Use a number 2 pencil to fill in the information portion of your NCS answer sheet including the appropriate circles (bubbles). Write **"Star Form"** above your name in the margin of your NCS answering sheet. Read all questions and answers carefully before choosing the single best response for each question. Feel free to ask the instructors for clarification. Don't be shy.

Many South American Indian tribes produce a mixture of plant poisons called curare. Curare is used as a poison on blowgun darts to kill animals and enemies. The most active compound in the poison mixture is tubocurarine which is extracted from two woody vines (lianas), *Chondrodendron tomentosum* and *Curarea toxifera*.

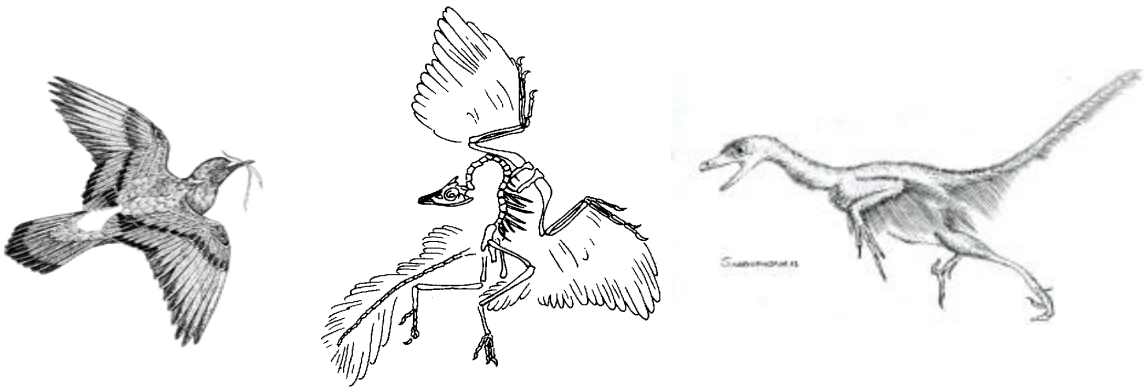
Tubocurarine was used as a skeletal muscle relaxant during surgery, allowing muscle relaxation without deep anesthesia. At present, the natural tubocurarine is largely replaced by the synthetic compounds atracurium and vercuronium.

All these compounds act as competitive inhibitors of the neurotransmitter acetylcholine in neuromuscular junctions by binding to acetylcholine receptors. Paralysis first occurs in the muscles of the face and neck, then those of the limbs, spreading to abdominal and respiratory muscles and the diaphragm. Death is caused by respiratory failure (no breathing).

Scientists have always recognized a close evolutionary link between birds and dinosaurs. Two different viewpoints on the exact relationship, however, developed in the 20th century. The first holds that birds evolved from an early reptile that also gave rise to dinosaurs. Thus, birds and dinosaurs evolved in parallel, and share an ancestry in pre-dinosaurian reptiles. The second viewpoint contends that the ancestor of birds actually **was** a dinosaur – a small swift, bipedal carnivore like *Velociraptor* from the "Jurassic Park" movies. If this second viewpoint is correct, then birds not only evolved from reptiles, they evolved from a specific kind of reptile: a dinosaur. This would mean that birds are really just like any other group of dinosaurs (the horned ceratopsians, the giant sauropods, the large family of duck-billed dinosaurs) – the only things that set birds apart are specific body modifications for flight. This would also mean that dinosaurs did not *all* go extinct at the end of the Cretaceous Period: there are about 10,000 different species still with us today!

Prehistoric birds and *Velociraptor*-type dinosaurs share many skeletal features. Until recently one feature that clearly set birds apart from all other creatures was a body covering of feathers. Beginning in the 1990s, however, new fossils from China and Argentina clearly showed impressions of a feathery covering on the bodies of several species of small dinosaurs. Because only the most exquisitely preserved fossils will reveal impressions of feathers, some scientists now suspect that most small dinosaurs were covered with feathers but few of their fossils are detailed enough to show them: small feathered dinosaurs were not the exception, they were the norm!

Opponents of evolutionary theory frequently base their opposition on a presumed lack of intermediate forms or "missing links" in the fossil record, yet as this example illustrates, we now have so many intermediate forms between dinosaurs and birds that it's exceedingly difficult to tell where to draw the line between them.



From left, a modern pigeon, fossil of the earliest known bird (*Archaeopteryx*), and reconstruction of a feathered dinosaur (*Sinornithosaurus*).

OSU President David Schmidly is considering writing the screenplay for a 4th Jurassic Park movie (OK, we made that part up!) in which a herd of *Stegosaurus* are successfully cloned from the ancient DNA of a single animal in the blood of the abdomen of a single mosquito found preserved in fossilized tree sap. (Amazing, isn't it?) This creates a small population with no genetic variability that is a subset of the original, genetically diverse population of Stegosaurs that once roamed the earth. The animals are particularly fond of eating the succulent leaves from one species of tree on their island home. Everything is going fine for the dinosaurs until one year an *El Nino* cycle kicks in and the island enters into a period of prolonged drought. As a result, their favorite food plant dies back and ***all*** the dinosaurs starve and die because apparently none were flexible enough in their diet to switch to other perfectly edible foods on the island.

To combat toxins in the leaves of other plants, perhaps prehistoric stegosauruses produced and secreted enzyme (proteins) into their intestines that broke down the toxins during digestion

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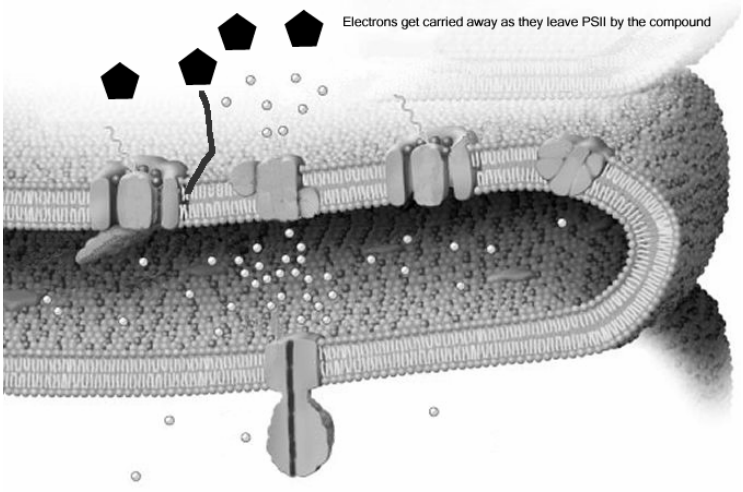
Many more species of Alpine buttercups (*Ranunculus spp.*) are found on the two islands of New Zealand than in North and South America combined. Each of the fourteen New Zealand species, which probably all originated from a single species, is found in only one of five habitats: snowfields, snowline fringe, stony debris, sheltered situations, and boggy habitats. It appears that different species evolved over time as glaciers expanded and receded opening new niches and isolating populations of buttercups. One species, the Tall Buttercup (*Ranunculus acris*), first evolved resistance to certain herbicides in 1988 and now infests many pastures.

Asaphodes stinaria, a species of moth that is in danger of extinction, appears to feed only on one species of *Ranunculus.* Scientists are concerned about the disappearance of the moth.

Buttercup leaves are green and contain several pigments that contribute energy to photosynthesis. Butter cup flowers are yellow.

A scientist places some buttercup leaf cells in a lighted sealed container and measures O_2 and CO_2 levels in the air in the chamber.

A scientist added a compound to a solution of chloroplasts from buttercup leaf cells in water. The compound accepts all the electrons being released from Photosystem II as indicated in the figure showing one of the thylakoids.



Marine iguanas and Galapagos penguins (indeed all marine birds) can drink sea water without any ill effects even though the salt concentration in their bodies is similar to yours, because they possess glands in their heads that filter excess salts from their blood. Salts are transported from the blood **against their concentration gradient** into the glands, and then expelled as a super-salty fluid from the nostrils or mouth.