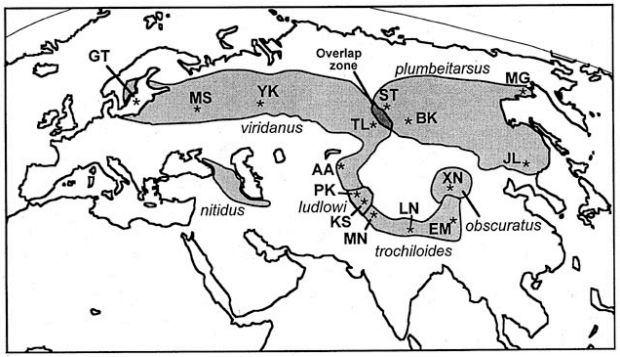
Species and Speciation III

by

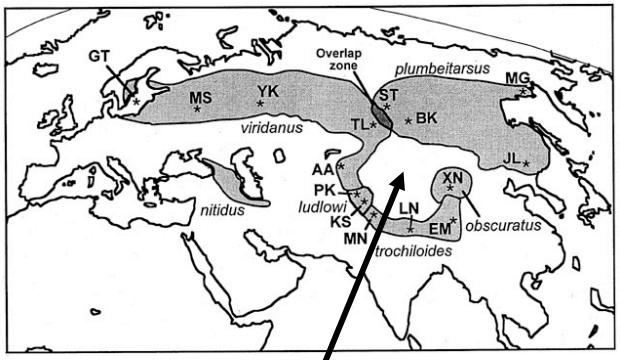
Dr. Evil

Case Study: *Ring species*

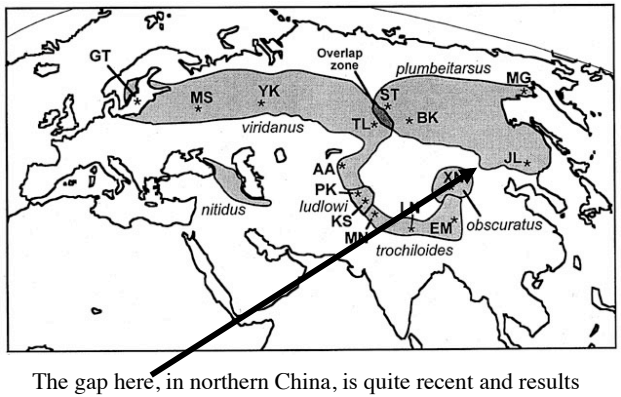
Greenish warbler, *Phylloscopus trochiloides*



P. trochiloides inhabits the shaded region on this map, from Sweden to China and Siberia to India. It's divided into six subspecies that grade into each other.



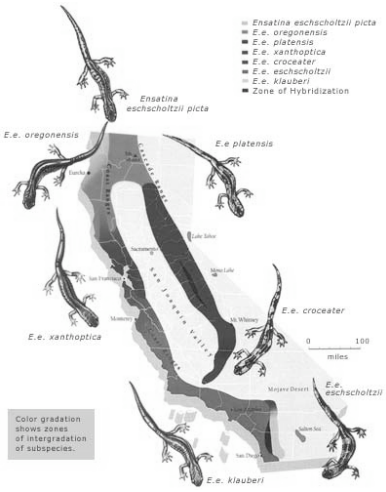
Note that it *doesn't* live here, in the Tibetan Plateau, an extremely high and mountainous area (including the Himalayas)



The gap here, in northern China, is quite recent and results from habitat destruction by humans—there's very little difference between birds on opposite sides, and birds from opposite sides can interbreed.

Ring species

- *P. trochiloides* forms a ring of intergrading and interbreeding forms around the Tibetan Plateau. . .
- . . . however, the "ends of the ring" overlap in central Siberia. . . and the two forms there do *not* interbreed!
- Males of the overlapping forms don't recognize each other's songs, and genetic analysis has shown no interbreeding
  - *Source:* Irwin, D. E., Bensch, S., and Price, T. D. 2001. Speciation in a ring. *Nature* 409: 333-337.



Another classic example: the California salamander *Ensatina eschscholtzii* forms a ring of subspecies surrounding the Central Valley of California. The six different subspecies interbreed where they come into contact. . .

. . . except where the "ends of the ring", *E. e. eschscholtzii* and *E. e. klauberi*, meet up in southern California—these do not interbreed!

E. e. eschscholtzii

E. e. klauberi

Had enough?

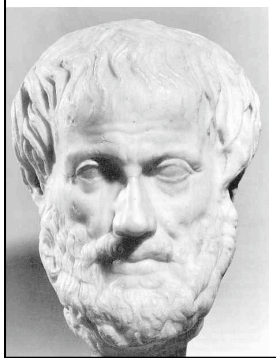
- It may now seem as if it's impossible to come up with a definition of "species" that will work in all cases. . .
- . . . but that's *exactly* what we'd expect to find if evolution is taking place!
  - There should always be cases of species coming into existence but not yet fully separated. . . no matter what species concept is in use.
  - The shift from *typological thinking* to *population thinking* was a major event in the development of evolutionary thought. . .

God has allowed him to see more of His created work than any mortal before him. God has endowed him with the greatest insight into natural knowledge, greater than any has ever gained. . . .

Link to more on Linnaeus

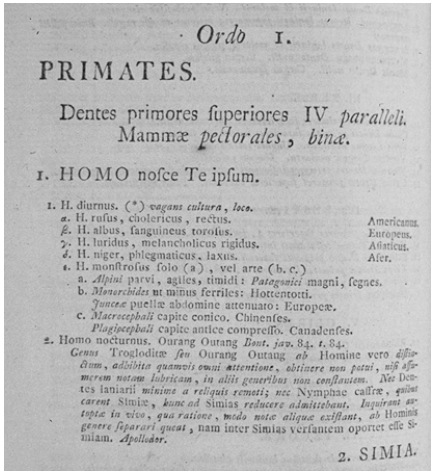
Consider Carl Linnaeus (1707-1778), a Swedish physician with a healthy ego! He saw himself as having a divine mission to study and classify the natural world.

Linnaeus went back to the ancient Greek philosopher Aristotle, who had classified things in terms of what made a group of things alike (their *genus*) and what made the group's members different from each other (their *species*).



Genus: **Man** (all men have two eyes, a nose, two ears, etc.)

Species: **Aristotle** (has a bald spot, big nose and beard, goes around philosophizing, etc.)



Ordo I.

PRIMATES.

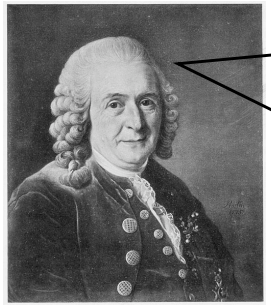
Dentes primores ſuperiores IV *paralleli.*
Mammæ *pectorales*, *binæ.*

1. HOMO noſce Te ipſum.

1. H. diurnus. (*) *vagans cultura, loco.*
α. H. rufus, cholericus, rectus. Americanus.
β. H. albus, ſanguineus torofus. Europeus.
γ. H. luridus, melancholicus rigidus. Aſiaticus.
δ. H. niger, phlegmaticus, laxus. Afer.
ε. H. monſtrofus ſolo (a), vel arte (b, c.)
a. *Alpini* parvi, agiles, timidi: *Patagonici* magni, ſegnes.
b. *Monorchides* ut minus ferriles: Hottentotti.
Junceæ puellæ abdomine attenuato: Europeæ.
c. *Macrocephali* capite conico. Chinenſes.
Plagiocephali capite antice compreſſo. Canadenſes.
2. Homo nocturnus. Ourang Outang *Bont. jav.* 84. *t.* 84.
Genus Troglodytæ *ſeu* Ourang Outang *ab* Homine vero *diſtinctum, adhibita quamvis omni attentione, obtinere non potui, niſi aſſumerem notam labricam, in aliis generibus non conſpicuam. Dee* Dentes laniarii *minime a reliquis remoti; nec* Nymphæ caffræ, *quibus carent* Simiæ, *hunc ad* Simias *reducere admittebant. Inquirant autoptæ in vivo, qua ratione, modo notæ aliquæ exiſtant, ab* Homine *genere ſeparari queat*, nam inter Simias verſantem oportet eſſe Similam. *Apollodor.*

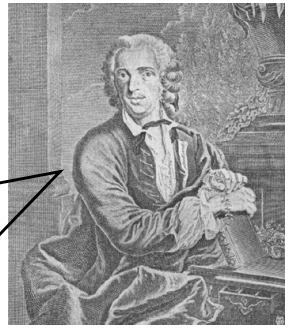
2. SIMIA.

Linnaeus published his classification of all life in his book *Systema Naturae*. The taxonomy presented in the tenth edition of this book, published in 1758 (the first to use binomial names throughout) still is the starting point for biological taxonomy. *HOWEVER*. . .



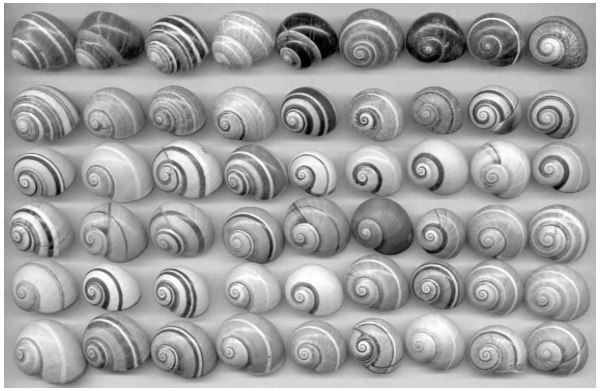
Linnaeus never doubted the Biblical creation story, and considered that each species must have been created separately by God, in the Garden of Eden. (He later suggested that some new species might have come into existence later, by hybridization.)

Unitas in omni specie ordinem ducit. (The invariability of species is the condition for order [in nature].)



Since Linnaeus wanted to "get inside God's head" and understand the complete Plan of Creation, he defined each species by its *essence* —by some sort of intrinsic nature that God had defined.

Variation among living members of each species (such as this Cuban land snail, *Polymita picta*) was irrelevant. What was important was the unchanging "true nature" of each species.



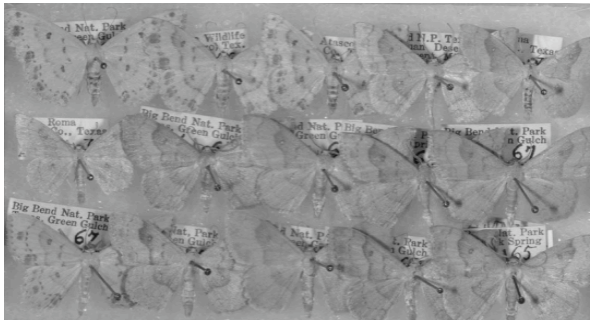
Linnaeus's *typological thinking* is still customary in biology: When a new species is named, the describer must deposit a *type specimen* (like this pressed plant, the type specimen of a Brazilian flower) in an established museum. The type specimen will forever be the standard reference for defining that species.

Such typological thinking is also very explicit in the thought of modern creationists (who get a bit annoyed if you ask them to define just what they mean by "created kind". . .)

All basic types of living things, including man, were made by direct creative acts of God during the Creation Week described in *Genesis*. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.

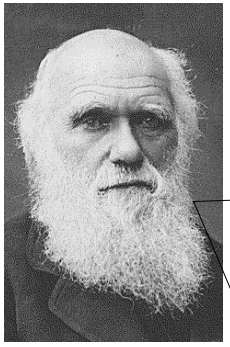
—Statement of Belief of the Creation Research Society

But to an evolutionary biologist, variation is critical—species *can* and *do* change, and variability is what makes that possible. And sometimes that variability will "slop over the edges" of your nice, neat definitions!

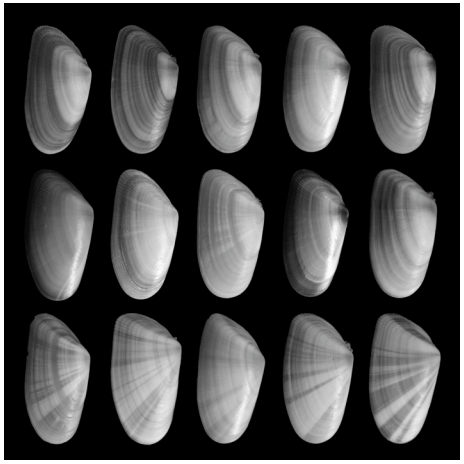


Semaeopus ella, a very variable moth from southern Arizona

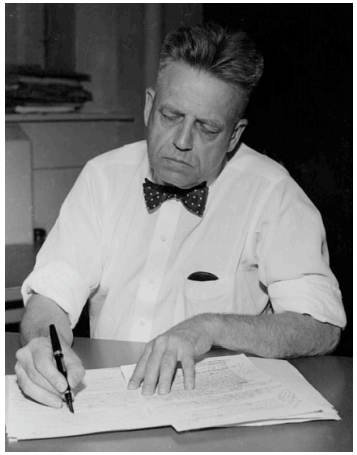
Darwin recognized this, and went so far as to suggest that "species" shouldn't be considered to be objectively real objects at all (a view called *nominalism*). . .



Hereafter we shall be compelled to acknowledge that the only distinction between species and well-marked varieties is, that the latter are known, or believed, to be connected at the present day by intermediate gradations, whereas species were formerly thus connected. . . . In short, we shall have to treat species in the same manner as those naturalists treat genera, who admit that genera are merely artificial combinations made for convenience. This may not be a cheering prospect; but we shall at least be freed from the vain search for the undiscovered and undiscoverable essence of the term species.
—*Origin of Species*, ch. 14



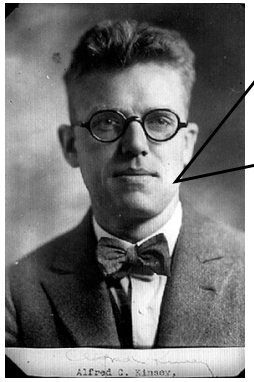
Ernst Mayr, who was also a renowned historian of biology, has emphasized the importance of this shift, from *typological thinking* to *population thinking*



But few people have realized the importance of variation more fully than the American entomologist Alfred C. Kinsey (1894-1956), who actually became famous for his work in a rather different field of study. . .

Kinsey was an expert on the Cynipidae, a family of stingless wasps that lay eggs in plant tissues, causing swellings or *galls* in which the larvae grow. (Look at any oak tree in summer—you'll find cynipid galls on the twigs and/or leaves.)

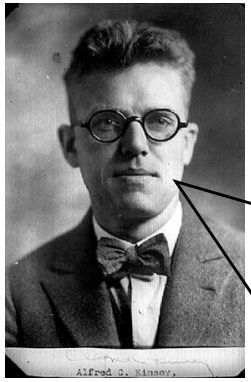
Kinsey and co-workers collected over 71,000 cynipid specimens from all over the United States, in an attempt to define what cynipid species *were* and how variable they were.



Too many systematists attain their objectives when each species is "represented" by a half-dozen specimens pinned in their cabinets. These are the systematists responsible for the definition of systematic entomology as the science of transferring pins from one box to another.

—*The Gall Wasp Genus* Cynips, 1929

Kinsey concluded that species were real entities, even though they were capable of seemingly limitless change.



. . . these instable protoplasmic entities have maintained their stability. A stability like that of a stream, with materials always contributing from many sources, with endlessly changing waters, varying currents and eddies—the stability of a stream that spreads over the lowland or thru the delta with a dozen offspring streamlets, while the flowing stream still remains the stream of yesterday, today, and tomorrow.

—*The Gall Wasp Genus* Cynips, 1929