land creatures that "lost" their legs and move "back" to the sea?

-They are convinced that there is a link between the stickleback losing its spikes and other creatures, like a manatee, losing their legs. And they have two tantalizing clues.One: the same body-plan gene that is responsible for the stickleback spikes also plays a role in the development of the hind limbs. The second clue is more tentative. The lake stickleback may have lost its spikes, but evolution has left behind some tiny remnants: the traces of bones And are lopsided, bigger on the left than on the right.

14. How do finches end up with different beak shapes when they all have the same DNA sequence in their beak genes?

-their beaks were vital to the birds' survival, and the best of the best survive, also, descent with modification. On an island where the main food was seeds, finches had short, tough beaks for cracking them open. On an island where the main food was from flowers, birds had long pointy beaks for sucking up nectar. the finches are born with their beaks fully formed. So it depended on what was required for survival. They also had such different beaks because something happened to the finches as embryos, in the egg. The genes were changing and depends on how much you turn the gene on and when you turn it on, when you turn it off. The body-plan genes are what throw these switches, which tell the stuff genes what to do and when to react.

15. Why was the discovery of the fossil Tiktaalik significant for the study of evolution? Also, describe the features that made this organism significant.

-the discovery of tiktalik was significant for the study of evolution because it represented the most primitive form of the first organism under water. Many of its body is that of a fish. It's covered in scales. it also had something very un-fishlike, an arm-like fin, or, perhaps, a fin-like arm. Tiktaalik had the bone structure that is seen in the arms and legs of every-four limbed animal: one big bone at the top& two bones underneath, leading to a cluster of bones in the wrist and ankle. It is important because it reveals that the evolution of hind legs actually began as enhanced hind fins. This challenges existing theory that large, mobile hind appendages were developed only after vertebrates transitioned to land.

16. What do Hox (homeotic) genes do? How do they explain how a fish obtained legs?

-Shubin found that Hox genes had a key role in the formation of paddlefish fins. One set of Hox genes orders the first stage of fin development, a sturdy piece of cartilage that grows out from the torso. In the paddlefish, another set of Hox genes command the next stage of fin development. the same genes control the growth of our two forearm bones.

17. What do "switches" do?

-A piece of D.N.A. called a switch. They don't make stuff like hair, cartilage or muscle, but they turn on and off the genes that do. Switches are very powerful parts of D.N.A., because they allow animals to use genes in one place and not another; at one time, and not another; and so, choreograph the spots and stripes and blotches of animal bodies.

18. What makes human hands unique?