Medical Academy named after S.I. Georgievsky

SPECIES AND ITS CRITERIA

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- **BIOLOGY**
- **a group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding. The species is the principal natural taxonomic unit, ranking below a genus and denoted by a Latin binomial, e.g. *Homo sapiens*.**

- ***About 8.7 million (give or take 1.3 million) is the new, estimated total number of species on Earth -- the most precise calculation ever offered -- with 6.5 million species on land and 2.2 million in oceans. Announced by the Census of Marine Life, the figure is based on a new analytical technique.***

Domain
Eukarya

Kingdom
Animalia

Phylum
Chordata

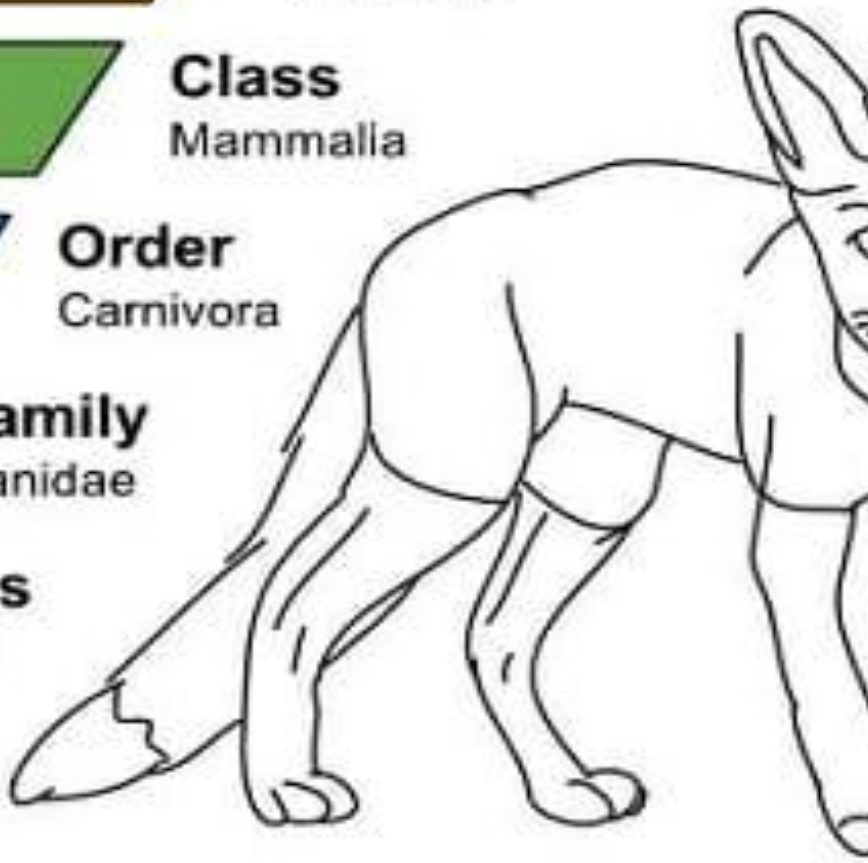
Class
Mammalia

Order
Carnivora

Family
Canidae

Genus
Vulpes

Species
vulpes



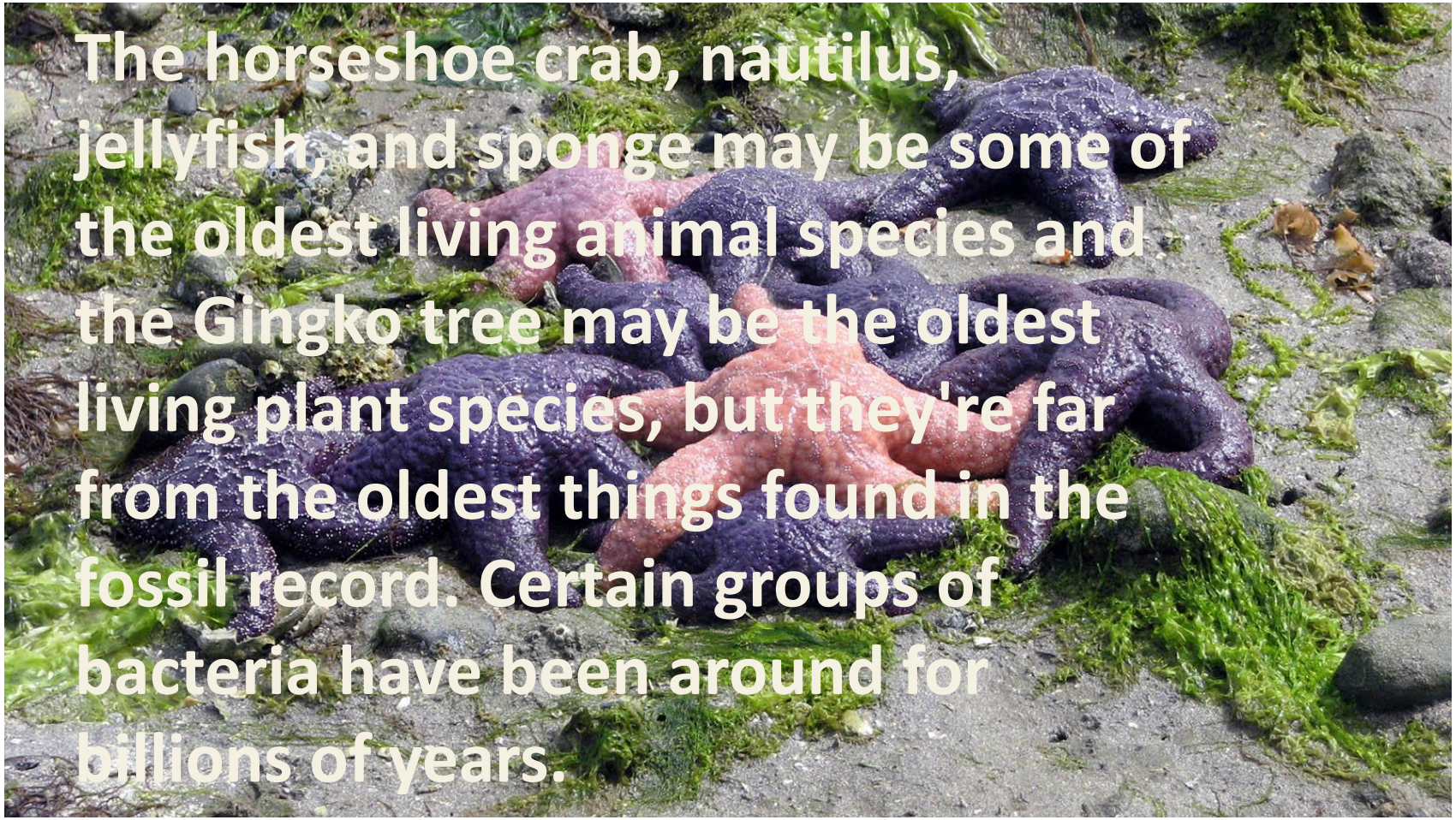
Red fox (*Vulpes vulpes*)

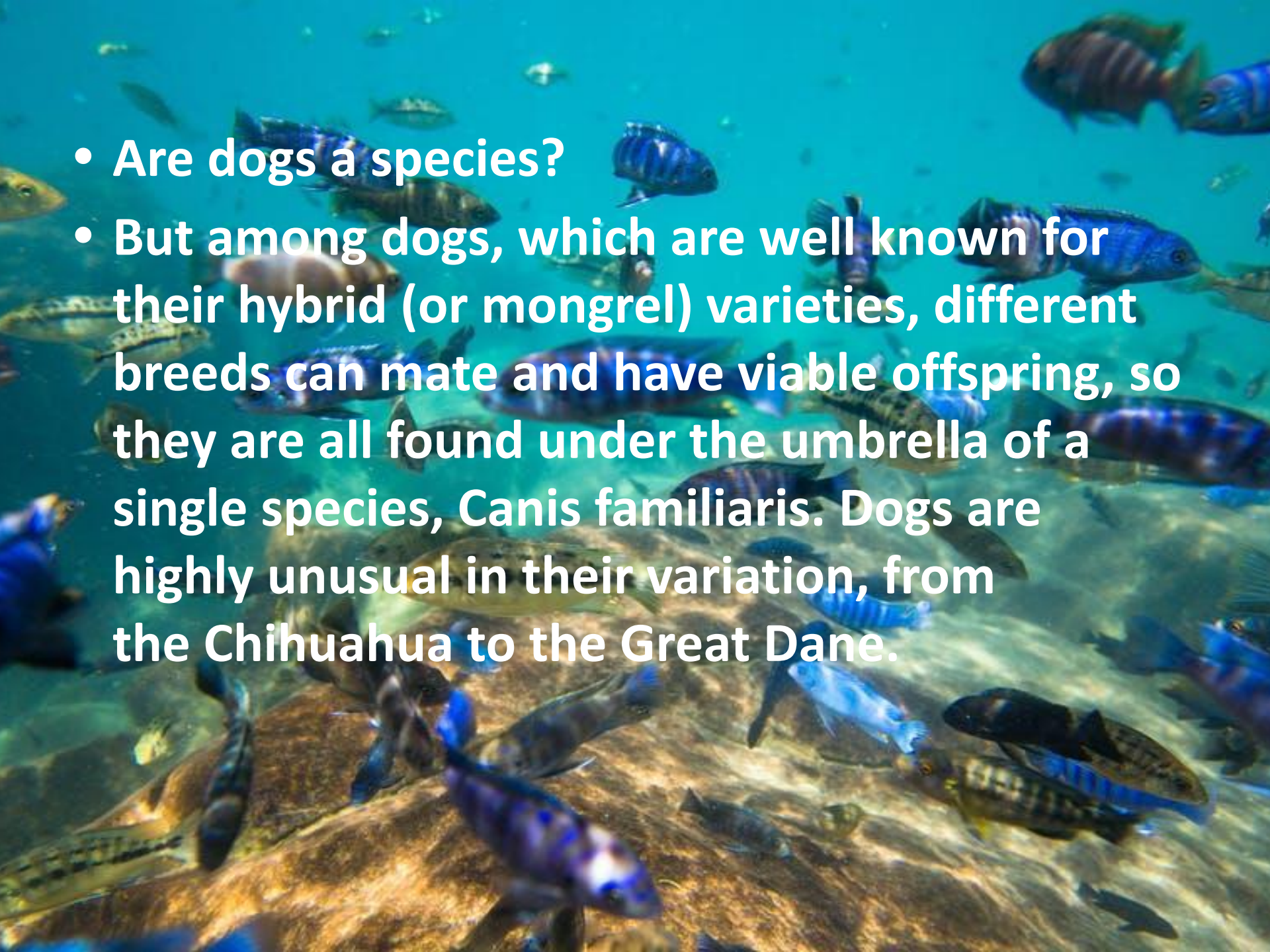
Name of the species concept/criterion	Definition of the species	Major contributor(s)	Refs.
Interbreeding species concept [forms the basis for the General (metapopulation) Lineage Concept]	A group of potentially interbreeding populations	Wright (1940); Mayr (1942); Dobzhansky 1950	175–177
Isolation species concept[a] [often called the biological species concept]	A group of potentially interbreeding populations that is reproductively isolated from other such groups	Poulton (1904); Mayr (1942); Dobzhansky (1970)	177–179
Phenetic species concept	A group that forms a phenetic cluster (quantitative difference)	Sokal and Crovello (1970)	180
Ecological species concept	A group that shares the same niche or adaptive zone	Van Vaalen (1976)	181
Evolutionary species concept[a] [corresponds closely to the General (metapopulation) Lineage Concept]	A lineage (i.e., an ancestral-descendant sequence of populations) evolving separately from others and with its own evolutionary role and tendencies	Simpson (1951); Wiley (1978)	182, 183

FOR EXAMPLE:

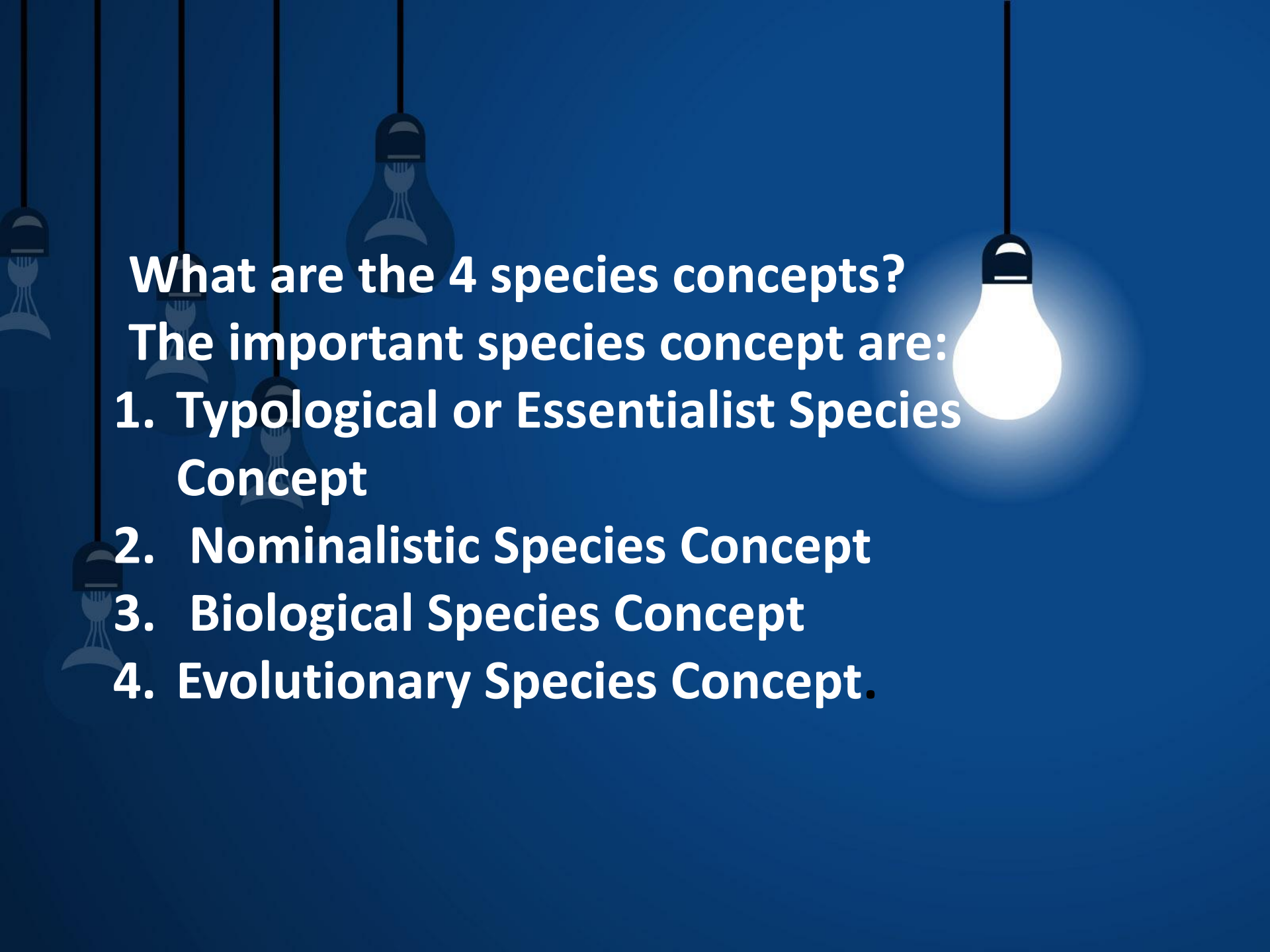
- **Humans (Homo sapiens), moose (Alces laces), black bears (Ursus americans), jack pines (Pinus banksiana) are all examples of different species.**

OLDEST LIVING SPECIES:





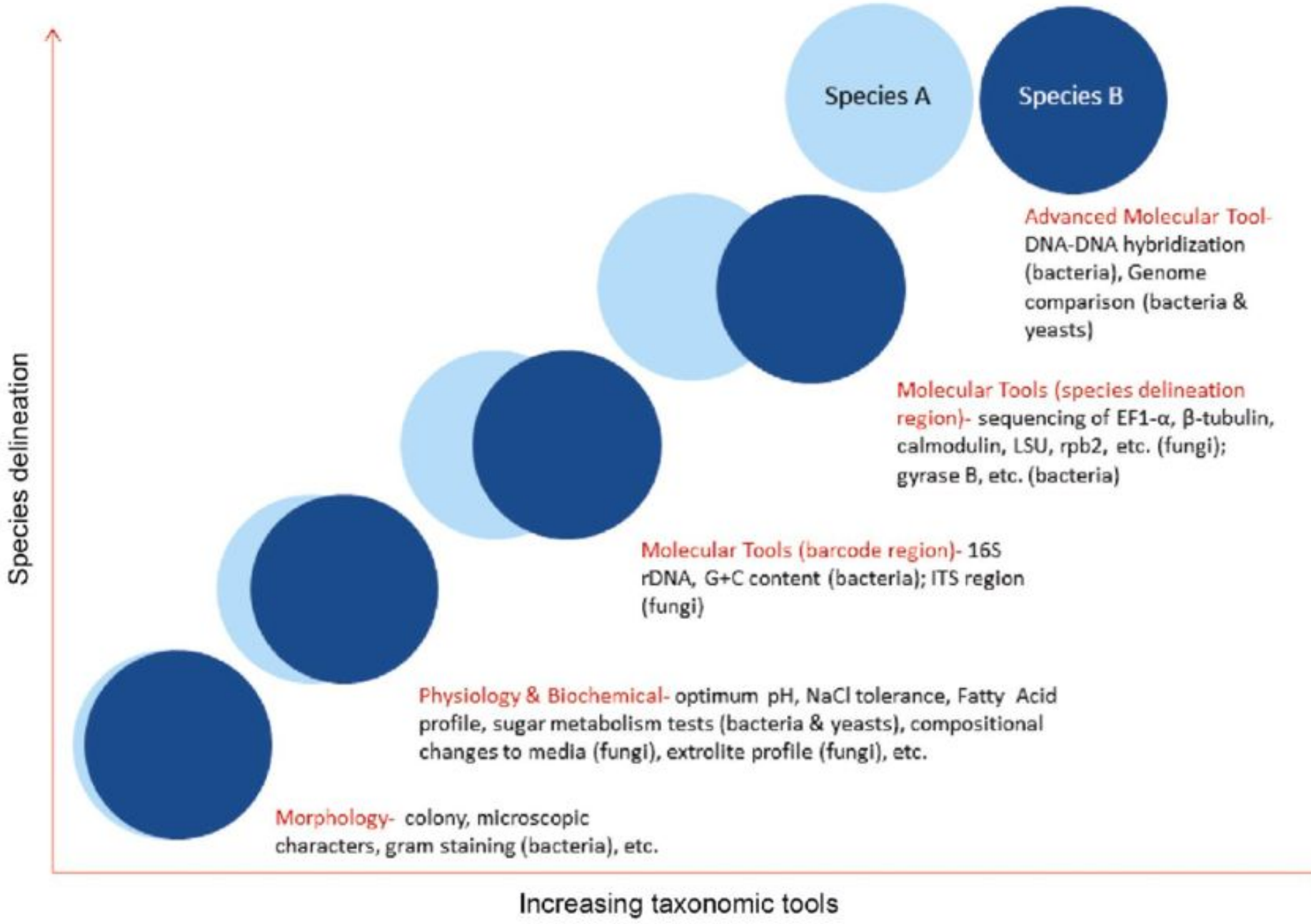
- Are dogs a species?
- But among dogs, which are well known for their hybrid (or mongrel) varieties, different breeds can mate and have viable offspring, so they are all found under the umbrella of a single species, Canis familiaris. Dogs are highly unusual in their variation, from the Chihuahua to the Great Dane.

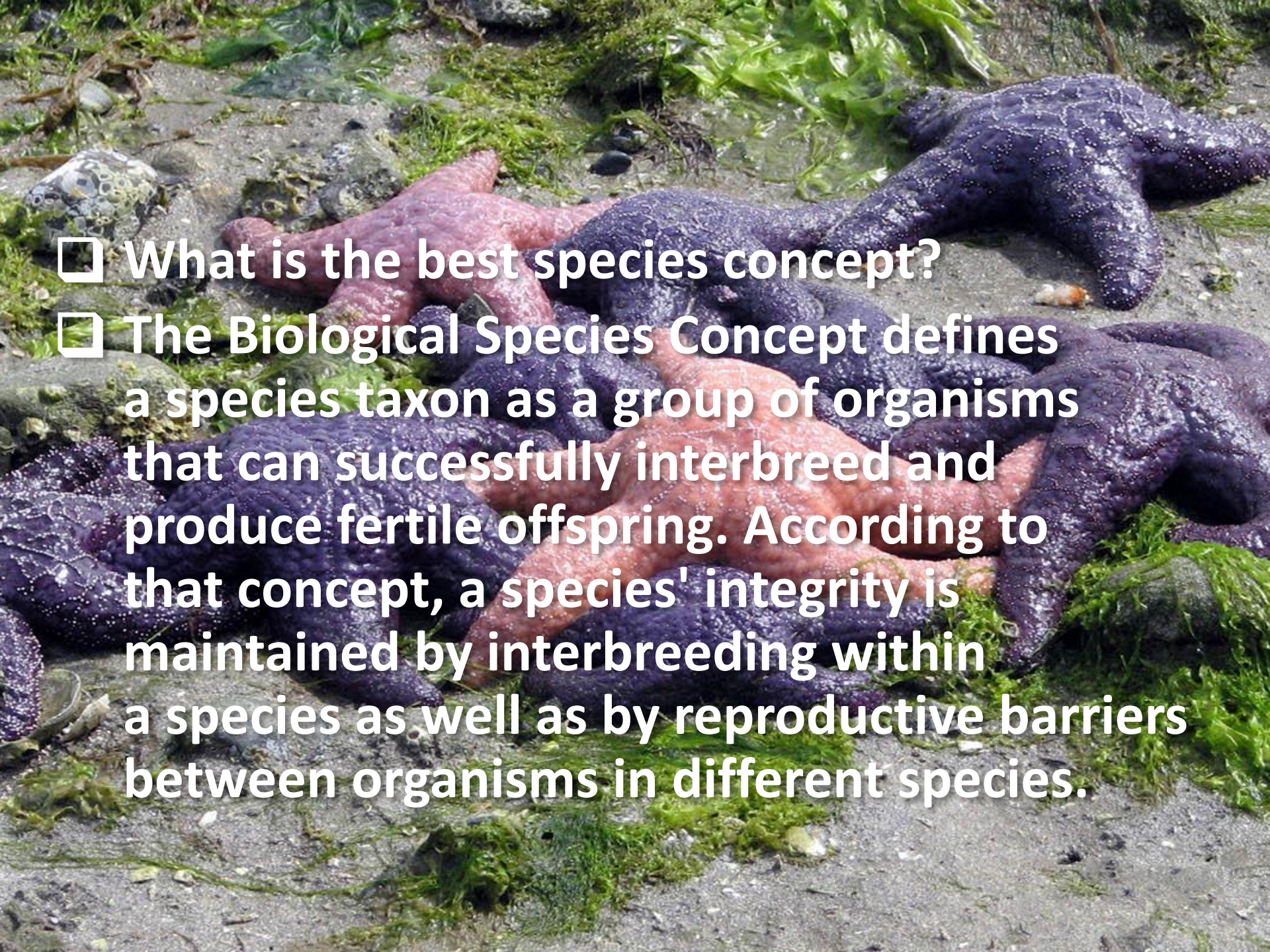


What are the 4 species concepts?

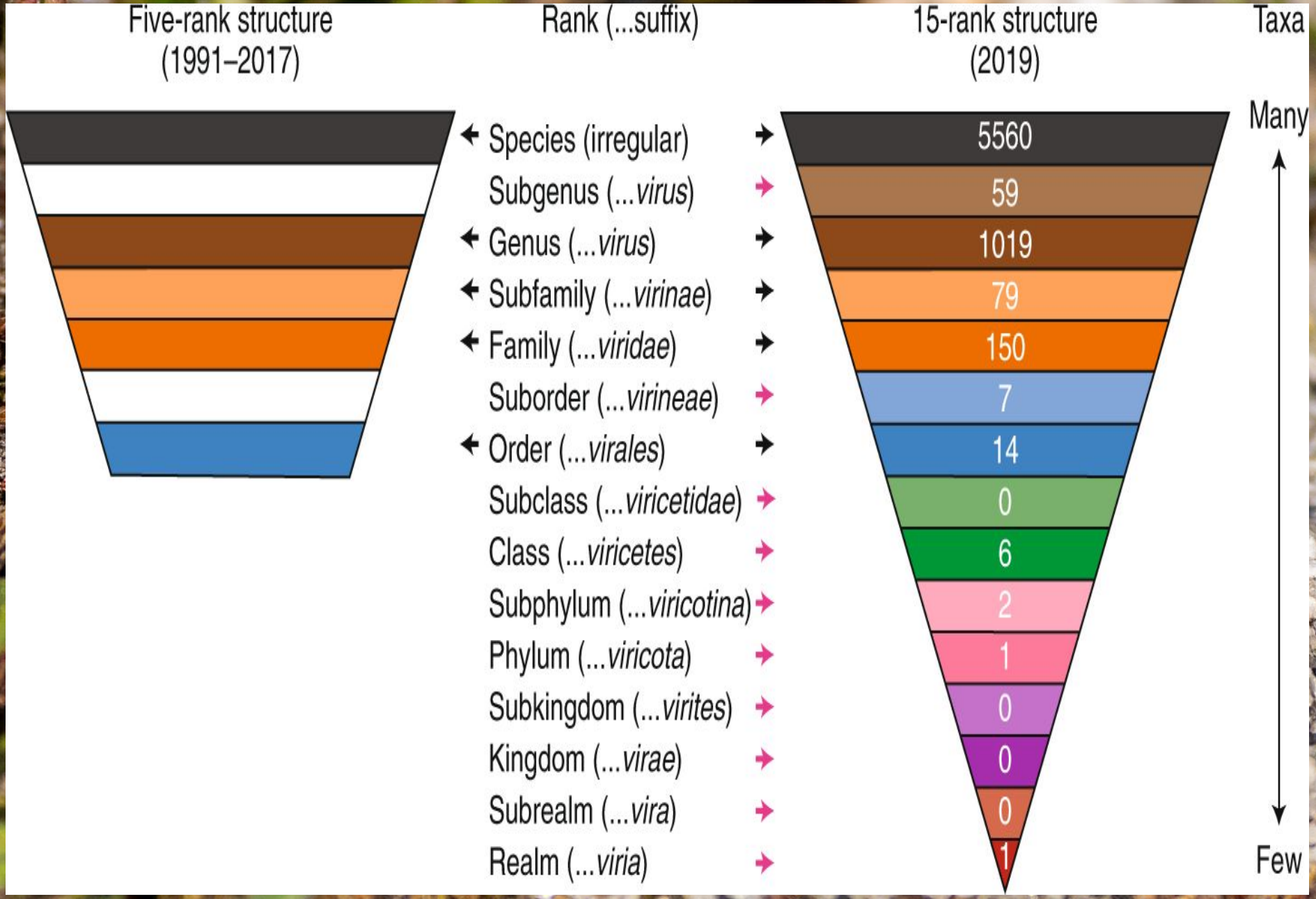
The important species concept are:

1. **Typological or Essentialist Species Concept**
2. **Nominalistic Species Concept**
3. **Biological Species Concept**
4. **Evolutionary Species Concept.**

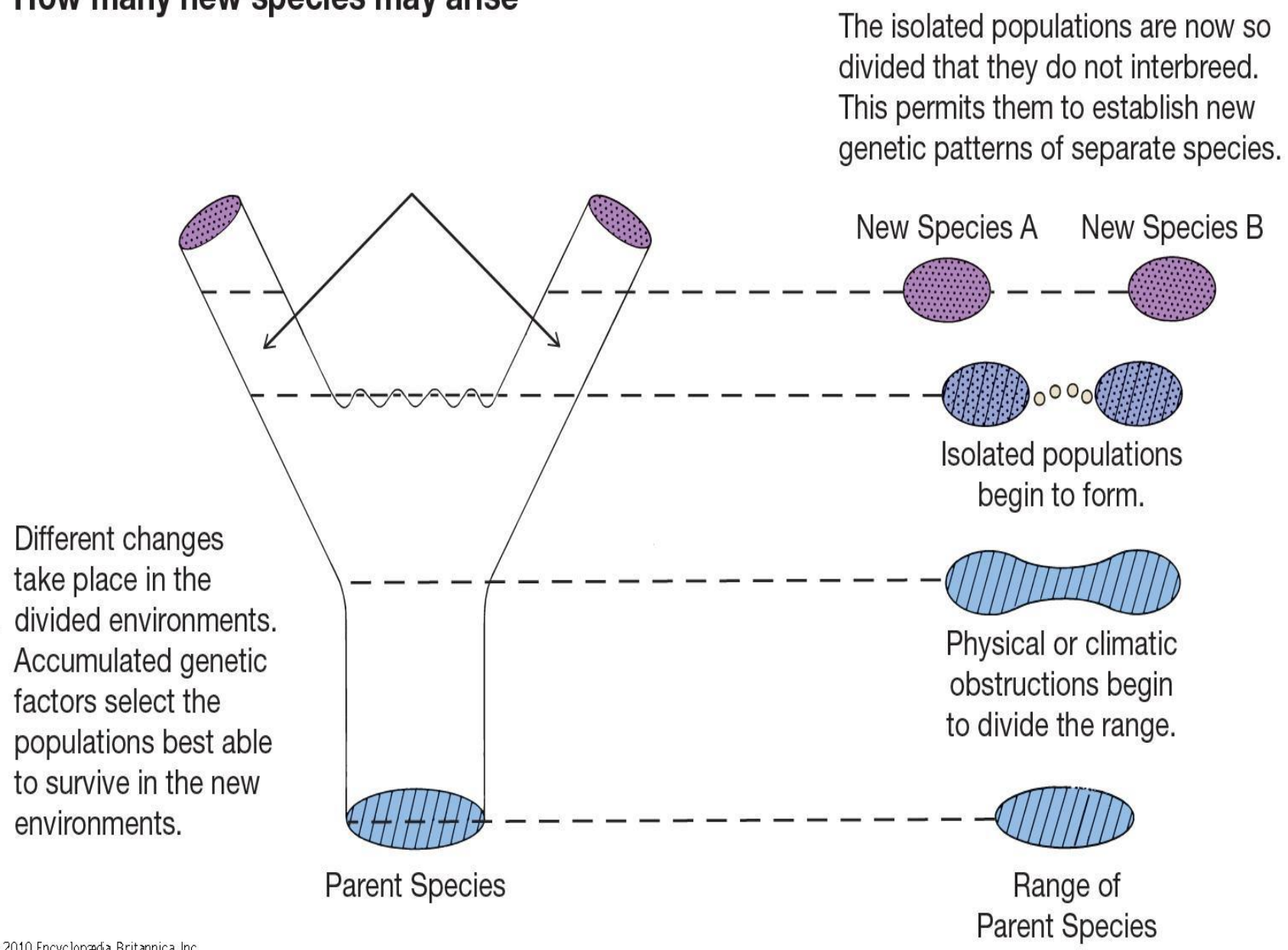

Species A
Species B
Advanced Molecular Tool- DNA-DNA hybridization (bacteria), Genome comparison (bacteria & yeasts)
Molecular Tools (species delineation region)- sequencing of EF1-α, β-tubulin, calmodulin, LSU, rpb2, etc. (fungi); gyrase B, etc. (bacteria)
Molecular Tools (barcode region)- 16S rDNA, G+C content (bacteria); ITS region (fungi)
Physiology & Biochemical- optimum pH, NaCl tolerance, Fatty Acid profile, sugar metabolism tests (bacteria & yeasts), compositional changes to media (fungi), extrolite profile (fungi), etc.
Morphology- colony, microscopic characters, gram staining (bacteria), etc.
Species delineation
Increasing taxonomic tools

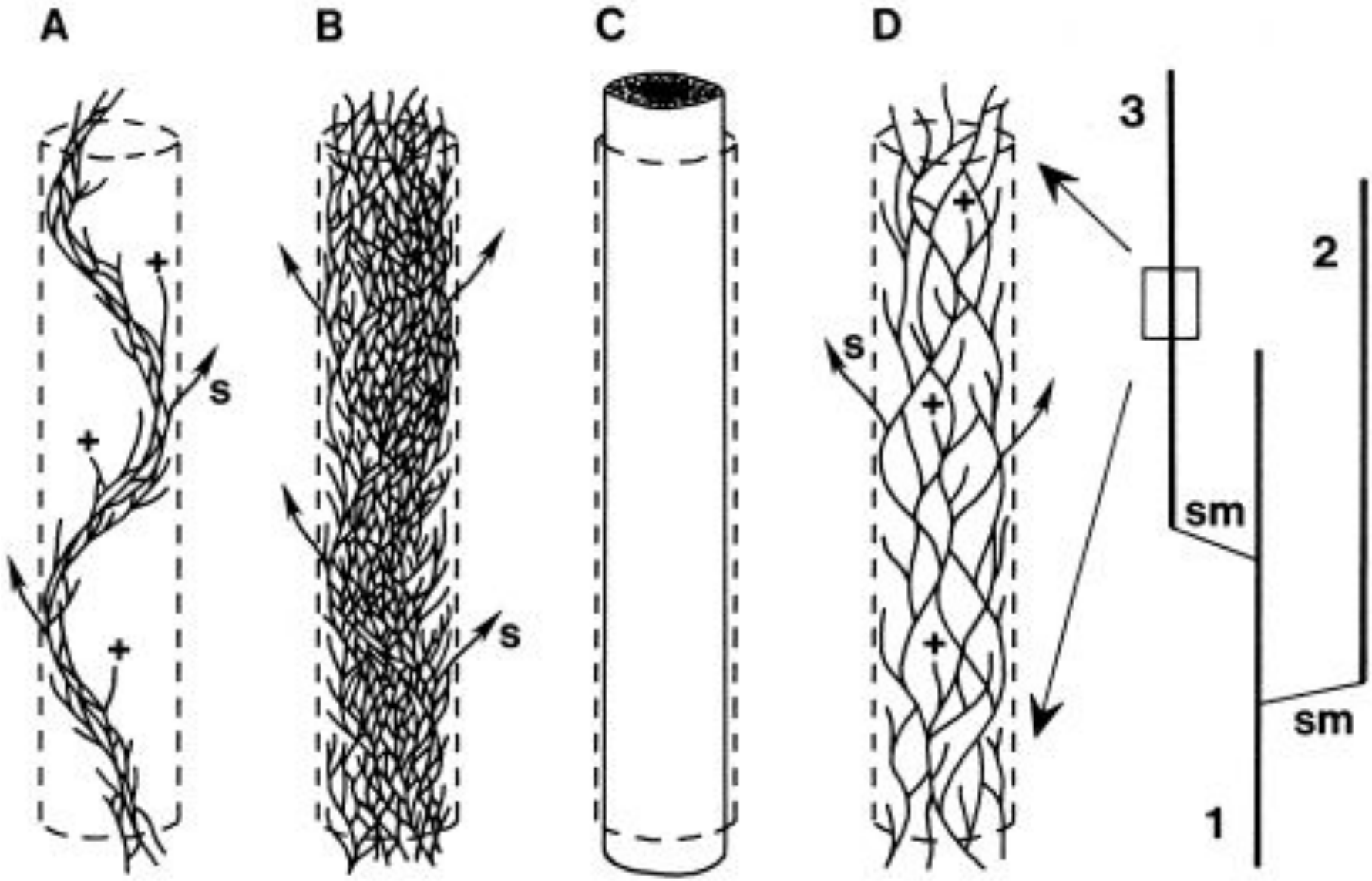


- What is the best species concept?
- The Biological Species Concept defines a species taxon as a group of organisms that can successfully interbreed and produce fertile offspring. According to that concept, a species' integrity is maintained by interbreeding within a species as well as by reproductive barriers between organisms in different species.


Five-rank structure
(1991–2017)
Rank (...suffix)
15-rank structure
(2019)
Taxa
Many
Few
Species (irregular)
Subgenus (...virus)
Genus (...virus)
Subfamily (...virinae)
Family (...viridae)
Suborder (...virineae)
Order (...virales)
Subclass (...viricetidae)
Class (...viricetes)
Subphylum (...viricotina)
Phylum (...viricota)
Subkingdom (...virites)
Kingdom (...virae)
Subrealm (...vira)
Realm (...viria)
5560
59
1019
79
150
7
14
0
6
2
1
0
0
0
1

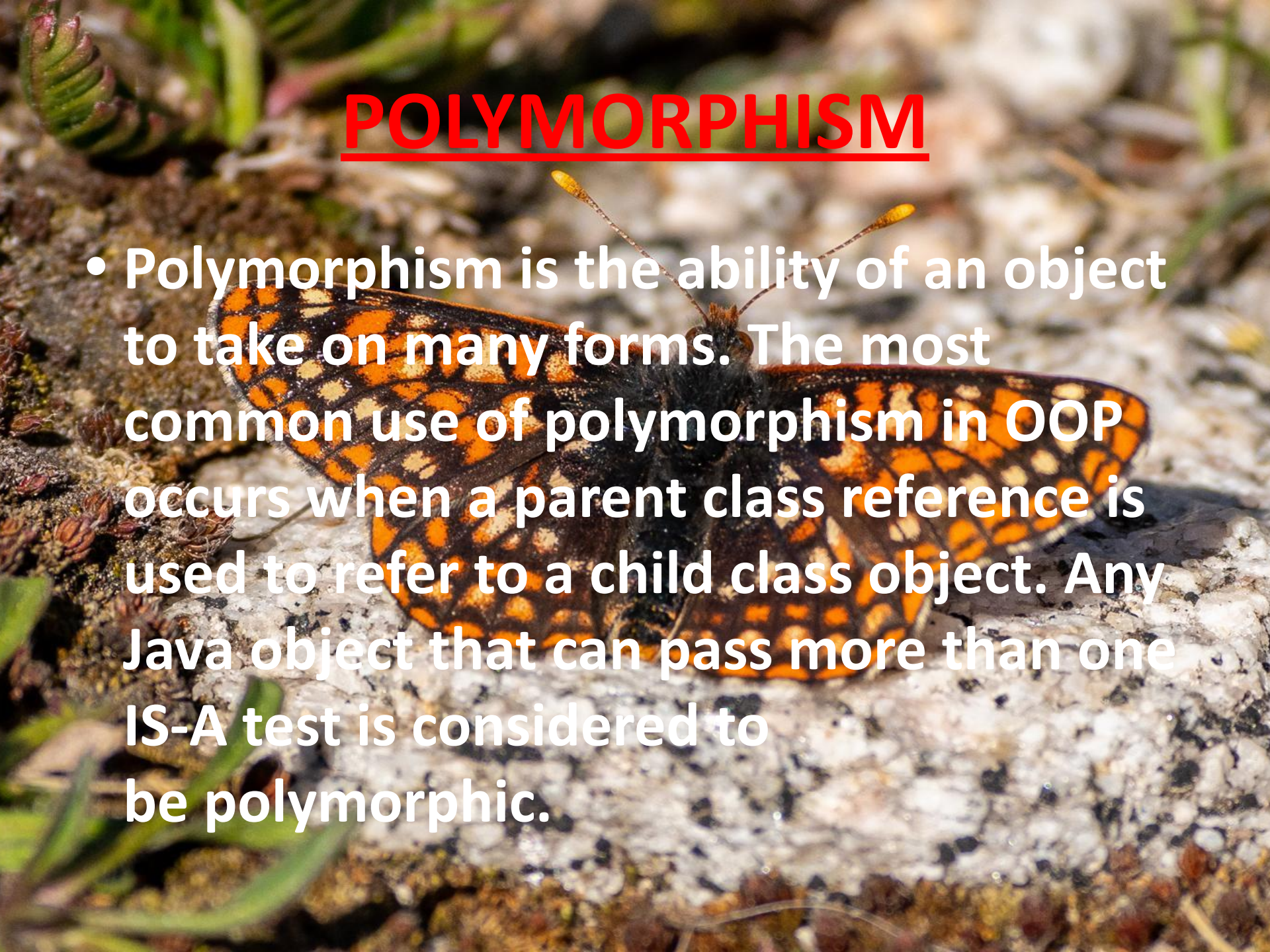
How many new species may arise




A
B
C
D
s
s
s
3
2
sm
sm
1

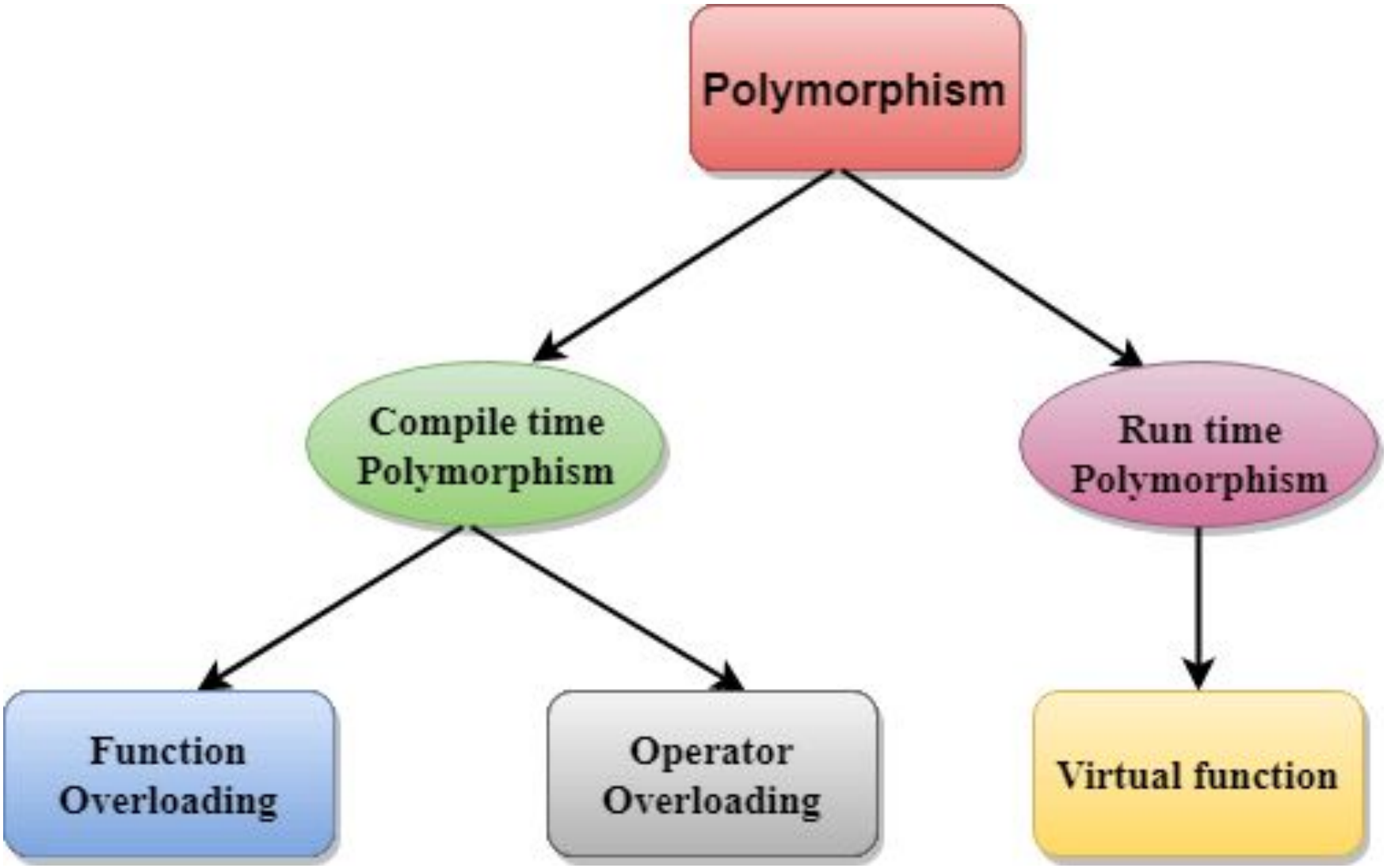
STRUCTURE OF SPECIES:

- 1. The possible internal structures of species-lineages. In general, species consist of demes or habitat clusters, and comprise clades. A) A lineage consisting of a bundle of demes that oscillate through the phenotypic/habitat space of an established species but does not fill up the space, as in the other models.

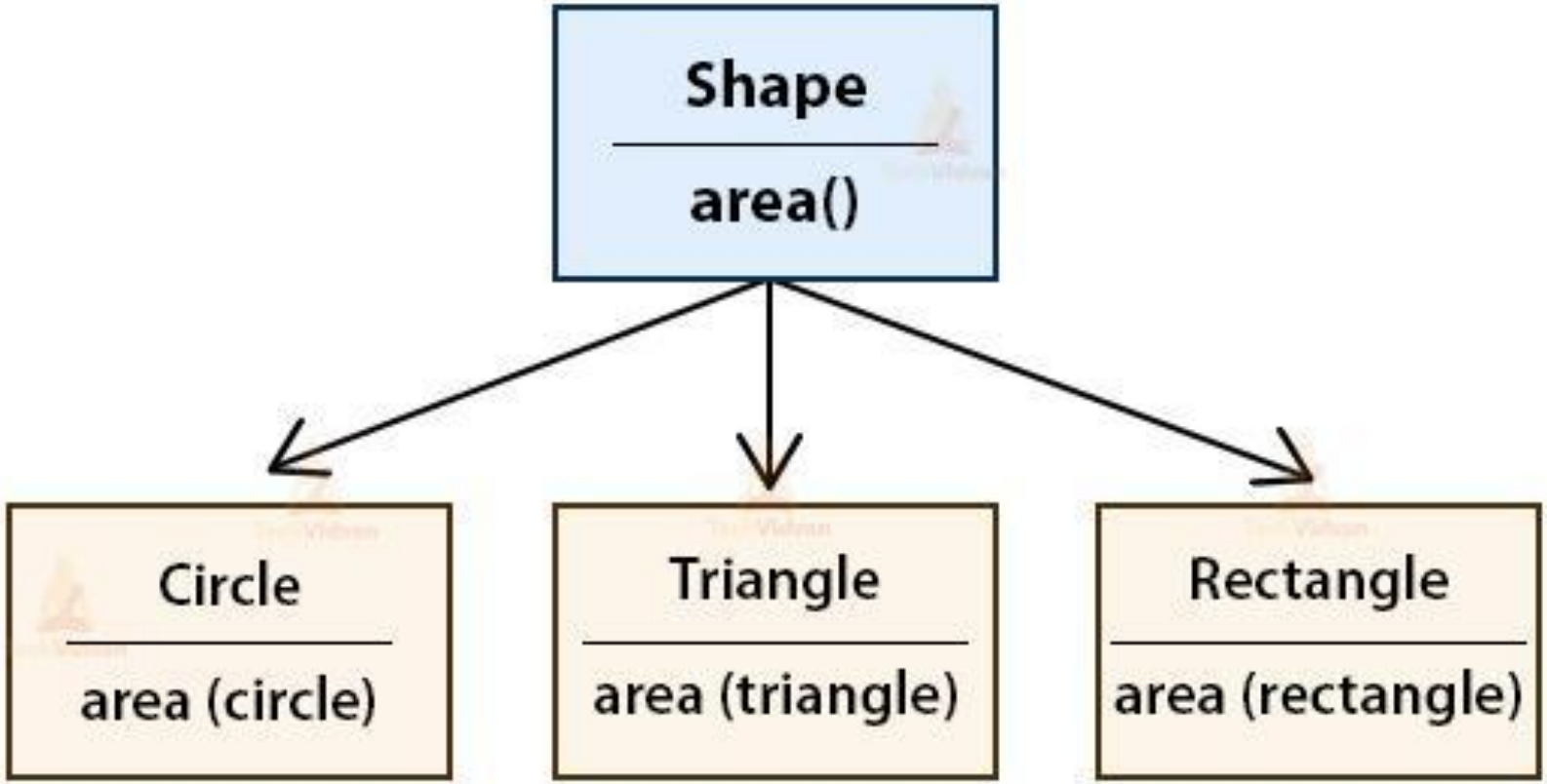


POLYMORPHISM

- Polymorphism is the ability of an object to take on many forms. The most common use of polymorphism in OOP occurs when a parent class reference is used to refer to a child class object. Any Java object that can pass more than one IS-A test is considered to be polymorphic.


Polymorphism
Compile time Polymorphism
Run time Polymorphism
Function Overloading
Operator Overloading
Virtual function

Example of Polymorphism in Java



POLYMORPHISM IN LEPIDOPTERA


THANK
YOU