

Food & Genes



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Plant species in a Big Mac meal with coffee.

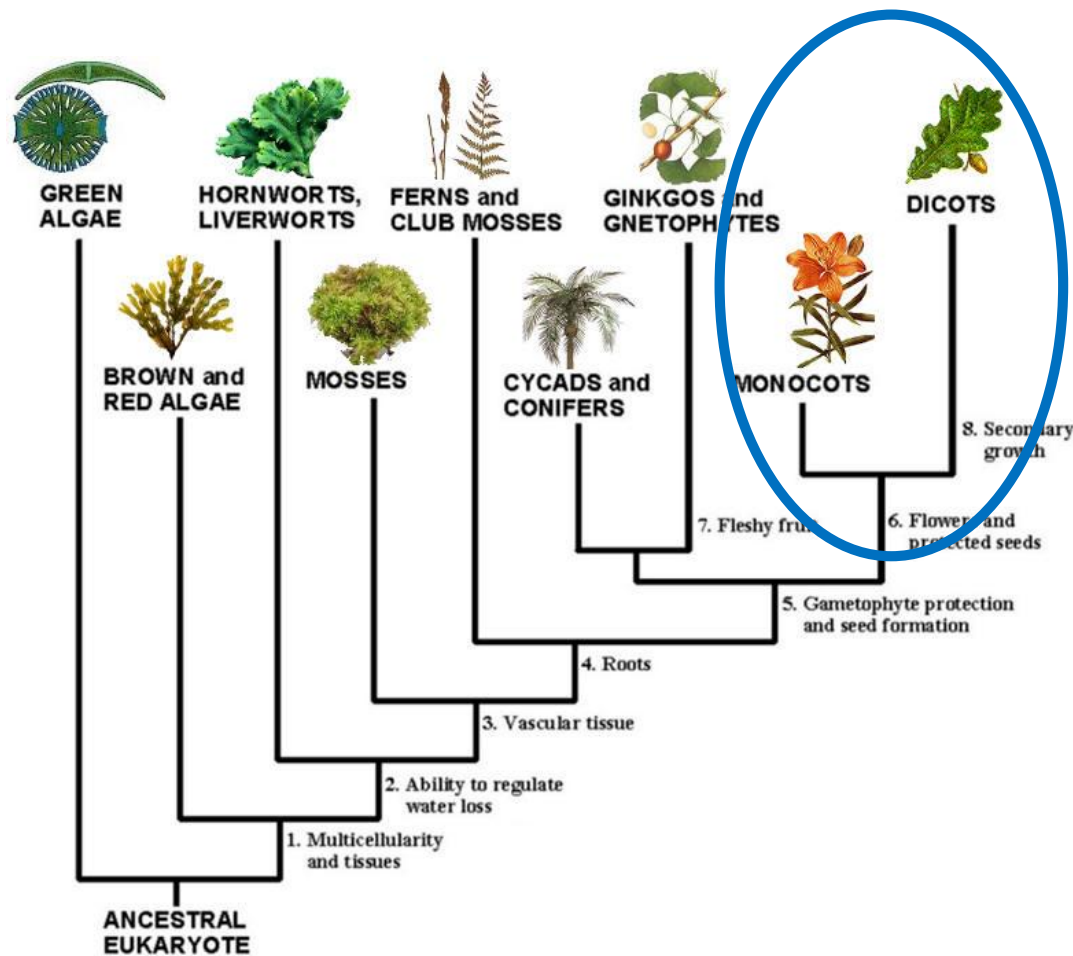
19 species

Common name	Species	Family	Origin	Use
Barley	<i>Hordeum vulgare</i>	Poaceae	Turkey/Iran	Bun
Cotton (seed for oil)	<i>Gossypium hirsutum</i>	Malvaceae	Multiple	Seasoning oil
Cucumber	<i>Cucumis sativus</i>	Cucurbitaceae	India	Sauce, pickle slices
Garlic	<i>Allium sativum</i>	Alliaceae	Mediterranean	Sauce
Lettuce	<i>Lactuca sativa</i>	Asteraceae	Mediterranean	Fresh
Maize	<i>Zea mays</i>	Poaceae	Mexico/ Central America	Bun, sauce, oil
Mustard	<i>Brassica juncea</i>	Brassicaceae	India	Sauce
Onion	<i>Allium cepa</i>	Liliaceae	Turkey/Iran	Dehydrated, sauce
Chili pepper	<i>Capsicum annuum</i>	Solanaceae	Mexico/ Central America	Sauce
Pepper (black)	<i>Piper nigrum</i>	Piperaceae	India	Seasoning
Potatoes	<i>Solanum tuberosum</i>	Solanaceae	Andes	Fries
Sesame	<i>Sesamum indicum</i>	Pedaliaceae	Multiple	Bun
Soybean	<i>Glycine max</i>	Fabaceae	China	Bun, sauce, seasoning, cheese, fries
Sugar (cane or beet)	<i>Saccharum officinarum</i> <i>Beta vulgaris</i>	Poaceae Amaranthaceae	New Guinea Mediterranean	Sauce
Tomatoes	<i>Lycopersicon esculentum</i>	Solanaceae	Mexico/ Central America	Ketchup
Turmeric	<i>Curcuma longa</i>	Zingiberaceae	Southeast Asia	Sauce, pickle slices
Wheat	<i>Triticum aestivum</i>	Poaceae	Turkey/Iran	Bun, fries
Rape, sunflower, cotton, or maize	<i>Brassica rapa</i> <i>Helianthus annuus</i>	Brassicaceae Asteraceae	Mediterranean California	Oil
Coffee	<i>Coffea</i> spp.	Rubiaceae	Ethiopia	Coffee

Proches et al. Bioscience 2008

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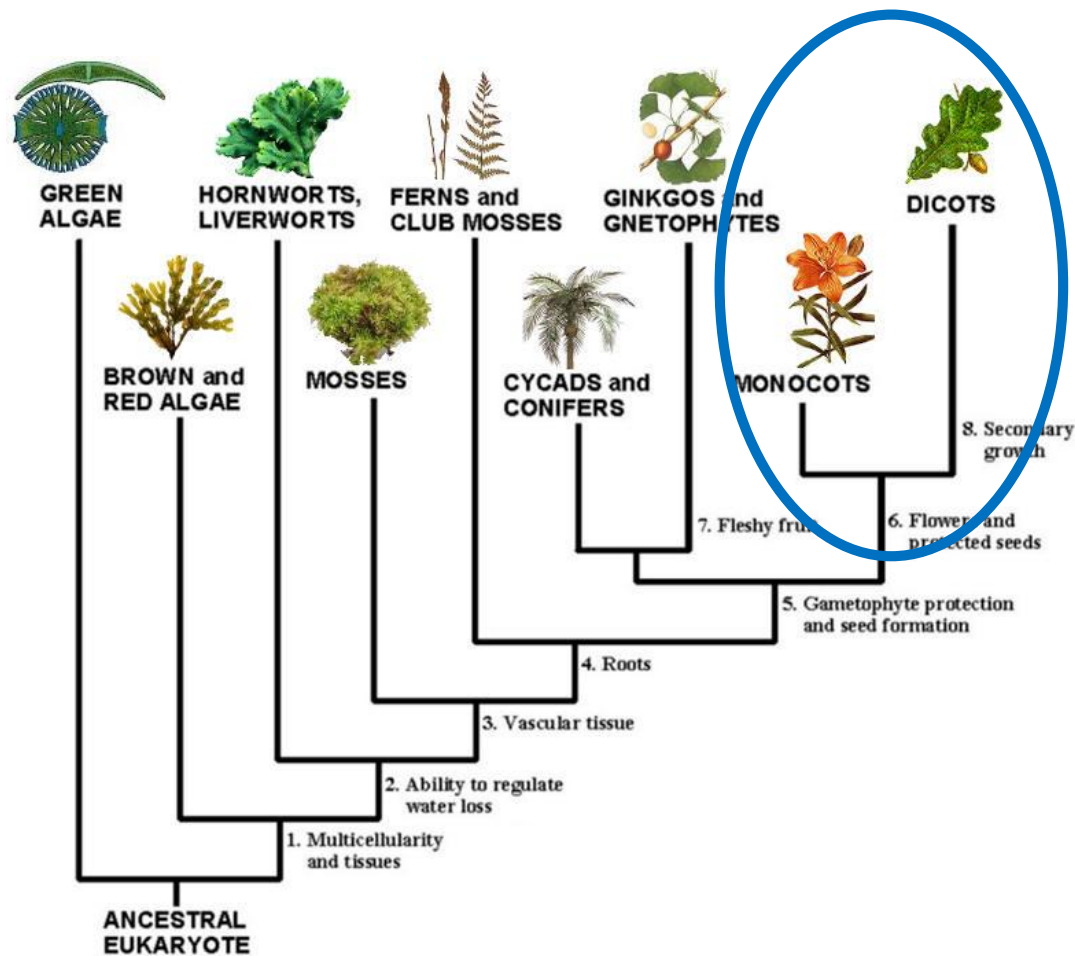
What do we eat and where does it come from?



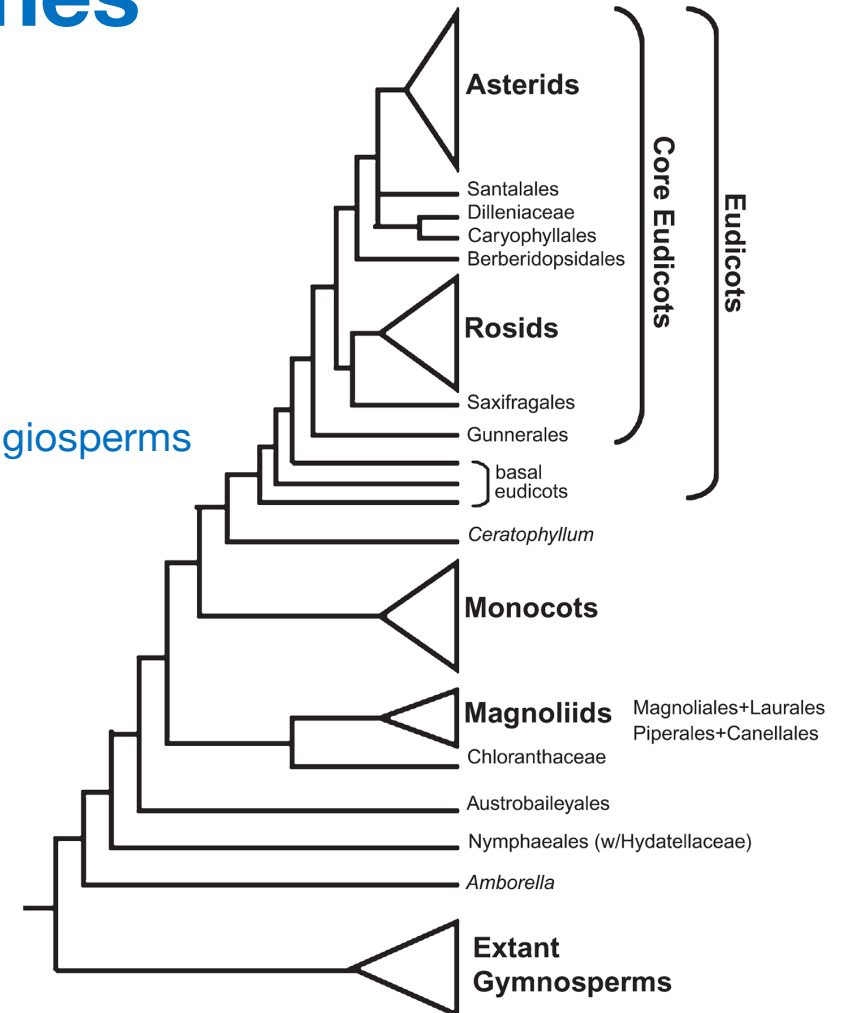
Angiosperms comprise between 50% and 90% of the total food volume of most human societies, and provide a similar percentage of total energy intake.

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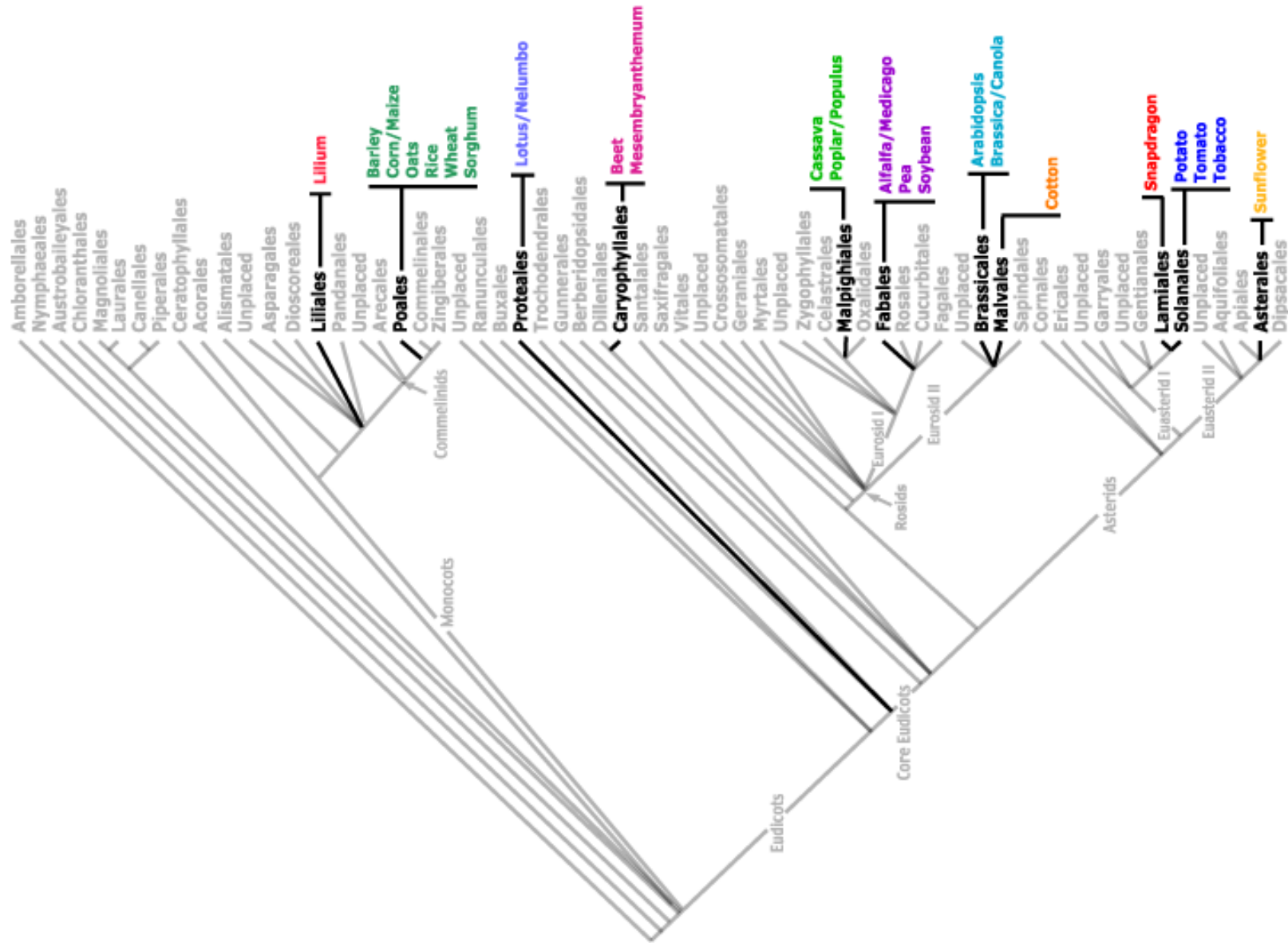
What do we eat and where does it come from?



Angiosperms



Soltis et al. Am J Bot 2009



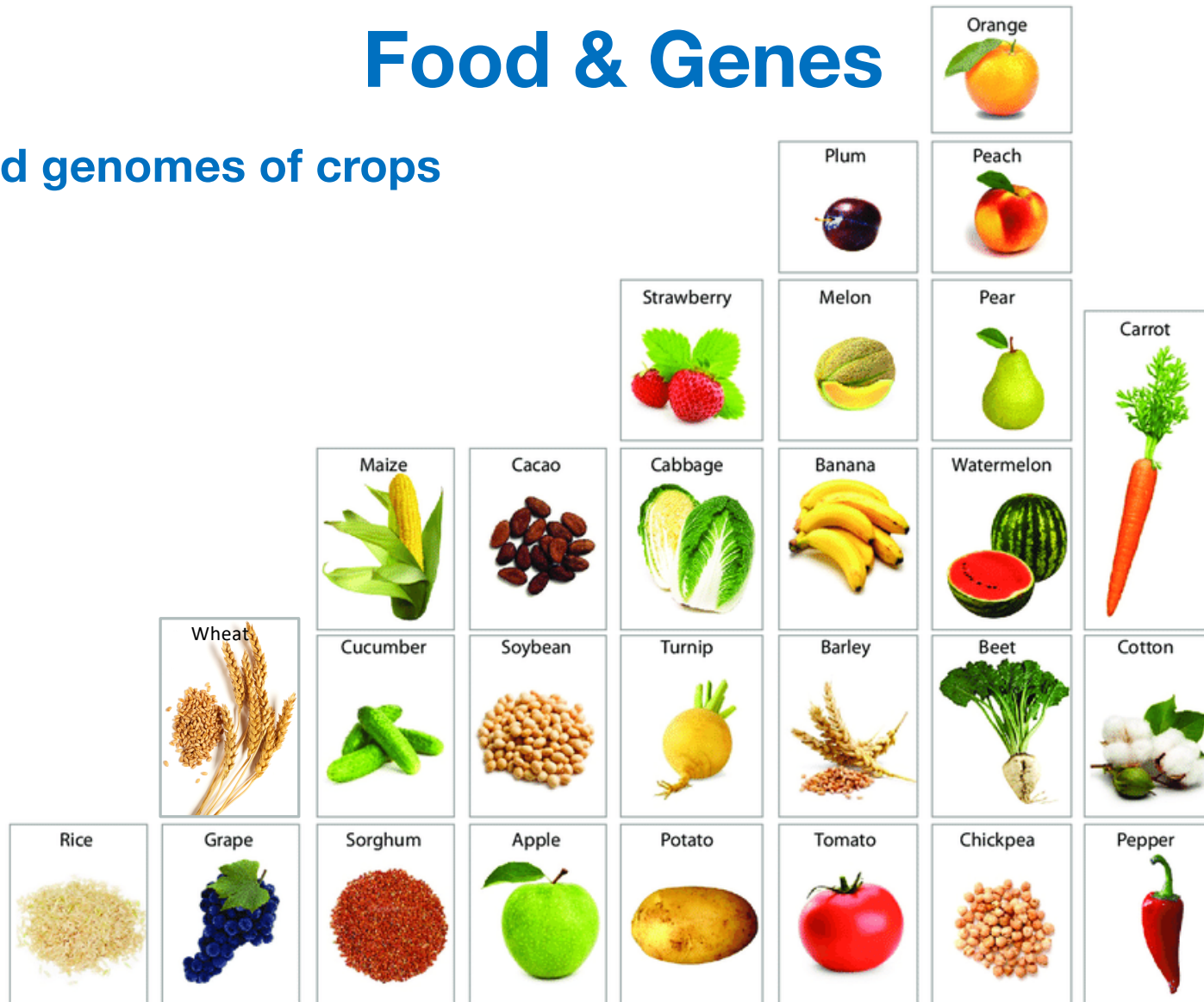
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Where do our preferred foods come from?

- Worldwide, it has been estimated that up to 75,000 angiosperm species could be edible out of a total of 200,000 to 400,000, and about 7000 are commonly eaten.
- The proportion of species eaten by humans is similar to that expected from a random distribution for the vast majority of plant families.
- However, several families have many more food species than expected (i.e. Rosaceae), and in others, food species are greatly underrepresented (i.e. Orchidaceae).

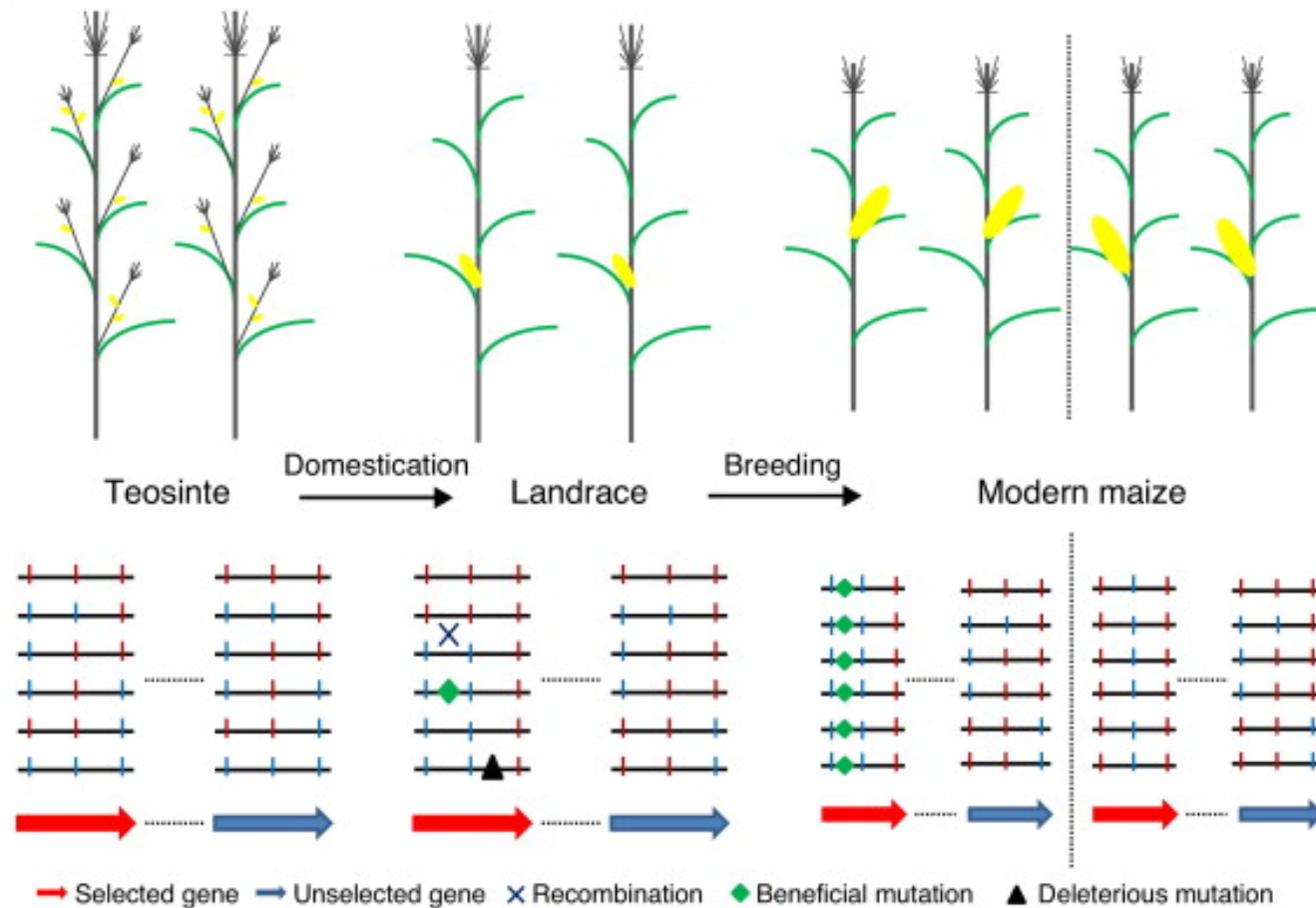
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Sequenced genomes of crops



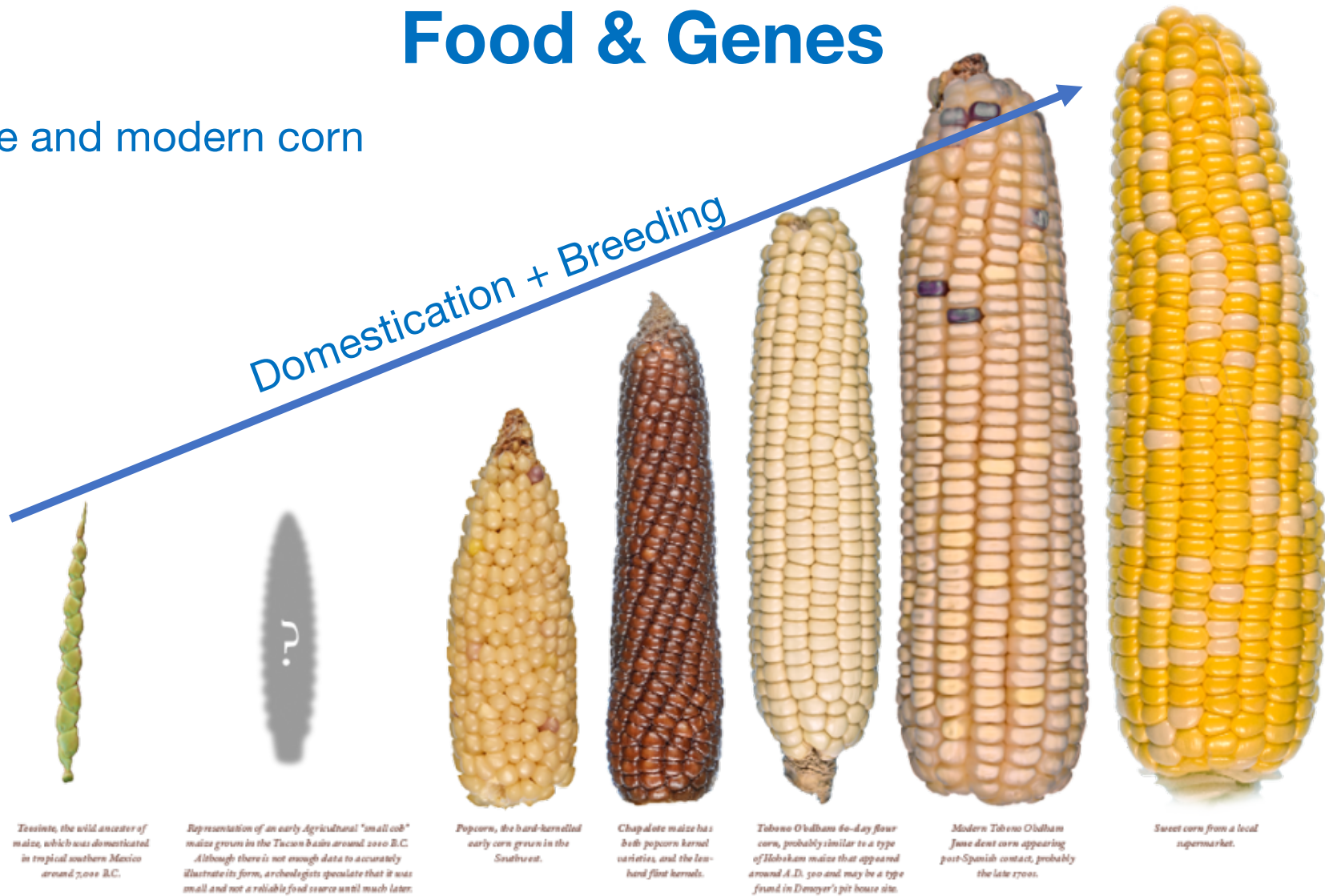
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Gnomes change with crop domestication



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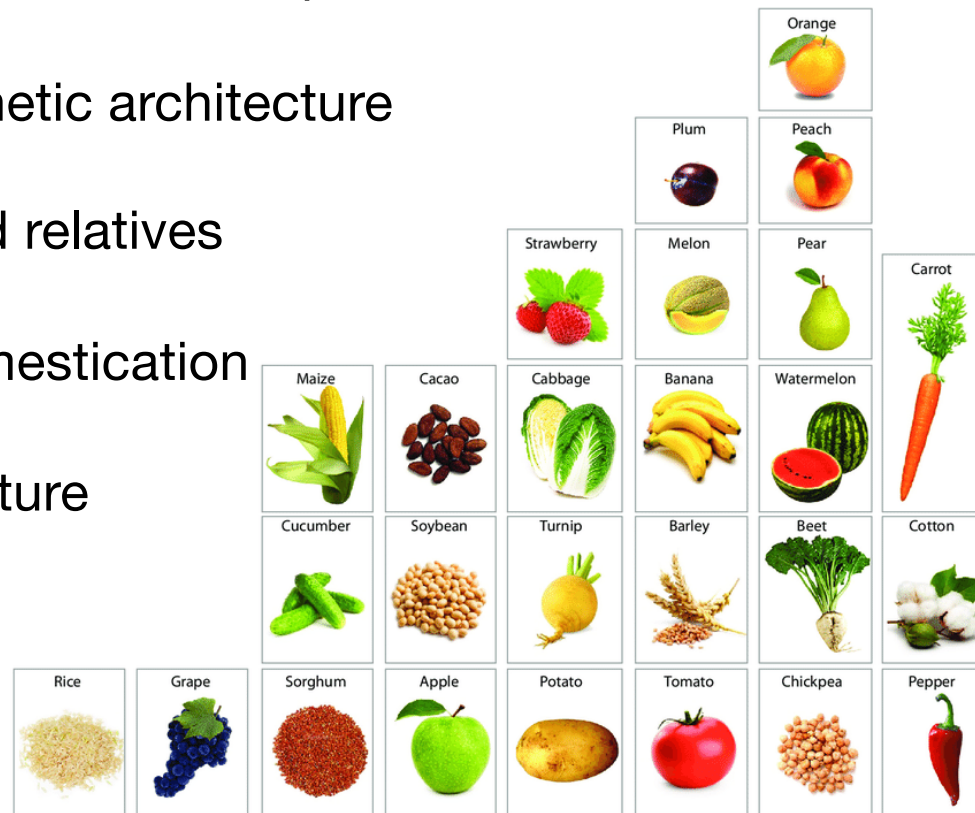
Teosinte and modern corn



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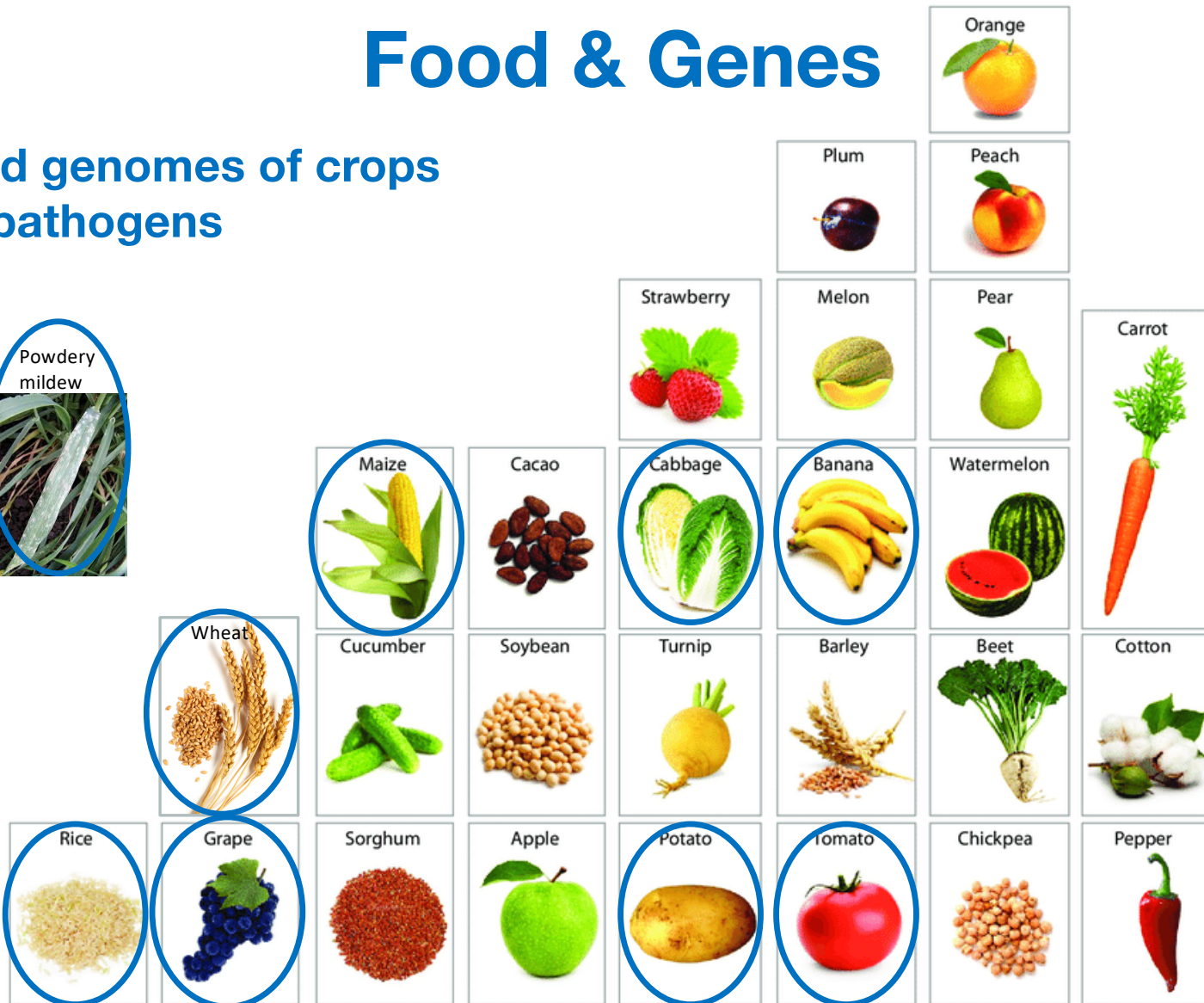
Why sequencing crop genomes?

- Understanding the genetic make-up of foods
- Knowledge on the genetic architecture
- Inferring ancestral wild relatives
- Reconstruction of domestication
- Improving crops for future



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Sequenced genomes of crops
and crop pathogens



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Student topics

1. What is the genetic history of the world-wide consumed **Banana** clone?
2. What is the genetic make-up of modern **Wheat** elite cultivars?
3. What is the genetic evolution of **Grapes**?
4. What are the genetic changes that adapted **Maize** for world-wide consumption?
5. What is the role of genetic modification in the evolution of **Rice** cultivars?
6. What is the genetic relationship between cultivated **Potato** and **Tomato**?
7. What is the genomic architecture of ***Phytophthora infestans***, the causal agent of the famous Irish potato famine?
8. What is the genomic architecture of **Powdery mildews**, a pathogen of staple and cash crops?
9. What are the genetic principles of diversification in the domestication of **Mustard** plants?
10. What are the genetic improvements in **Yeast** used in food processing?