

Pros

- i) Conservation efforts (*Stanley Temple*)
 - a. Protect, conserve, restore, *revive*
 - b. Re introduce valuable genetic variation in existing small populations (ex. Mauritius Kerstel bird, black footed ferrets have lost important survival benefit alleles)
 - c. Revive recently extinct species that had specific threats that we've now overcome, and for whom we now know the future will be secure as the habitats are now more welcoming and secure. Ex. Thylacine, ivory billed woodpecker (deliberately overkilled or habitat destroyed, which has since been addressed).
 - d. Organisms that have coevolved with keystone members in an ecosystem (ex. The dodo bird and tambalacoque tree). *Wolves change rivers, Yellowstone?*
 - e. ChytridEs fungus and The Lazarus Project with the southern gastric brooding frog (discovered 1972, 1979 extinct – swallows fertilized eggs, uses stomach as uterus, spews out newborn frogs).
- ii) Preventing the next (6th) mass extinction (*Carl Zimmer*)
 - a. Last one was 65 million years ago (Cretaceous, killing 76% of the species).
 - b. Extinctions per 1000 species per 1000 years, based on fossil records was ~0.1-1 species; In recent past it is at ~100; future projections range from 1,000-11,000. 10 million species on the world at the moment.
 - c. Asian Turtle Program (red river giant softshell turtle – only 3 known living organisms).
 - d. De-extinction as a way of buying more time
- iii) Resource regeneration and saving the world
 - a. Giant sloth (10,000 years ago) with a propensity to take large shits
 - b. Permafrost has a lot of greenhouse gases stored in it. If it melts, shit gonna get cray.
- iv) Moral imperative
 - a. We are responsible for their death, we bring them back.

Cons

- i) Put it back where it came from
 - a. Loss of earlier habitats due to heavy pollution (Vietnam, Lake Tai, Red River turtle)
 - b. Bringing back species == bringing back the World
 - c. *3.8 billion years of life becomes undone?!*
 - d. Threaten extant species and communities that have moved on since them. Ex saber tooth cat!
- ii) A genome is a dictionary, a book of instructions (*David Ehrenfeld*)
 - a. Epigenetics has shown how a single strand of DNA can be read in so many different ways. Proteins and nc-DNA that tell how to read a DNA in early development. It's the internal and external environments of an egg cell that tell it how to make an organism.
 - b. Using fusion models (extinct animal + current animal combination) can be confounded and messed up by host animal environment. Can test this by using two living species, pretending one is extinct.
- iii) Self sustaining populations (*David Ehrenfeld*)
 - a. Passenger pigeon, last one died in 1914 due to hunting and loss of their forests. *The more they were, the better they did.* So a smaller population might not do that well in self-proliferating, being a social animal in its reproductive model (1 egg per bird).
 - b. Bringing them back leads to what? Putting them in a cage?
- iv) Genomic barriers
 - a. Preservation and contamination: Permafrost preserved 50% mammalian, Croatian Neanderthal sample 3% primate. Also, highly fragmented DNA.

- b. No idea of heterochromatin structure, methylation regulation, location of mammoth specific genes.
- v) Ecological surrogacy (De extinction is not the only way to save habitats)
 - a. *David Burney* in Hawaii, introducing turtles to preserve habitats
- vi) May act as new vectors for pathogens
 - a. Equivalent to mosquitos in America for West Nile virus, as a vector.
- vii) Proper use of money?
 - a. Targeted to specific species, takes a lot of money
 - b. Reviving extinct species would still remain a 'conservation dependent' task to keep them going
 - c. Genetic management of small remenant populations will be hit
 - d. Conservationists working on protecting existing species
 - e. Setting up protected areas (now set up those for de-extinction species?)
 - f. Do we undercut the importance of conservation if we say extinction is not forever?

Rebuttals for

- i) Act as invasive species (Jursassic Park example) (+)
 - a. Steller's sea cow (1741 discovered ,extinct by 1768, lived in North Pacific). Could feed a crew of 33 for a month. No potential for them running amuck
- ii) Preventing the next mass extinction (-)
 - a. Loss of its existing habitats (Vietnam, Lake Tai, Red River Turtle). They're gonna go extinct again anyways.
- iii) Conclusion remarks
 - a. Some species cannot and shouldn't be revived, and should remain extinct.
 - b. Some species might be revived but may cause problems, so think *very* carefully before even considering.
 - c. Some species can and perhaps should be revived, so cautiously pursue reviving the species.

Currently, three strategies exist for de-extinction – backbreeding, cross species cloning, and genetic engineering. Backbreeding relies on selective breeding of existing species to try and re-attain lost morphological features. Cross species cloning and genetic engineering rely on more sophisticated gene technologies, and the availability of ancient DNA (which is usually highly fragmented, in poor condition, and contaminated by bacterial infestations and human handling).