Part III
Scientific Presentation

魏桐

3/22/2023

华大生命科学研究院
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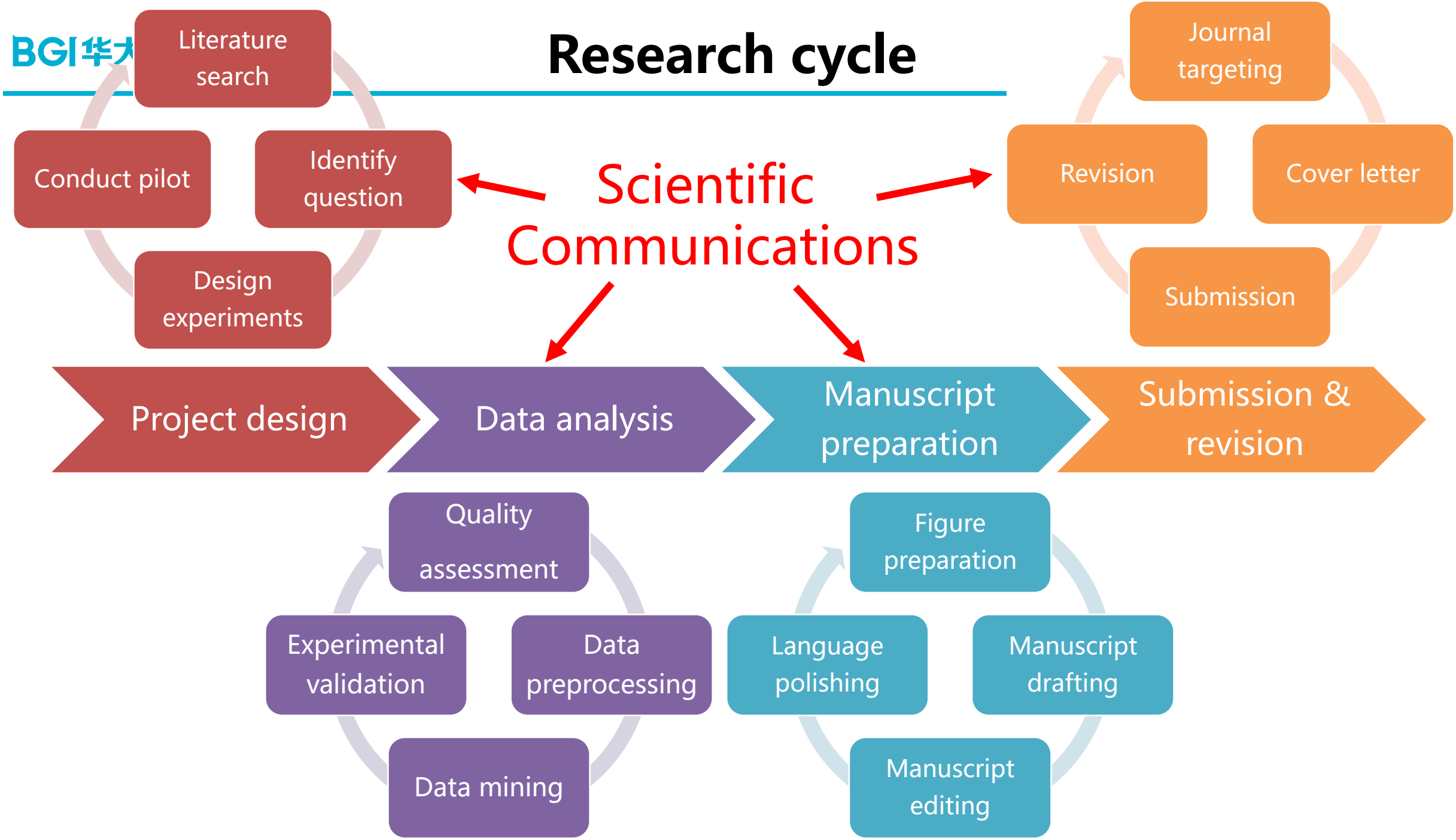
Research cycle



Scientific presentation

- Scientific presentation is
  - **An essential skill** of introducing personal work, communicating with peer, and seeking for supports, and
  - **A professional way** of describing observation, introducing hypotheses, demonstrating and interpreting results, and summarizing into conclusions.

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Prepare for presentations

- Prepare presentations in a logical way
- Elucidate details in methods and materials
- Summarize results in an effective manner

- Know your audience
  - **Use bare minimum** and provide only essential information
  - Stick to time limits (1 minute per slide)
- Know your story – **follow the logic**

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IMRaD structure for presentation

- IMRaD: **I**ntroduction, **M**ethods, **R**esults, and **D**iscussion

- Title slide includes the full title, the names, date, etc.
- Introduction
  - Provide a brief introduction of the **background**
  - State clearly the **aim or scientific questions**
- Methods
  - Use bullet points
  - Emphasize on **important details/parameters**

IMRaD structure (continued)

- Results
  - Present **ONLY one thing** in each slide
  - Use **figures** whenever possible
  - Enlarge text and numbers
- Discussion/Conclusion
  - Summarize the most important findings
- Other slides, acknowledgements, extra evidence,

Tips in preparation

- Follow **a logical structure**, with focus on major discoveries
- Use **figures and tables** with an appropriate font size
- Avoid using a big chunk of text
- Use **own words** instead of copy from papers
- Keep consistency in slides, font, size, color, etc.

- **Practice, practice, practice…**

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Tips in presentation

- Plan for an impressive and informative start
- Adjust **voice and pace** to ensure clarity
- Make **eye contact** with your audience
- Stay connected with your slides
- Explain the details in each slide

- Avoid reading each word in your slides

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Case study

Nat Genet 2021, 53:752-760

nature genetics

ARTICLES

https://doi.org/10.1038/s41588-021-00831-0

Check for updates

Whole-genome resequencing of 445 *Lactuca* accessions reveals the domestication history of cultivated lettuce

Tong Wei[1,11], Rob van Treuren[2,11]✉, Xinjiang Liu[1,11], Zhaowu Zhang[1,3], Jiongjiong Chen[4], Yang Liu[1], Shanshan Dong[5], Peinan Sun[4], Ting Yang[1], Tianming Lan[1,6], Xiaogang Wang[7], Zhouquan Xiong[7], Yaqiong Liu[8], Jinpu Wei[8], Haorong Lu[8], Shengping Han[8], Jason C. Chen[8], Xuemei Ni[1], Jian Wang[1,9], Huanming Yang[1,9], Xun Xu[1,10], Hanhui Kuang[4], Theo van Hintum[2], Xin Liu[1]✉ and Huan Liu[1]✉

Lettuce (*Lactuca sativa*) is an important vegetable crop worldwide. Cultivated lettuce is believed to be domesticated from *L. serriola*; however, its origins and domestication history remain to be elucidated. Here, we sequenced a total of 445 *Lactuca* accessions, including major lettuce crop types and wild relative species, and generated a comprehensive map of lettuce genome variations. In-depth analyses of population structure and demography revealed that lettuce was first domesticated near the Caucasus, which was marked by loss of seed shattering. We also identified the genetic architecture of other domestication traits and wild introgressions in major resistance clusters in the lettuce genome. This study provides valuable genomic resources for crop breeding and sheds light on the domestication history of cultivated lettuce.

Science 2018, 359:eaao0185

SCIENCE COMMUNITY

Science of science

Santo Fortunato,[1,2*] Carl T. Bergstrom,[3] Katy Börner,[2,4] James A. Evans,[5] Dirk Helbing,[6] Staša Milojević,[1] Alexander M. Petersen,[7] Filippo Radicchi,[1] Roberta Sinatra,[8,9,10] Brian Uzzi,[11,12] Alessandro Vespignani,[10,13,14] Ludo Waltman,[15] Dashun Wang,[11,12] Albert-László Barabási[8,10,16*]

Identifying fundamental drivers of science and developing predictive models to capture its evolution are instrumental for the design of policies that can improve the scientific enterprise—for example, through enhanced career paths for scientists, better performance evaluation for organizations hosting research, discovery of novel effective funding vehicles, and even identification of promising regions along the scientific frontier. The science of science uses large-scale data on the production of science to search for universal and domain-specific patterns. Here, we review recent developments in this transdisciplinary field.

Domestication history of cultivated lettuce revealed by resequencing 445 *Lactuca* accessions

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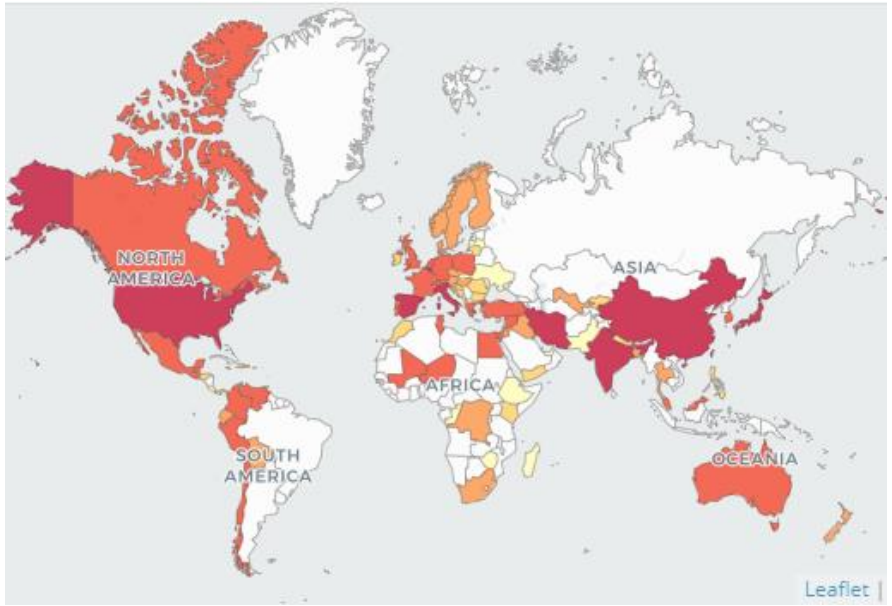
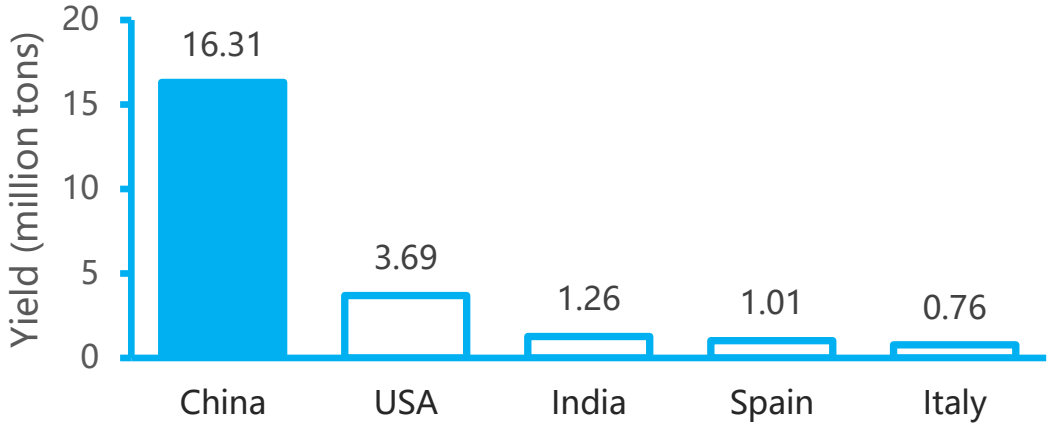
Lettuce is an important vegetable crop

- Consumed worldwide
- A rich source of vitamin K and vitamin A, and a moderate source of folate and iron

- Ranks the 3rd in leafy vegetable worldwide





http://www.fao.org/faostat/

Lettuce is a model Asteraceae plant

- A short life cycle
- Easy for transformation
- Well-preserved germplasms
- Various agronomic traits
- Potential bioreactor

Lettuce crop types

Crisp

Butterhead

Cutting

Cos

Stalk

Oilseed

L. serriola
proposed wild progenitor

Lettuce cultivation history

From a 14th century medical book in Europe

Painted stela of Tatiaset from the ancient Egypt

https://valentinachirico.com/2020/10/lettuce-ancient-egypt-usages/

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The oldest archaeological evidence

This tomb dates to the V dynasty, 2494-2345 BC

An Ancient Egyptian Herbal (p. 113)

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Scientific questions about domestication

1. Where was lettuce domesticated?
2. When was lettuce domesticated?
3. What are the key events during lettuce domestication?
4. What are the genetic determinants for the domestication traits?

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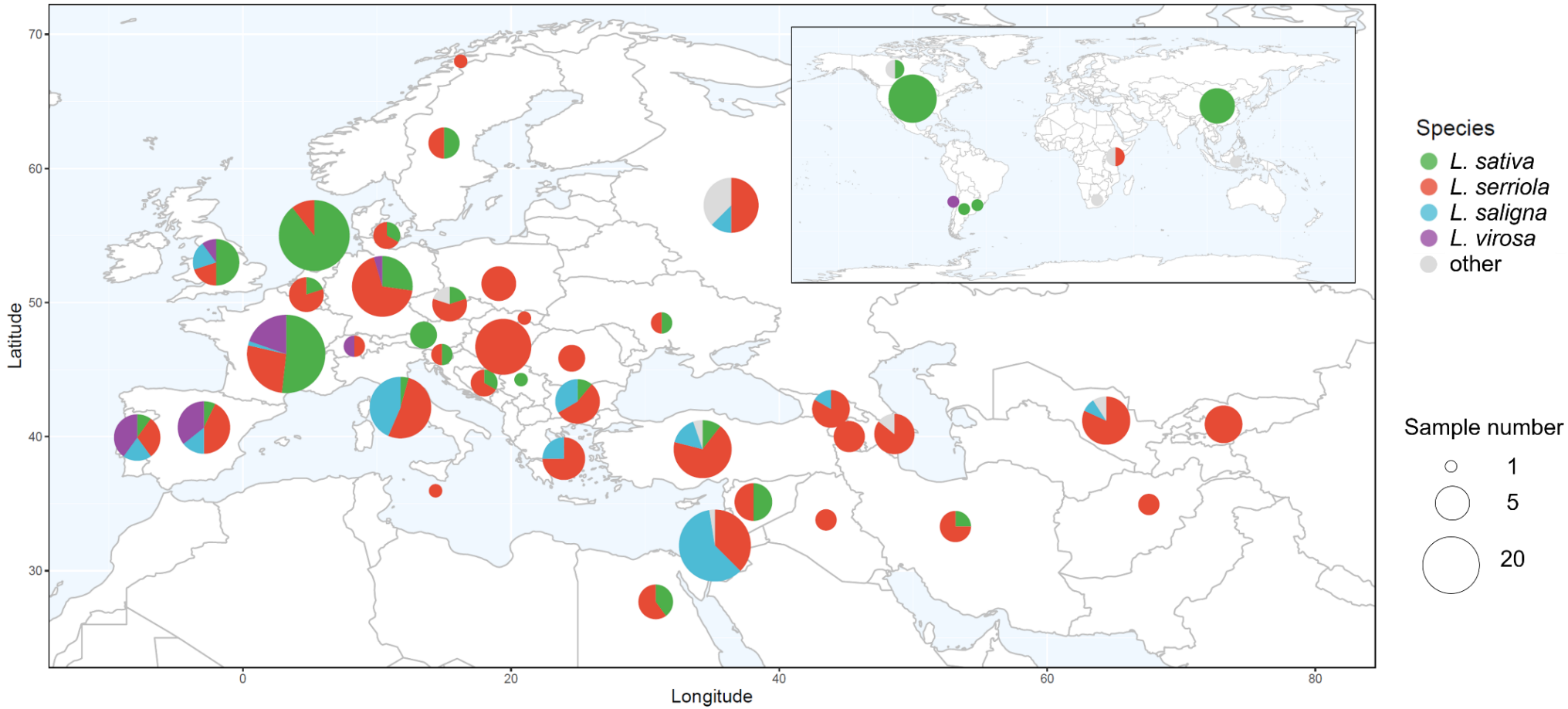
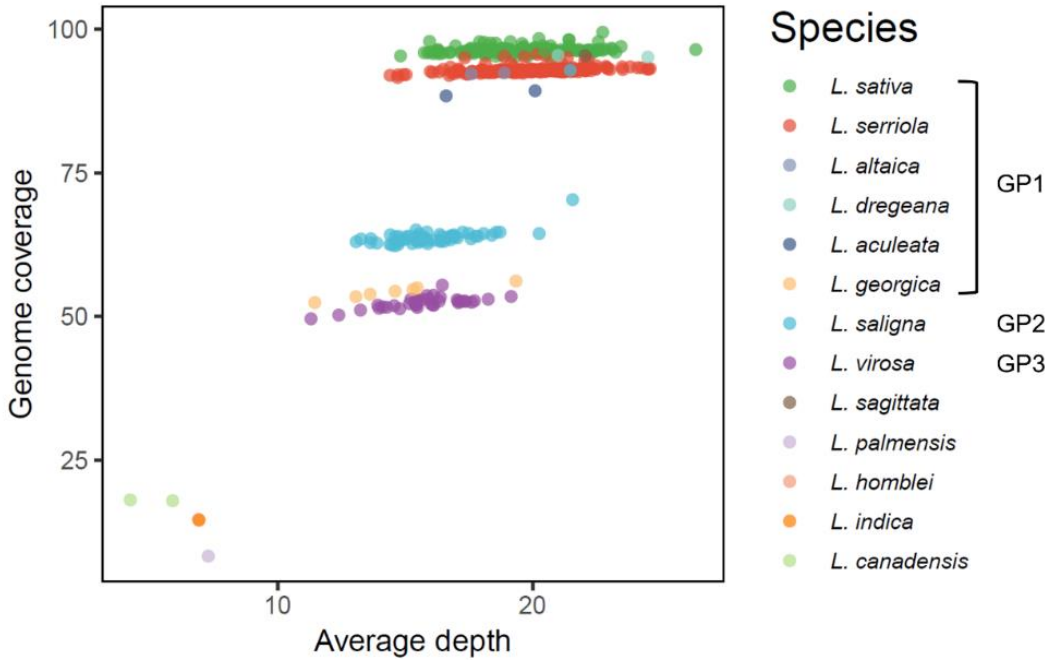
Geographic distribution

445 lines from 47 countries, mainly composed of gene pool (GP) materials of *L. sativa*, *L. serriola*, *L. saligna* and *L. virosa*



Nat Genet 2021, 53:752-760

A comprehensive variation map



	L. sativa	*L. serriola*	*L. saligna*	*L. virosa*	Total
Accessions	133	199	56	36	440
SNPs	39,178,999	120,447,837	53,113,802	36,089,902	178,807,215
indels	3,125,340	11,705,344	9,538,216	6,333,010	29,535,608
SVs	64,956	201,188	17,549	13,680	244,866
Nonsynonymous	219,770	700,293	567,159	447,516	1,580,355
Synonymous	196,874	541,084	625,850	501,114	1,399,417
5'-UTR	35,294	109,579	135,152	102,524	313,409
3'-UTR	31,409	97,492	112,224	85,743	262,579
Intron	499,831	1,472,748	1,129,693	845,087	3,010,148
Splicing	20,287	58,515	65,845	50,567	151,540
Intergenic	38,182,102	117,487,760	50,506,000	34,079,182	172,149,804

Nat Genet 2021, 53:752-760

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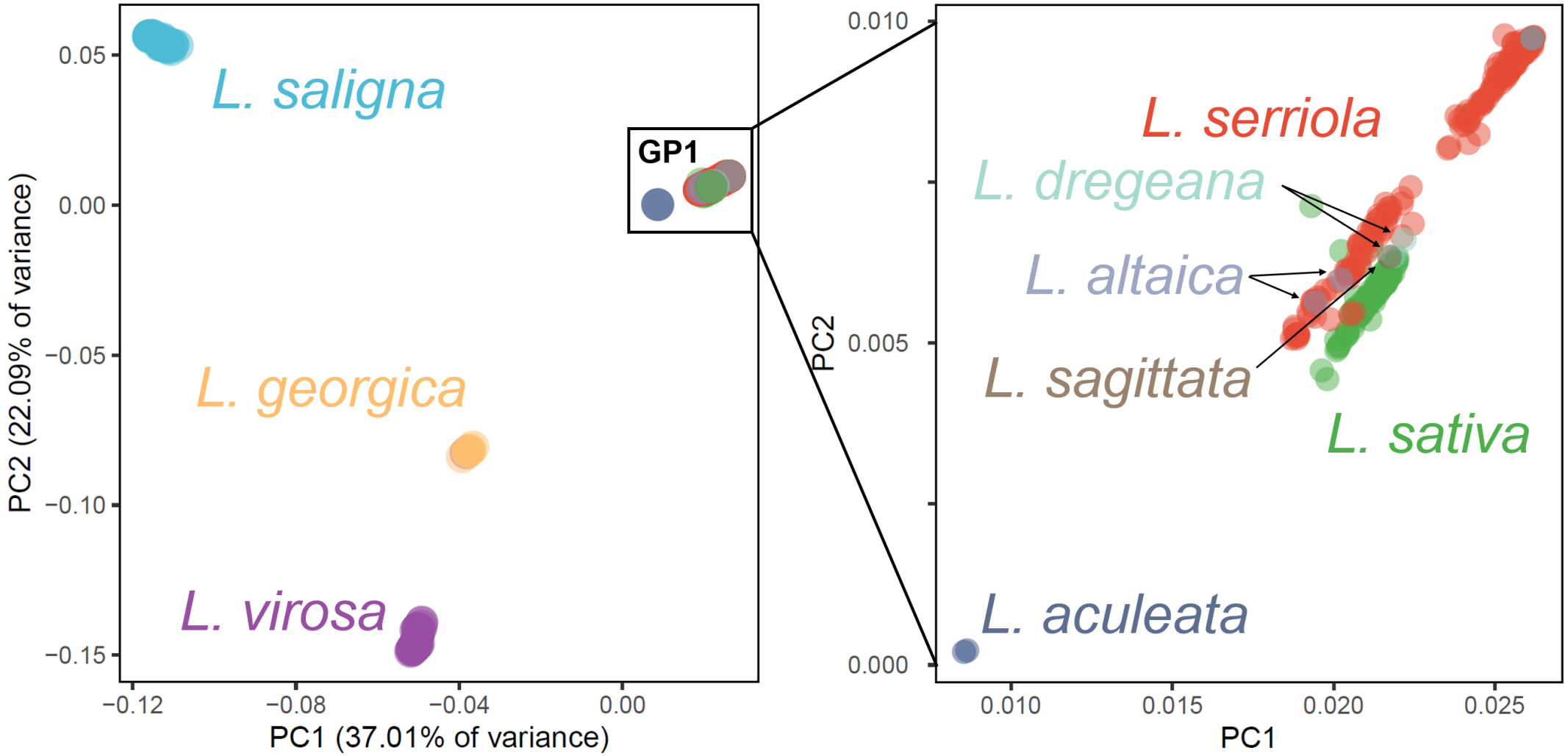
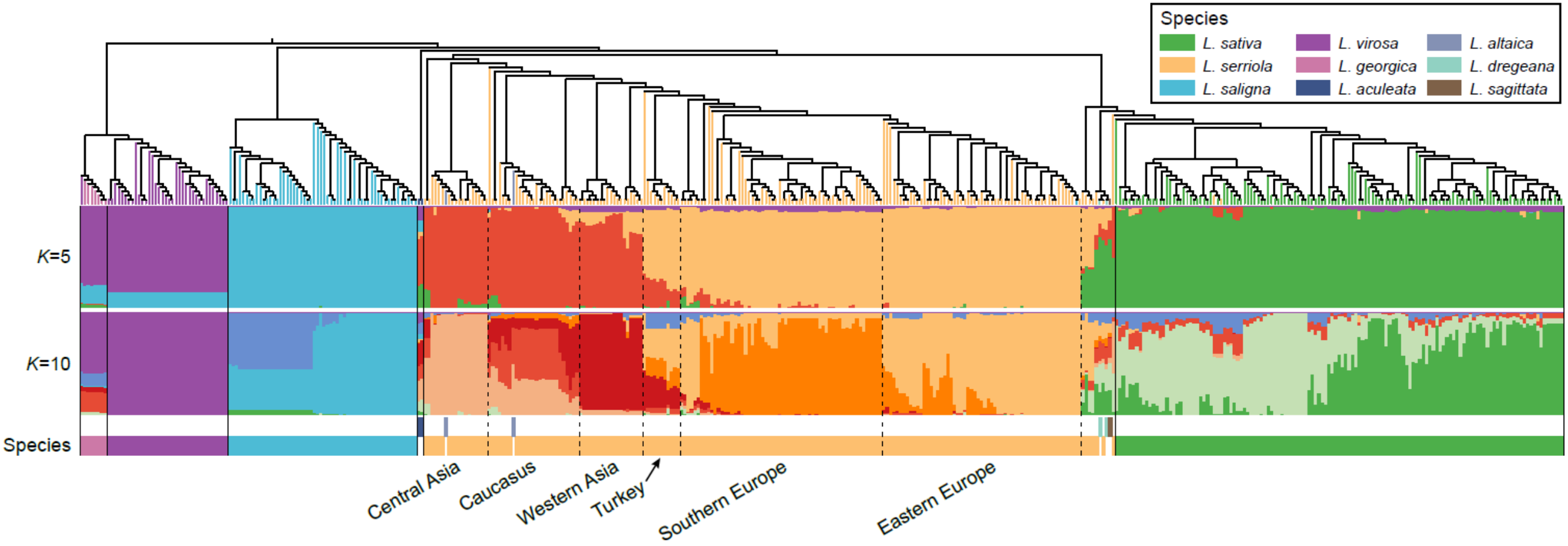
GP1 samples cluster together



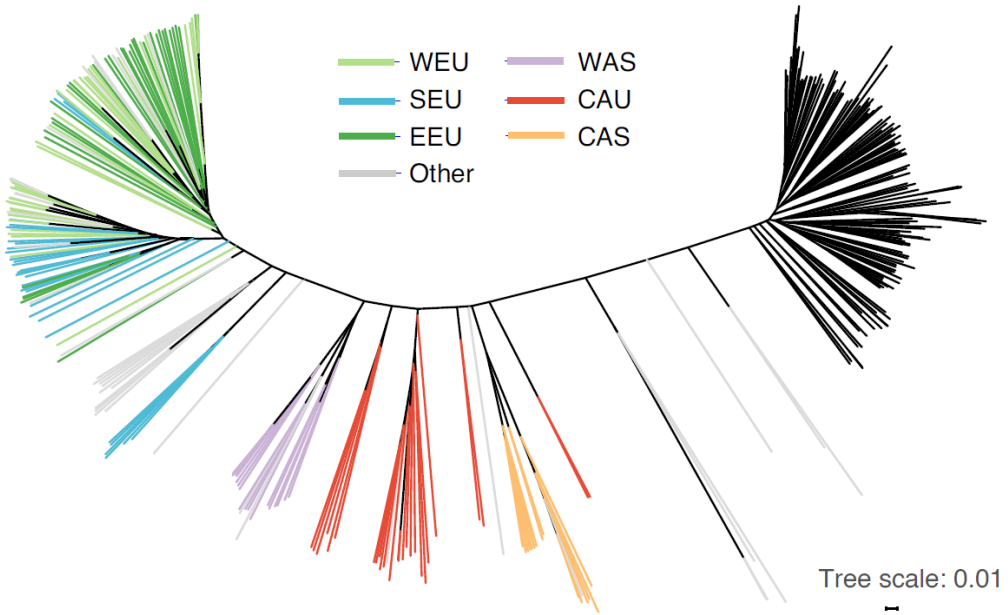
Nat Genet 2021, 53:752-760

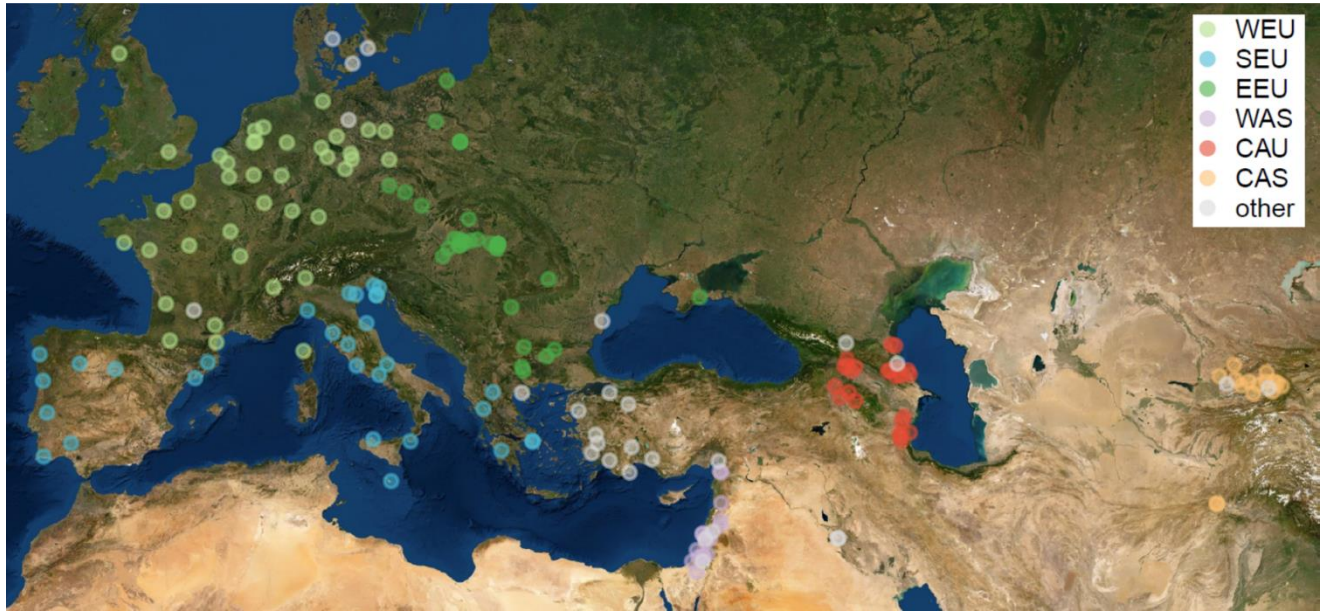
Intra-specific structure in *L. serriola*



Nat Genet 2021, 53:752-760

Phylo-geographic grouping of *L. serriola*



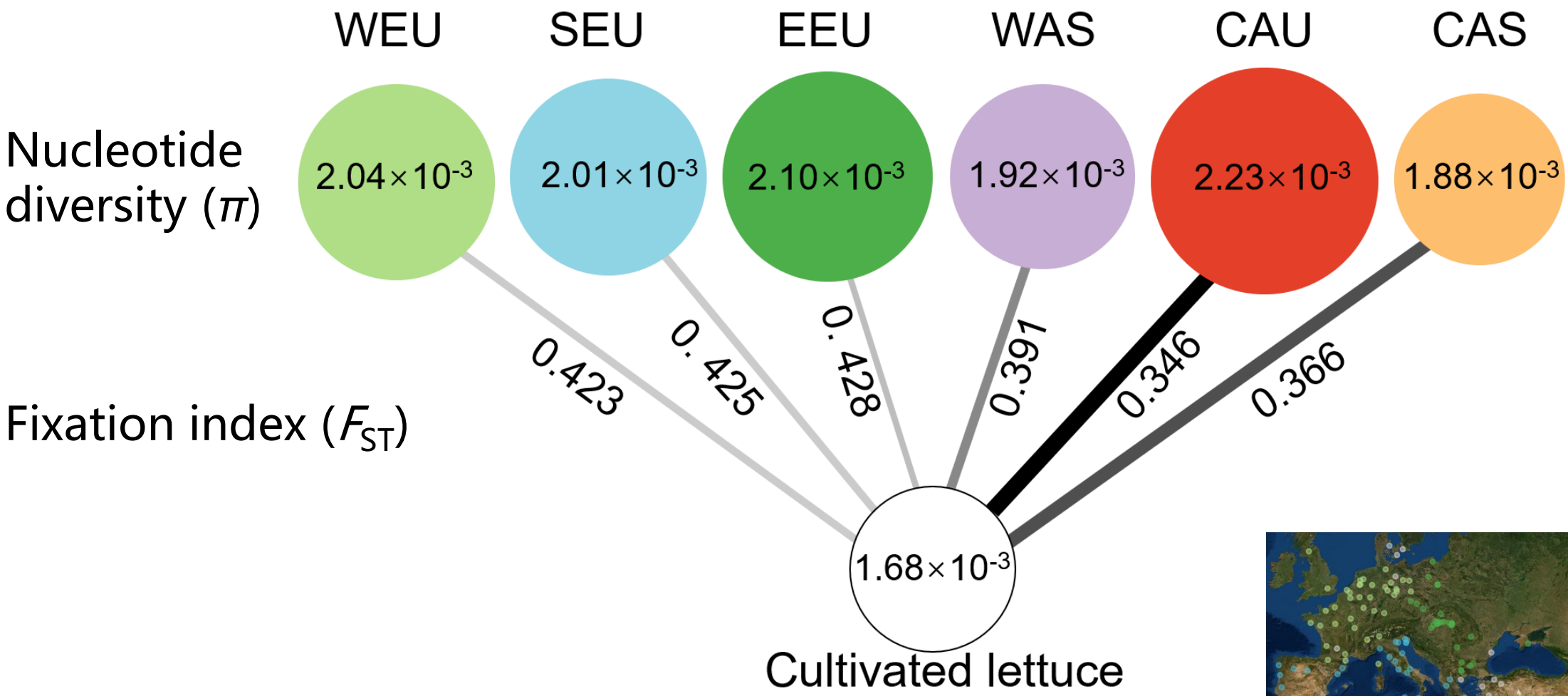


3 European groups
- WEU: western Europe
- SEU: southern Europe
- EEU: eastern Europe

3 Asian groups
- WAS: western Asian
- CAU: Caucasian
- CAS: central Asian

Nat Genet 2021, 53:752-760

The highest π in the CAU group



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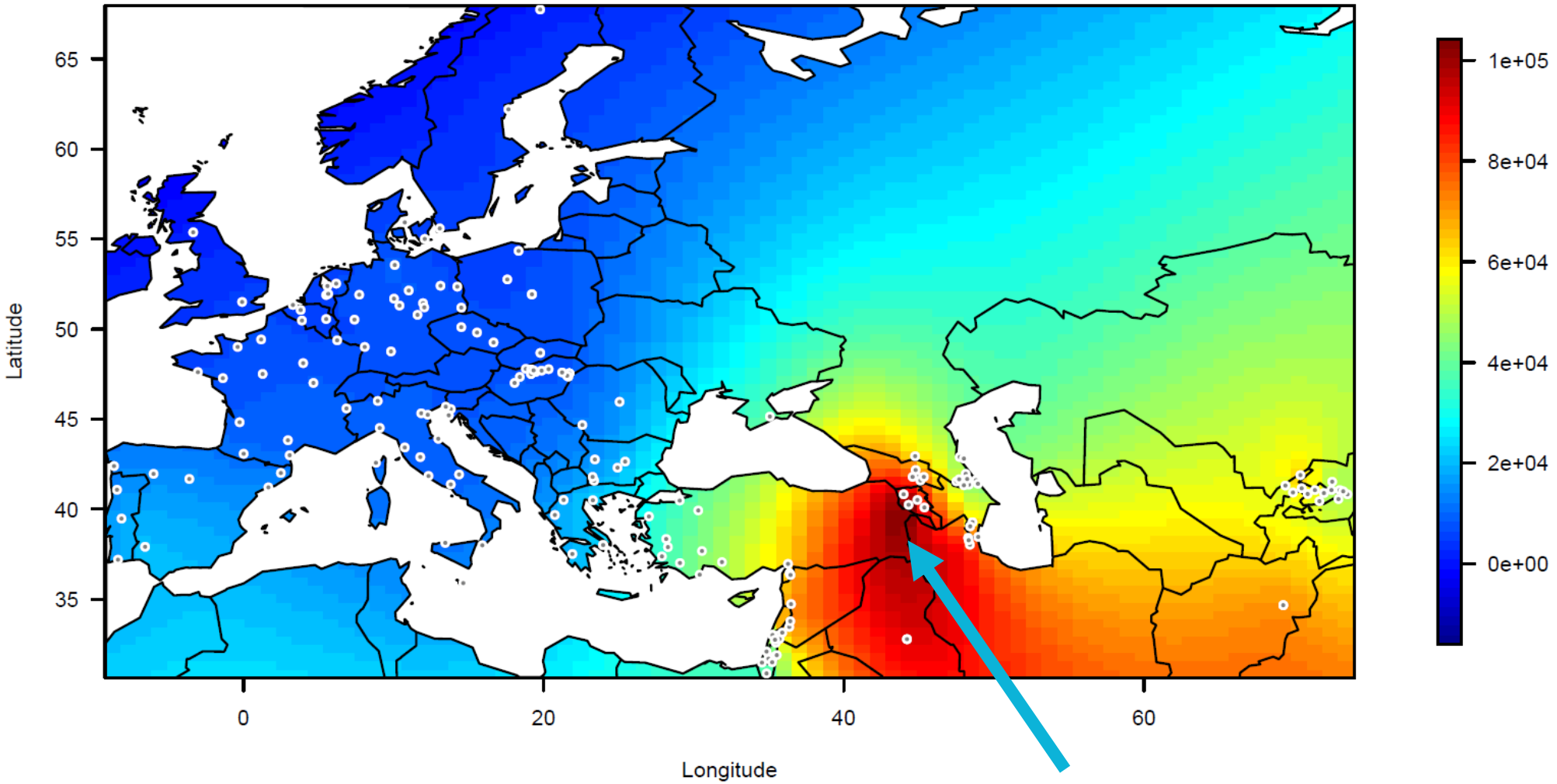
The most abundant singletons in CAU



Vavilov center of origin

Nat Genet 2021, 53:752-760

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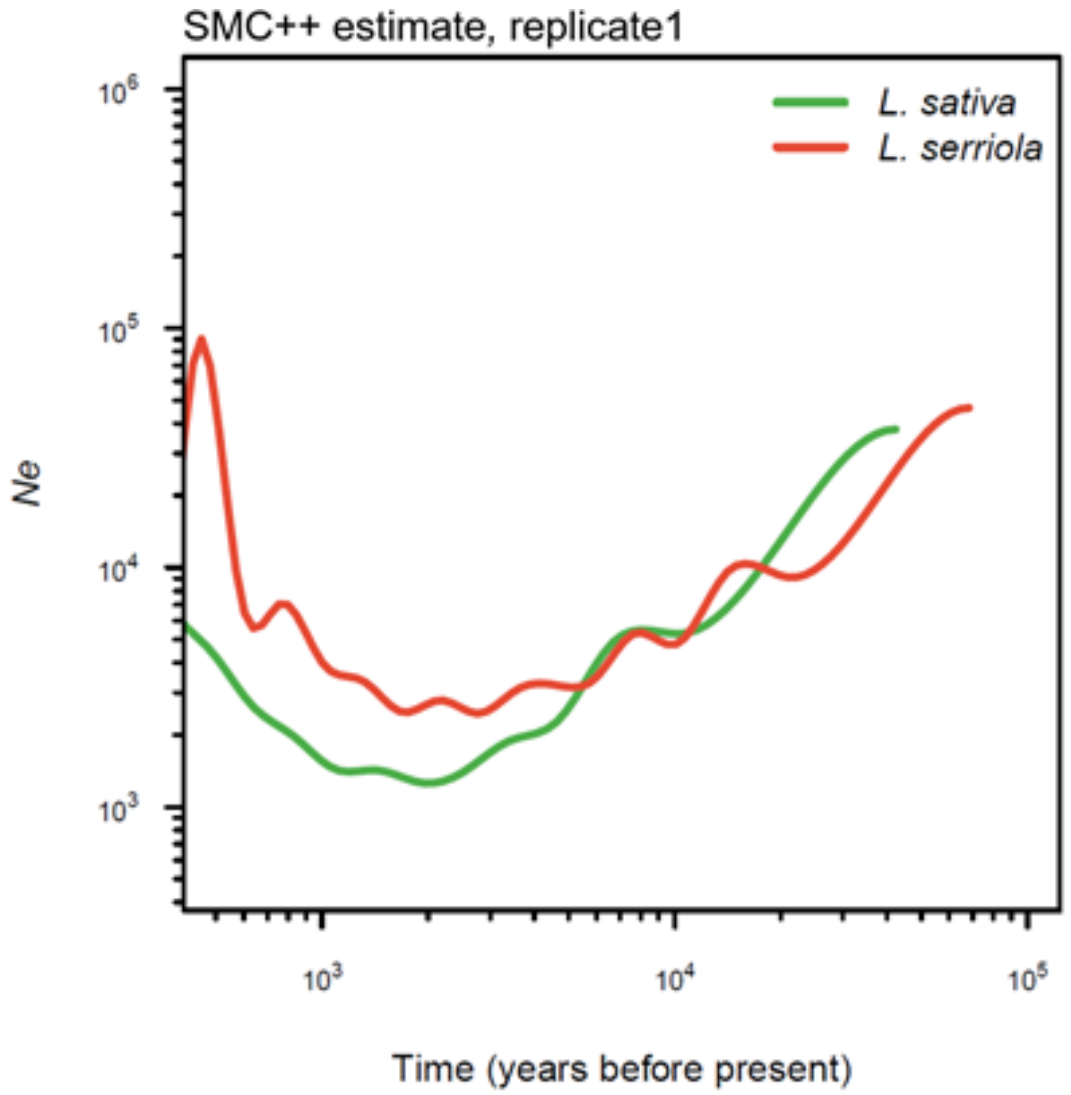
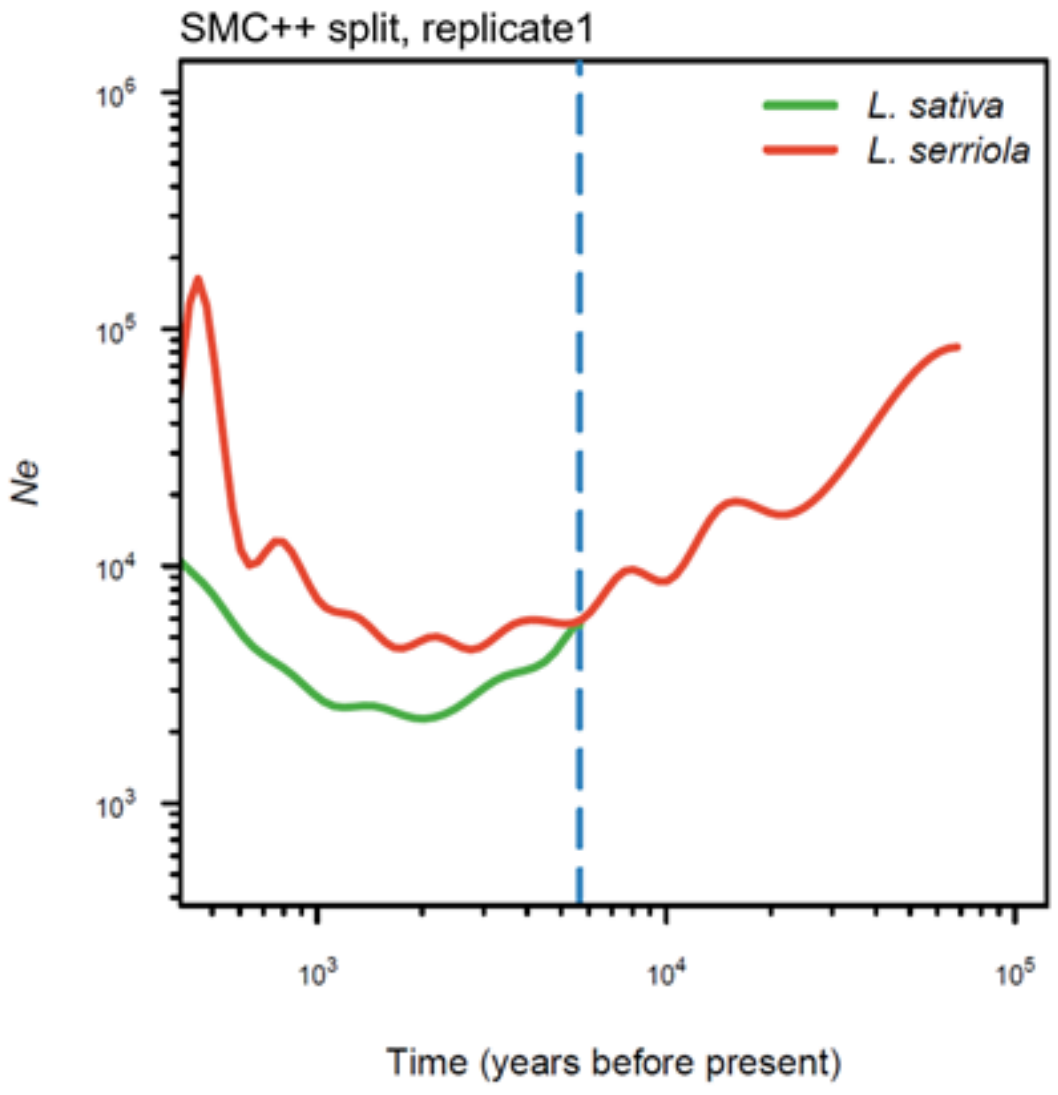
Divergence of *L. sativa* and *L. serriola*





Nat Genet 2021, 53:752-760

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Answers to the scientific question

- Q1: Where was lettuce domesticated?
- A1: Lettuce was domesticated from the *L. serriola* population from, or close to, the Caucasus.

- Q2: When was lettuce domesticated?
- A2: The divergence time between *L. sativa* and *L. serriola* was approximately 6,000 years ago.

Nat Genet 2021, 53:752-760

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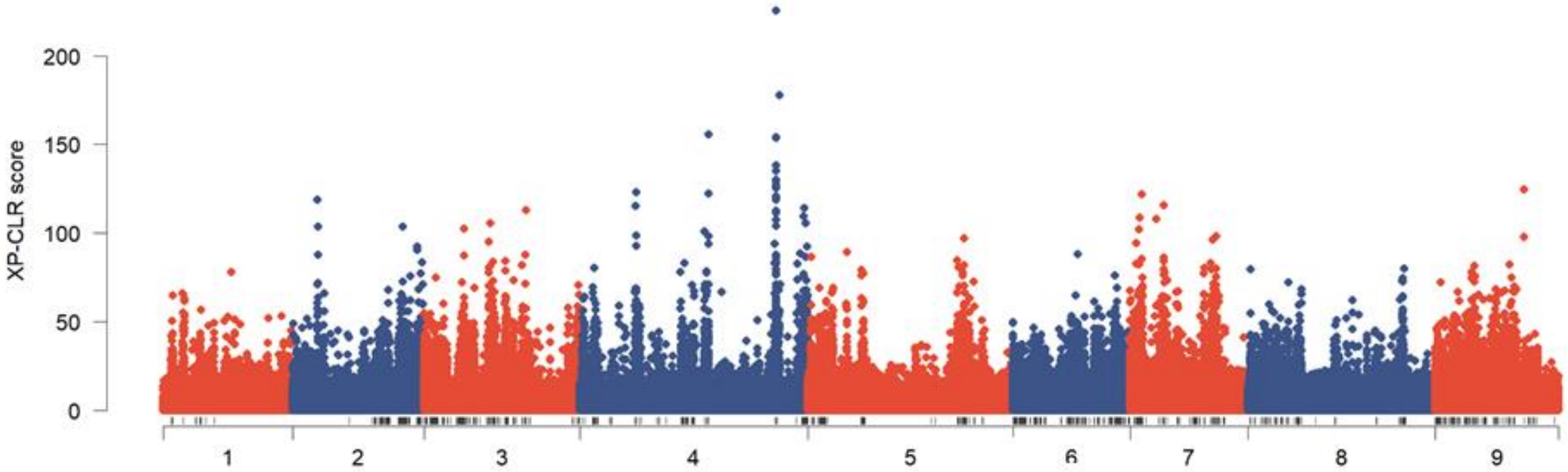
Selective sweeps in the lettuce genome

107.7 Mb and 2,304 genes within 4,089 selective sweeps



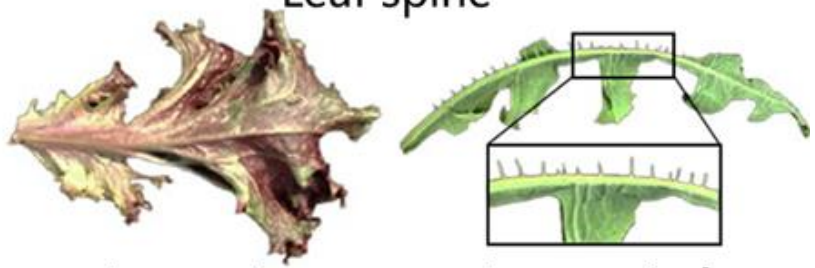
Nat Genet 2021, 53:752-760

GWAS of domestication traits

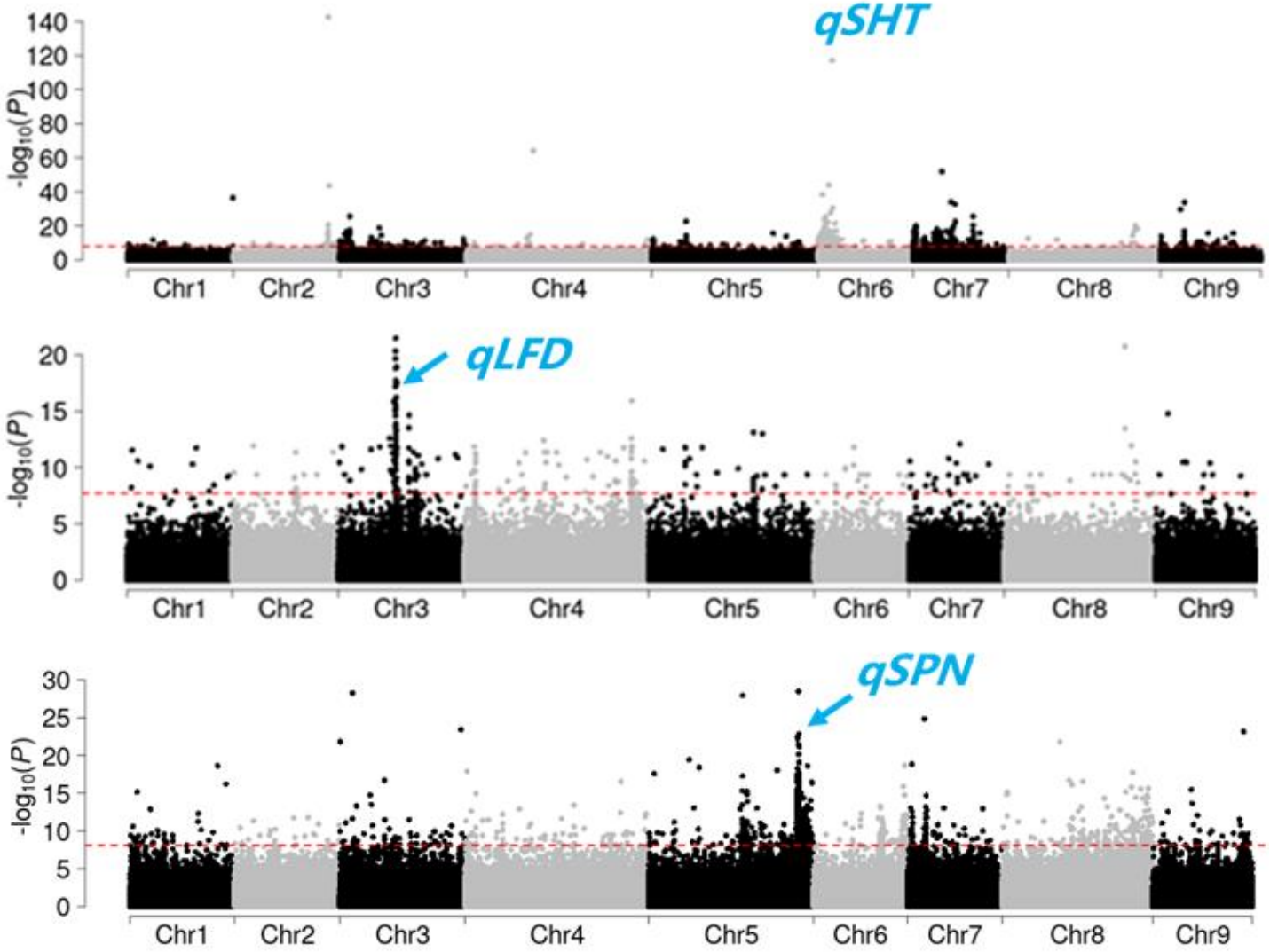
Seed shattering

Leaf morphology

Leaf spine



L. sativa *L. serriola*



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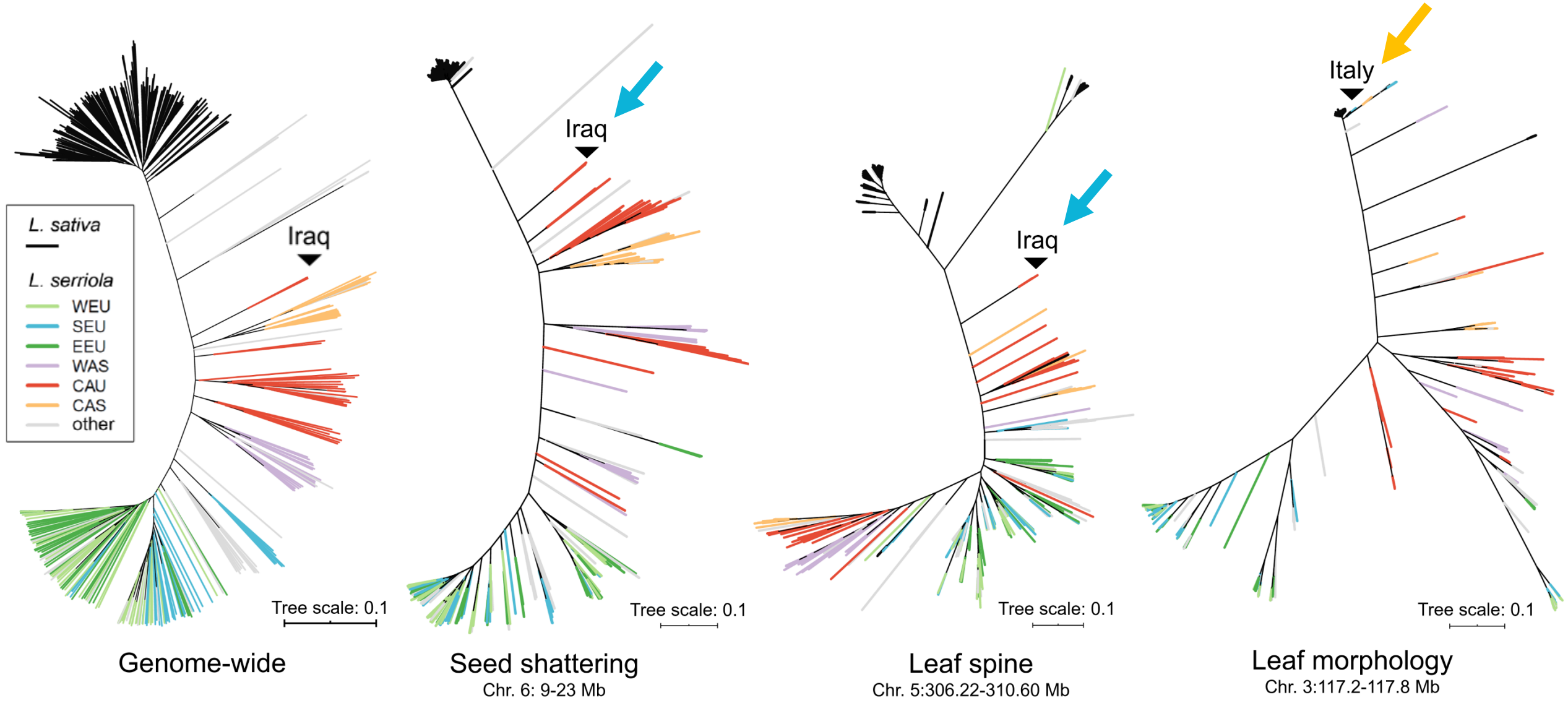
Origins of domestication traits



Genome-wide

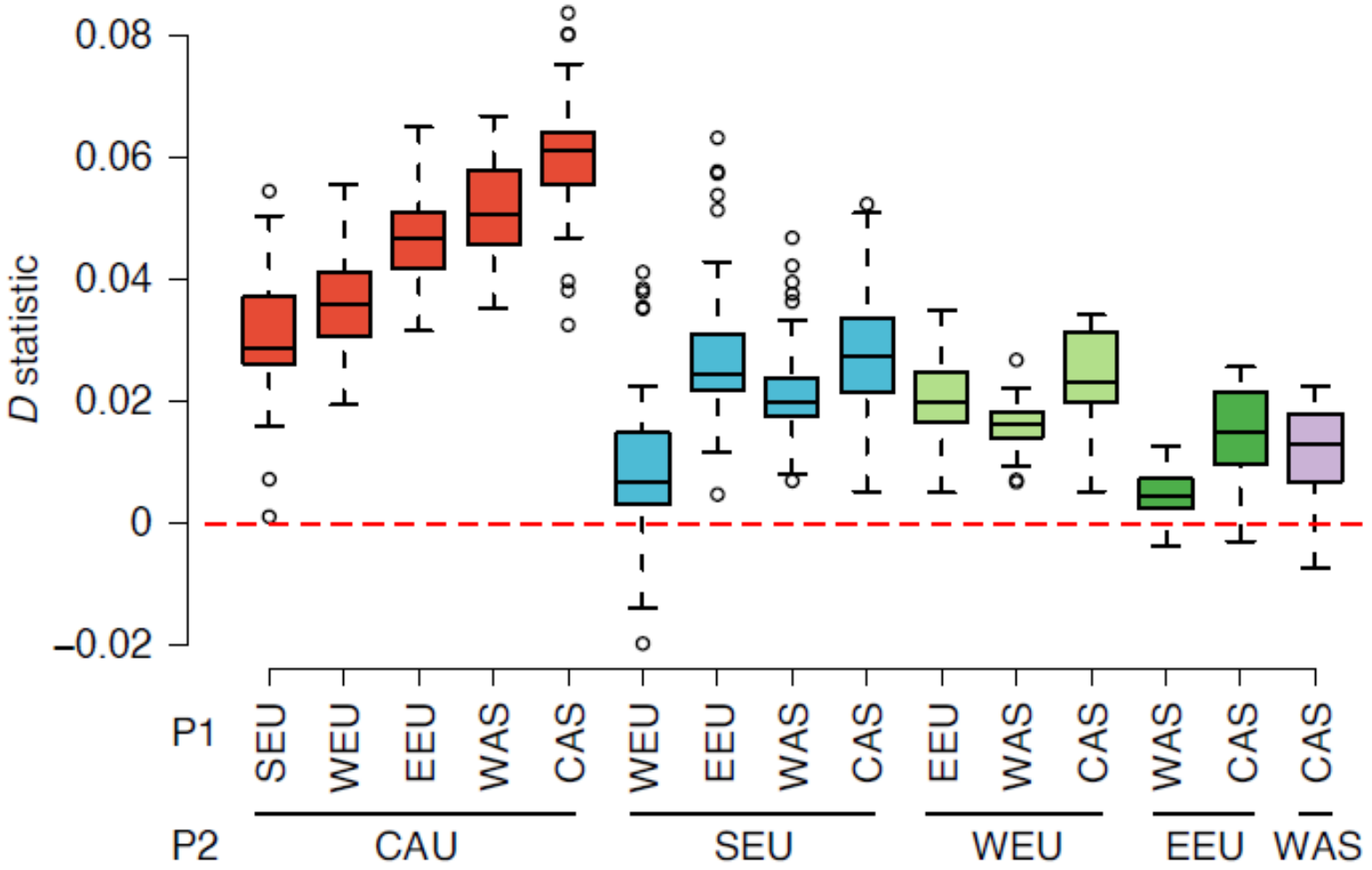
Seed shattering
Chr. 6: 9-23 Mb

Leaf spine
Chr. 5:306.22-310.60 Mb

Leaf morphology
Chr. 3:117.2-117.8 Mb

Nat Genet 2021, 53:752-760

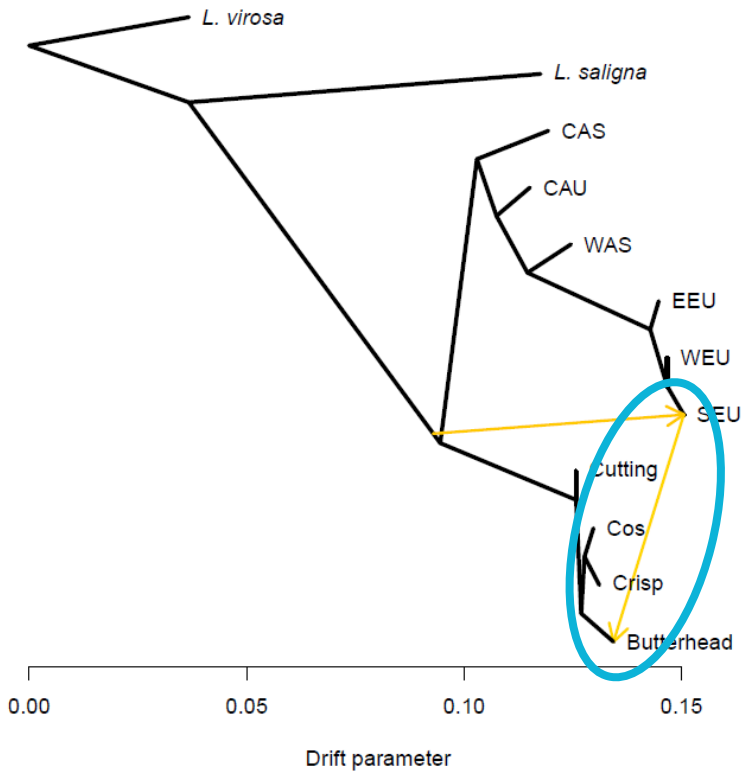
BGI华大 Close relationship between SEU and lettuce



Outgroup: *L. saligna*
P3: *L. sativa*
P1 & P2: *L. serriola* groups

Nat Genet 2021, 53:752-760

Gene flow from SEU and *L. virosa*



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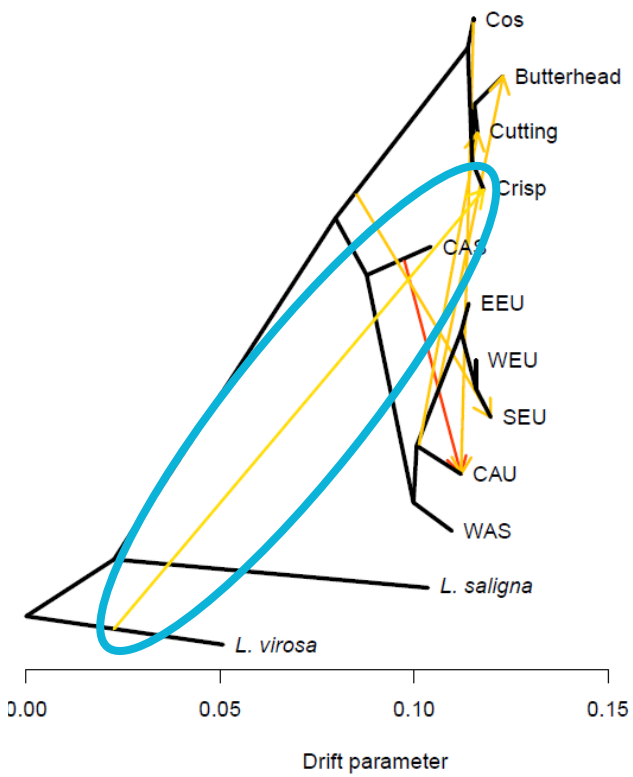

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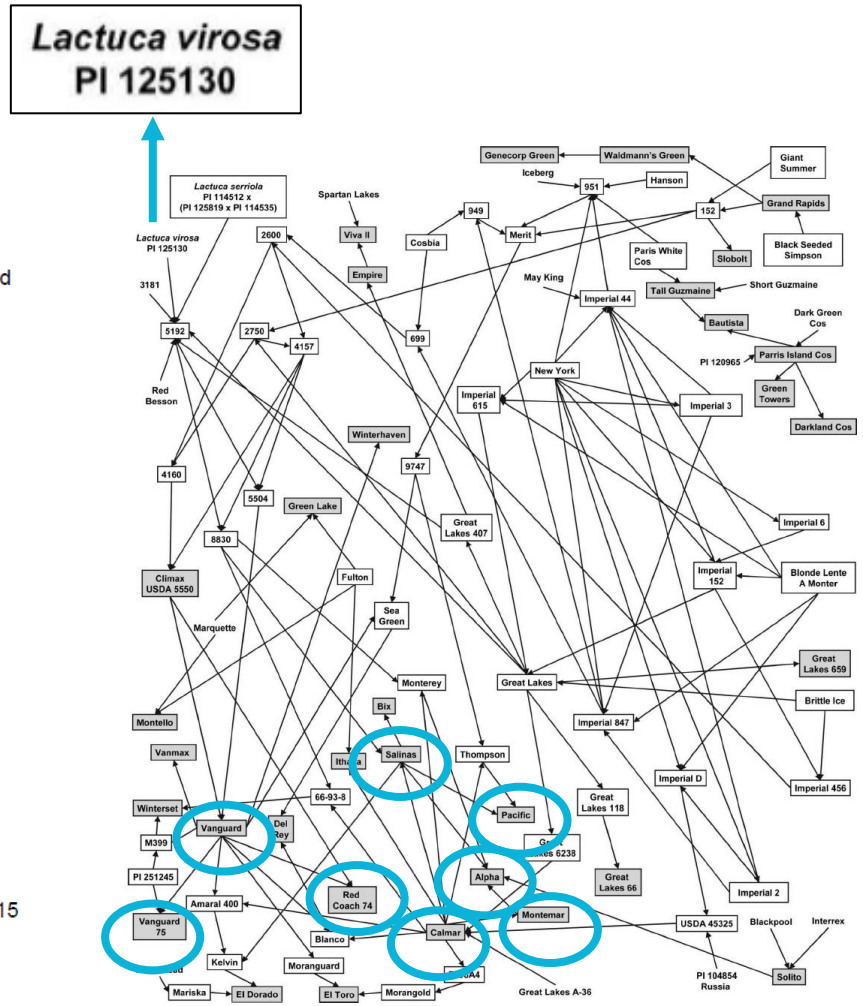
Nat Genet 2021, 53:752-760



Hortscience (2007) 42,489

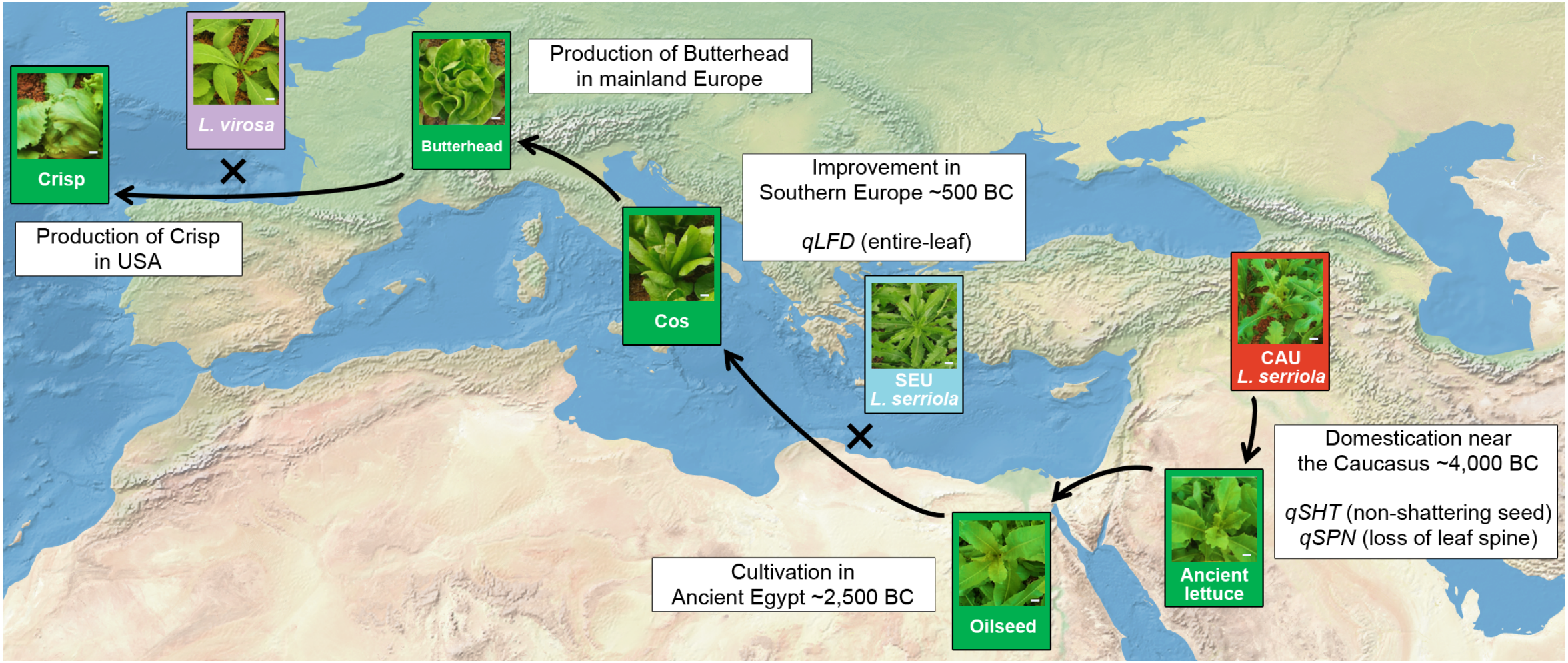
Answers to the scientific questions

- Q3: What are the key events during lettuce domestication?
- A3: Non-shattering seed and loss of leaf spine marked lettuce domestication, while the entire-leaf trait was introduced in Southern Europe.

- Q4: What are the genetic determinants for domestication traits?
- A4: Genomic regions associated with seed shattering, leaf spine and leaf morphology were identified.

Nat Genet 2021, 53:752-760

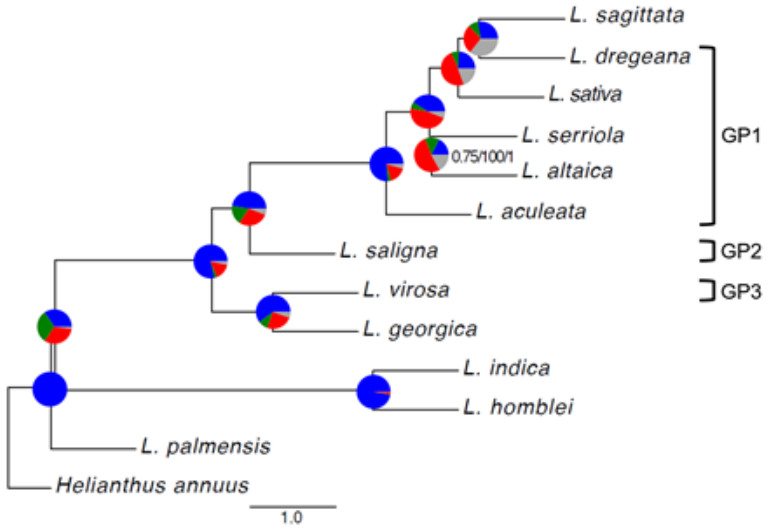
A proposed domestication history



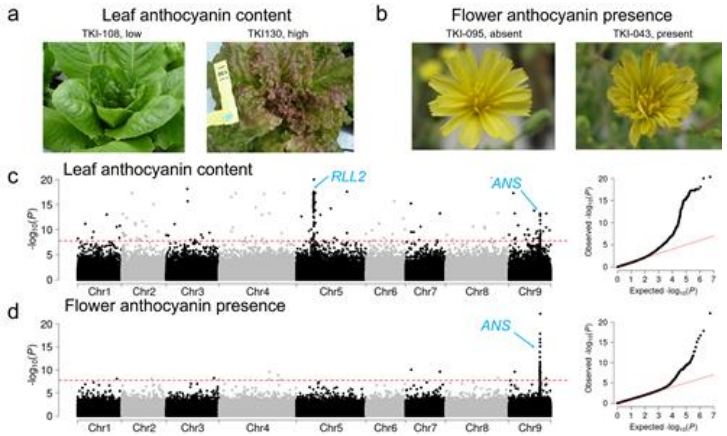
Nat Genet 2021, 53:752-760

Other findings

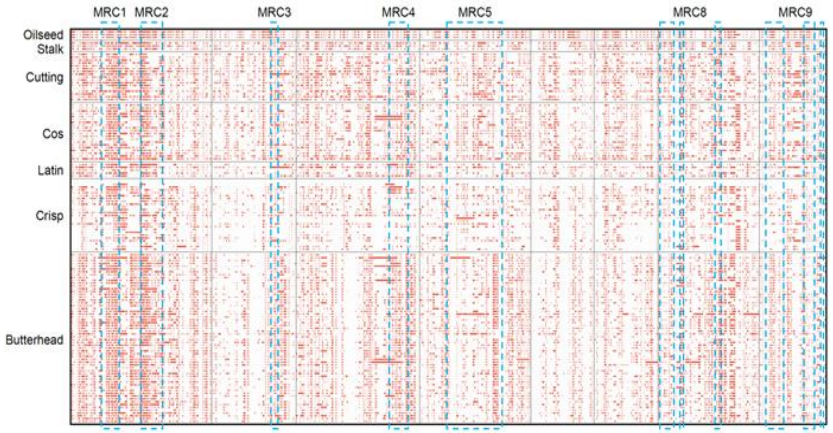
Lactuca phylogeny



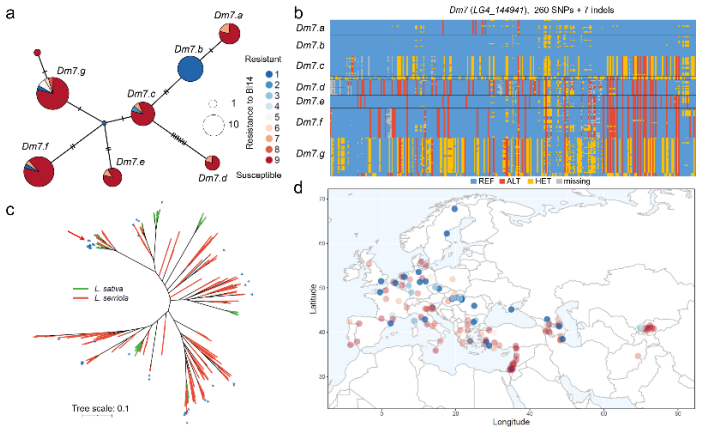
Association with traits



Wild introgression



Resistance haplotype



Summary

- Resequencing of 445 accessions generated a comprehensive variation map for cultivated and wild lettuce
- Population analyses revealed clarified taxonomic issues in GP status
- Demography identified selective sweeps and major genetic determinants of agronomic traits during lettuce domestication and improvement
- Our study revealed the domestication history of cultivated lettuce

Summary: clear scientific questions

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Lettuce is an important vegetable crop

- Consumed worldwide
- A rich source of vitamin K and vitamin A, and a moderate source of folate and iron
- Ranks the 3rd in leafy vegetable worldwide

http://www.fao.org/faostat/

53 ★

Lettuce is a model Asteraceae plant

- A short life cycle
- Easy for transformation
- Well-preserved germplasms
- Various agronomic traits
- Potential bioreactor

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Lettuce crop types

L. serriola
proposed wild progenitor

55 ★

Lettuce cultivation history

From a 14th century medical book in Europe

Painted stela of Tatiaset from the ancient Egypt

https://valentinachirico.com/2020/10/lettuce-ancient-egypt-usages/

56

The oldest archaeological evidence

This tomb dates to the V dynasty, 2494-2345 BC

An Ancient Egyptian Herbal (p. 113)

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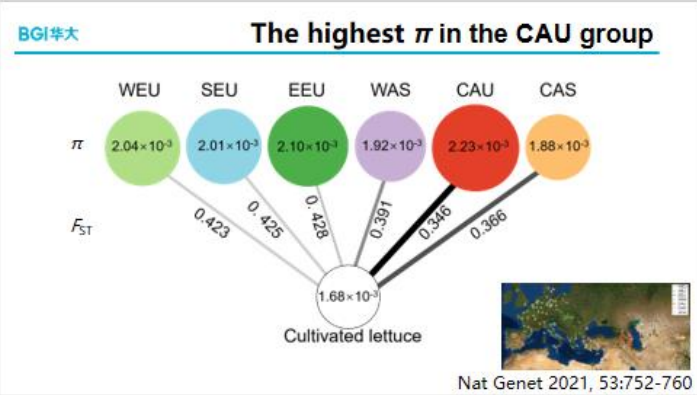
Scientific questions about domestication

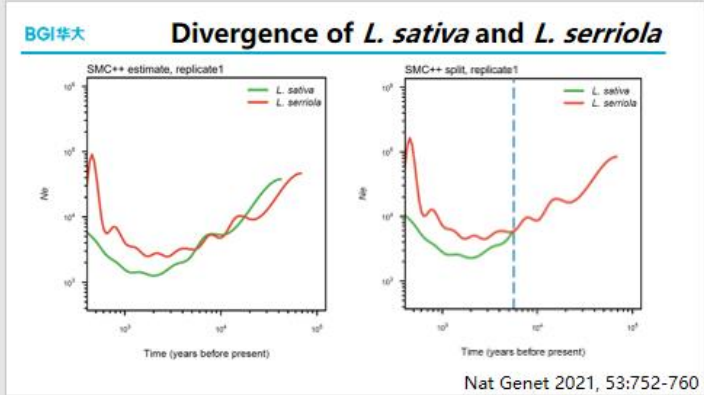
1. Where was lettuce domesticated?
2. When was lettuce domesticated?
3. What are the genetic determinants for important agronomic traits?
4. What are the key events during lettuce domestication?

58

Summary: a story line



1



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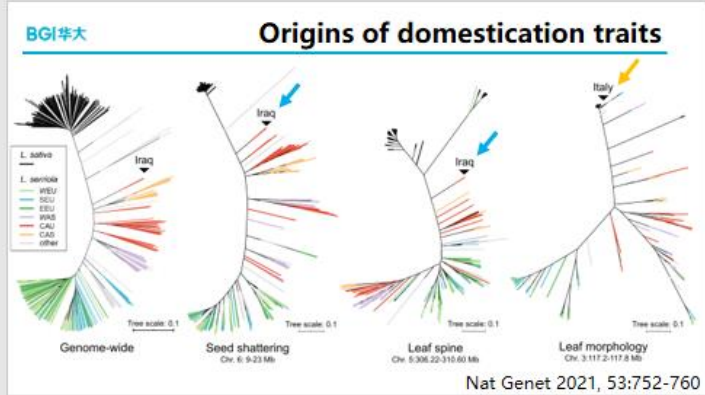

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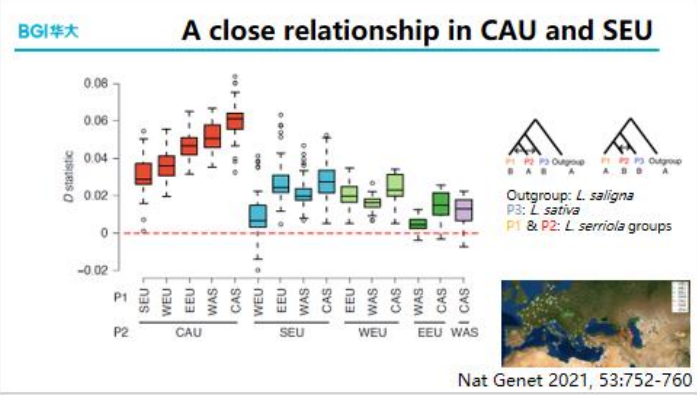

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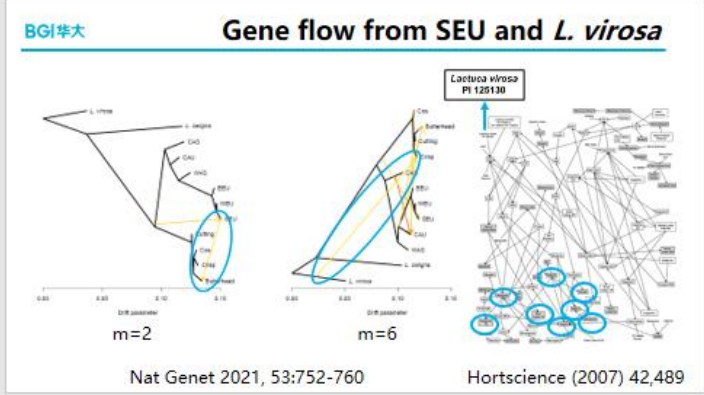

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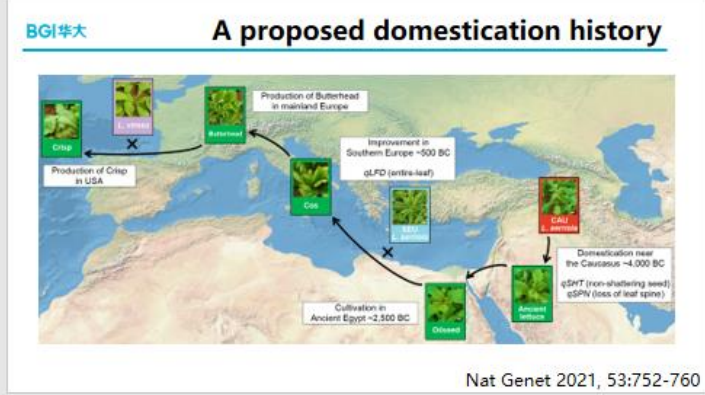


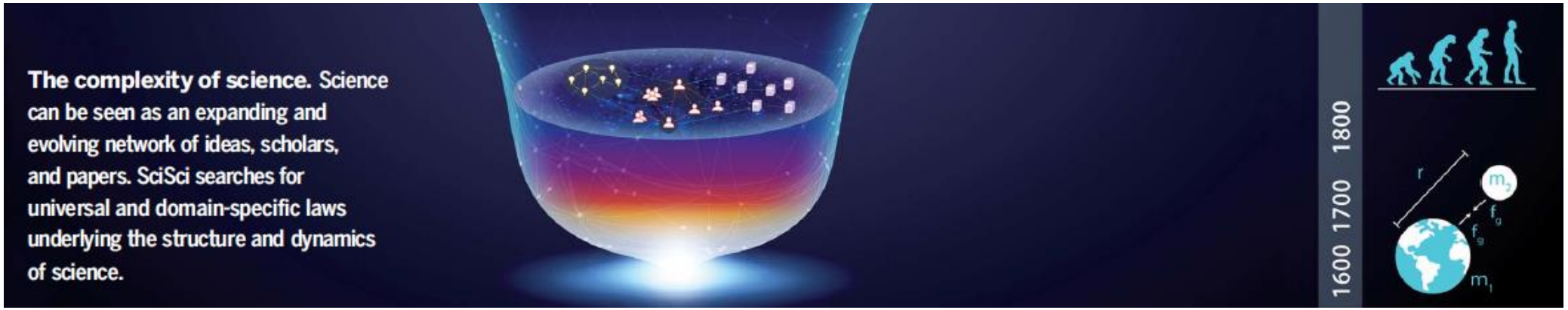
6

Science of Science

华大生命科学研究院
BGI · research

The science of science

How does science work?



Science 2018, 359:eaao0185

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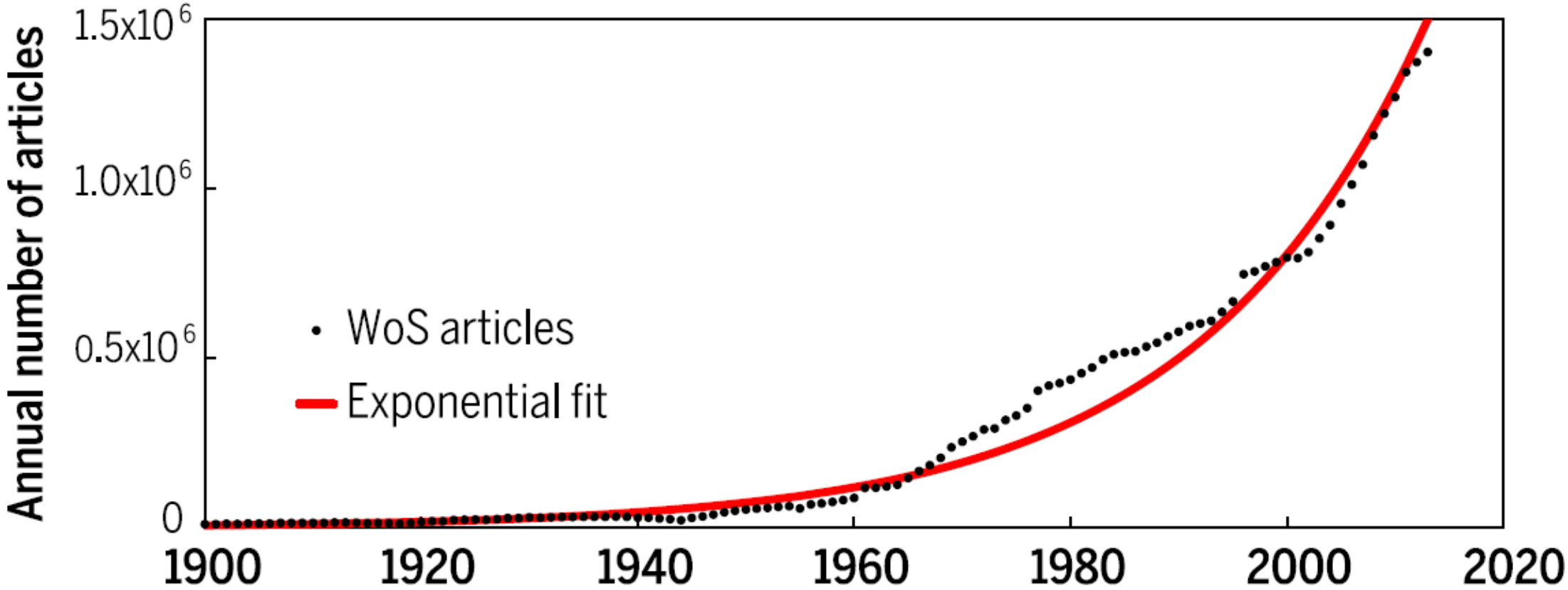
Growth of science



Science 2018, 359:eaao0185

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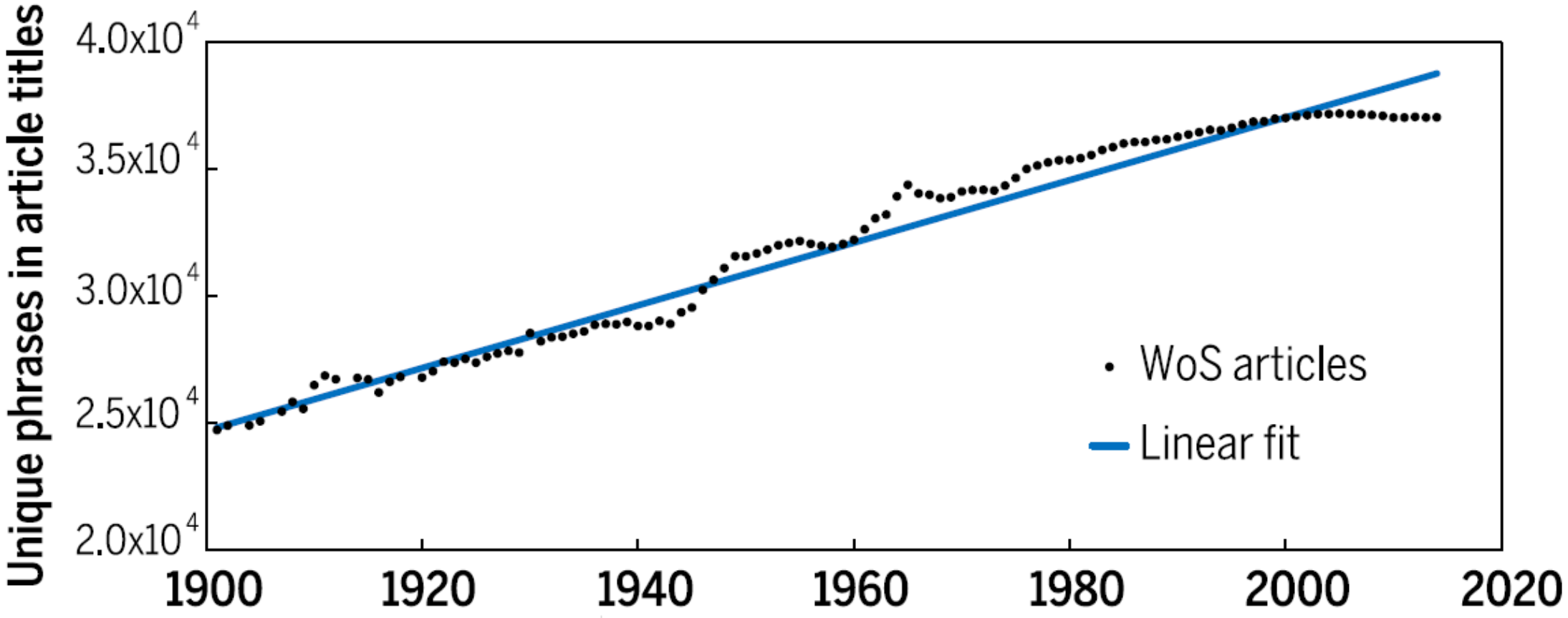
Growth of ideas



Science 2018, 359:eaao0185

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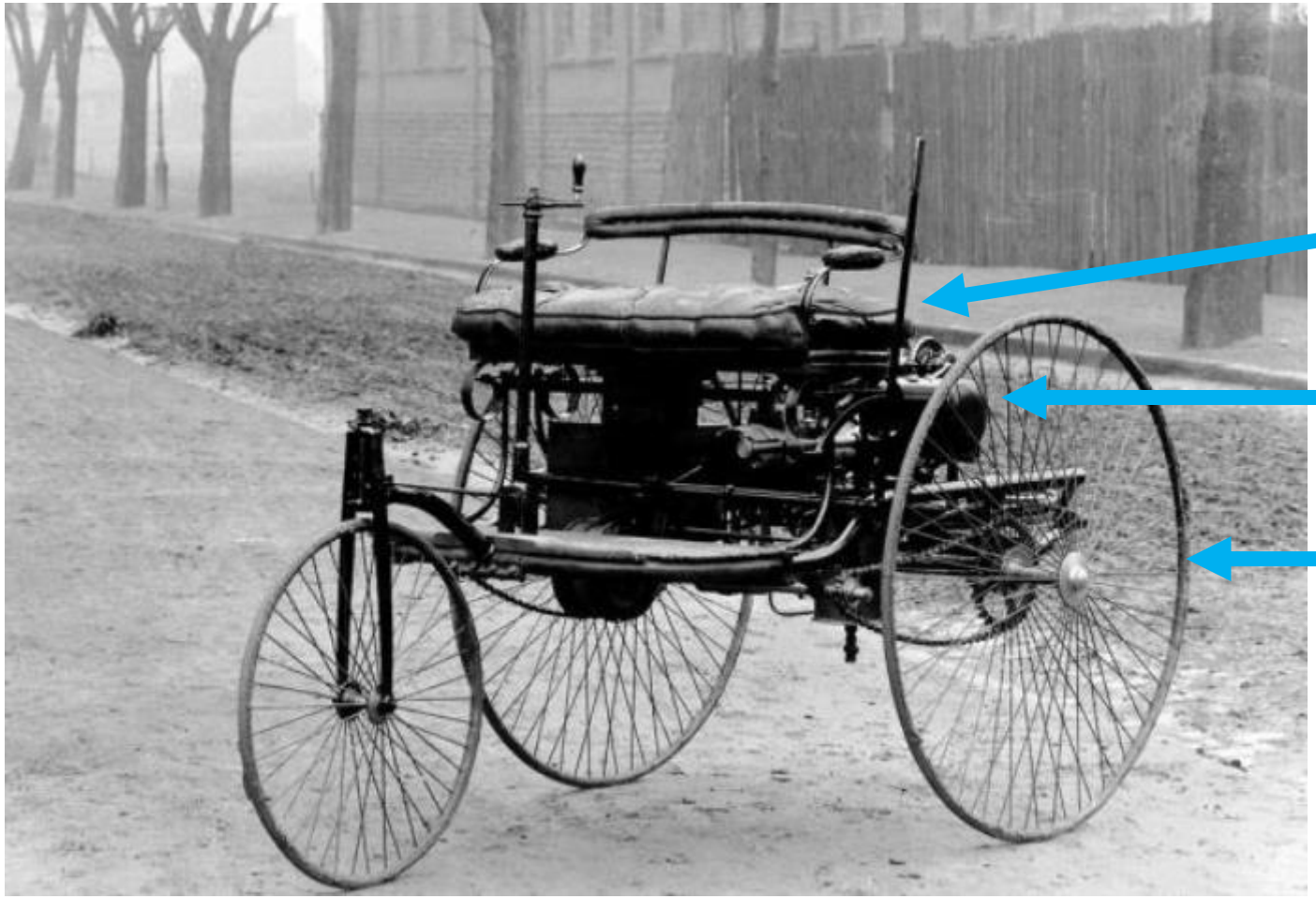
New ideas from combinations



The first automobile – Benz Motorwagen in 1885

The Science of Science, part 3, pp. 31

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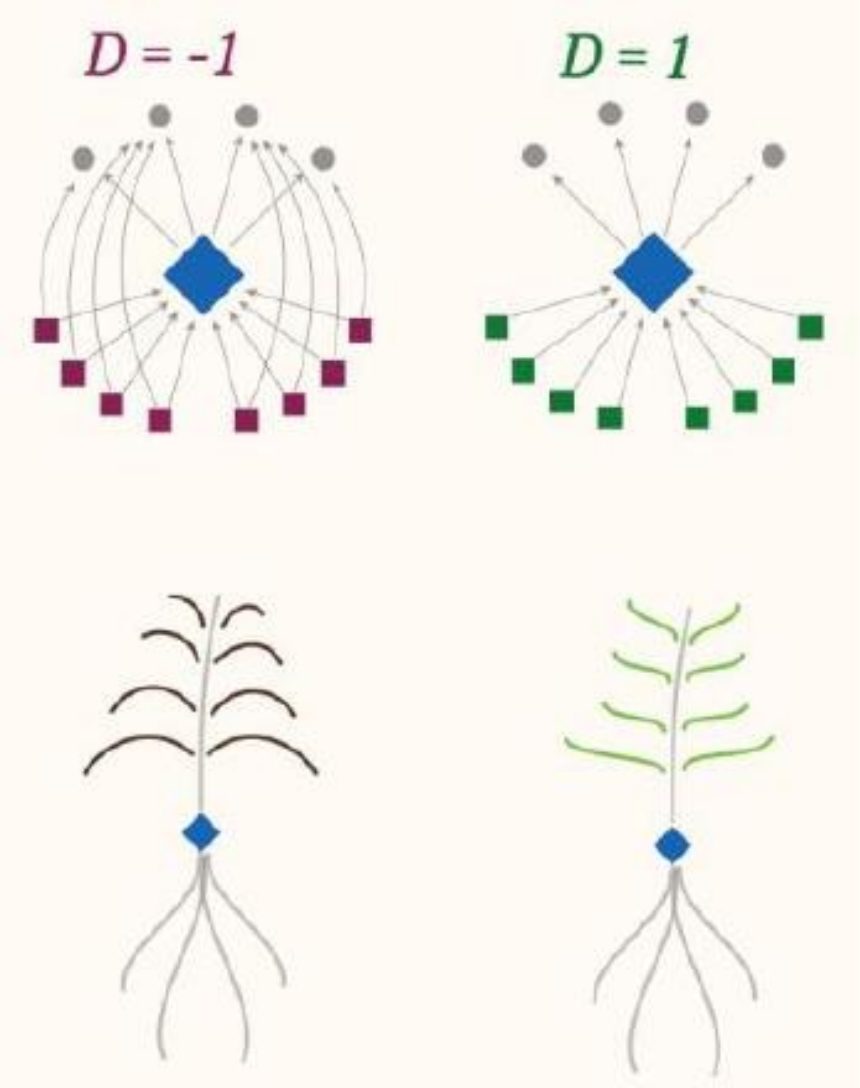
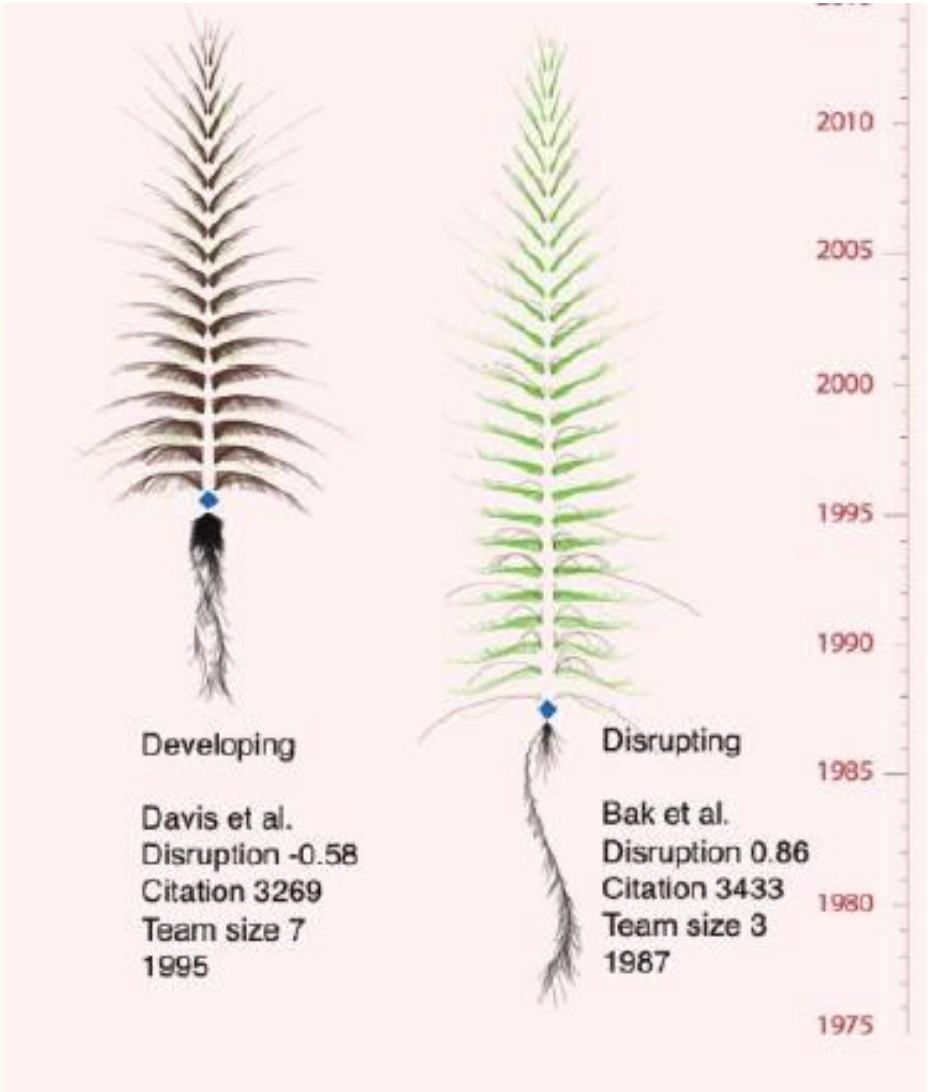
Feature in innovations





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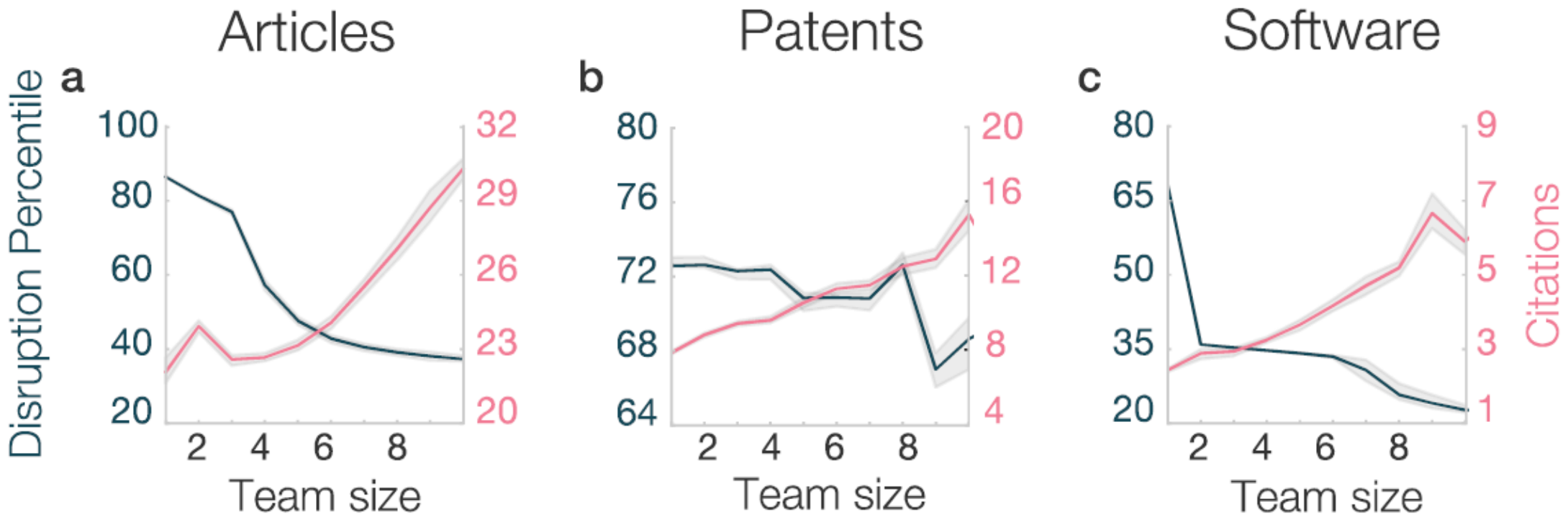
Team size vs. innovations



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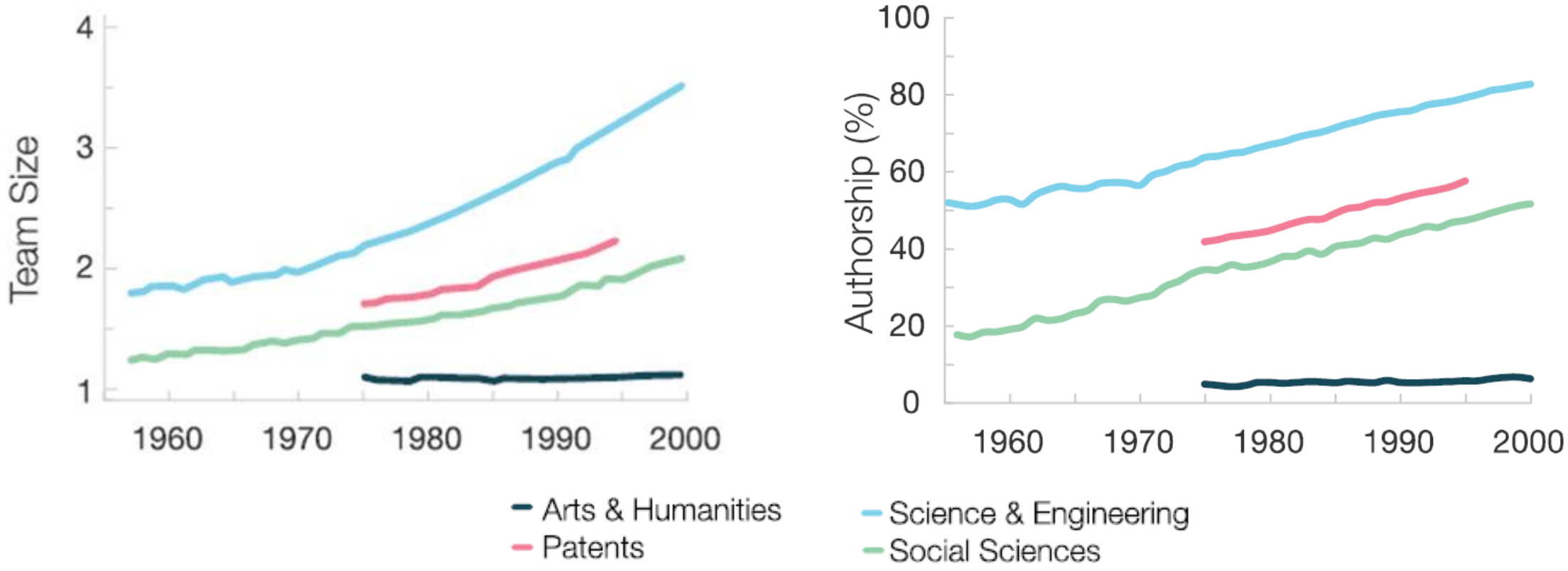
Prevalence of team science



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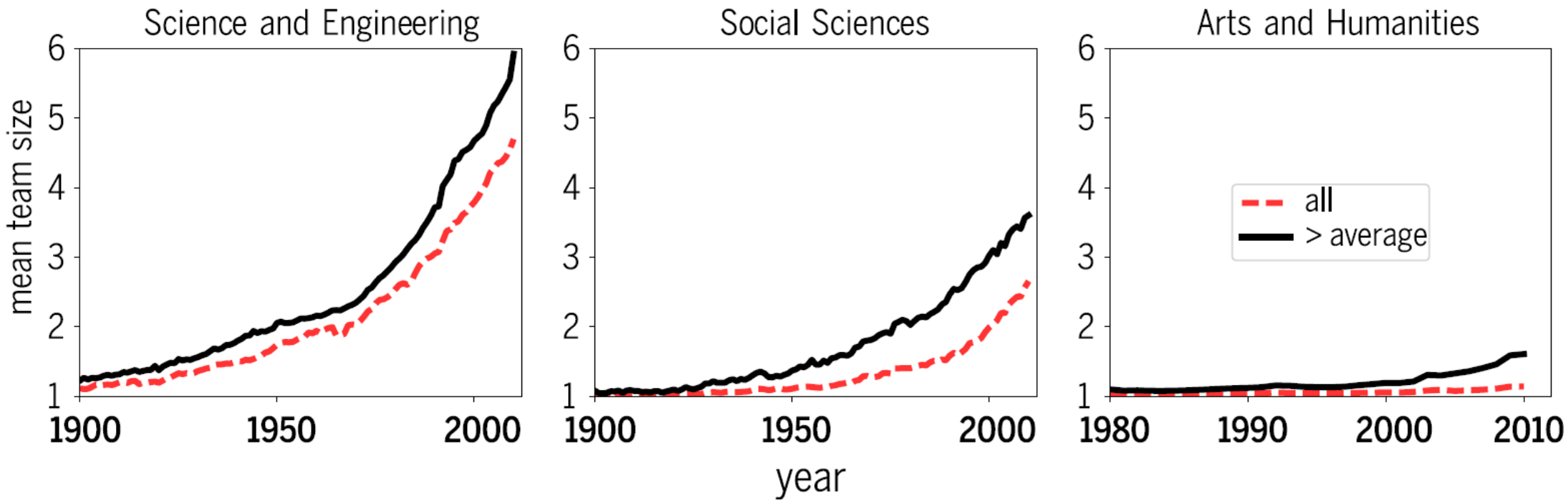
Large teams receive more citations



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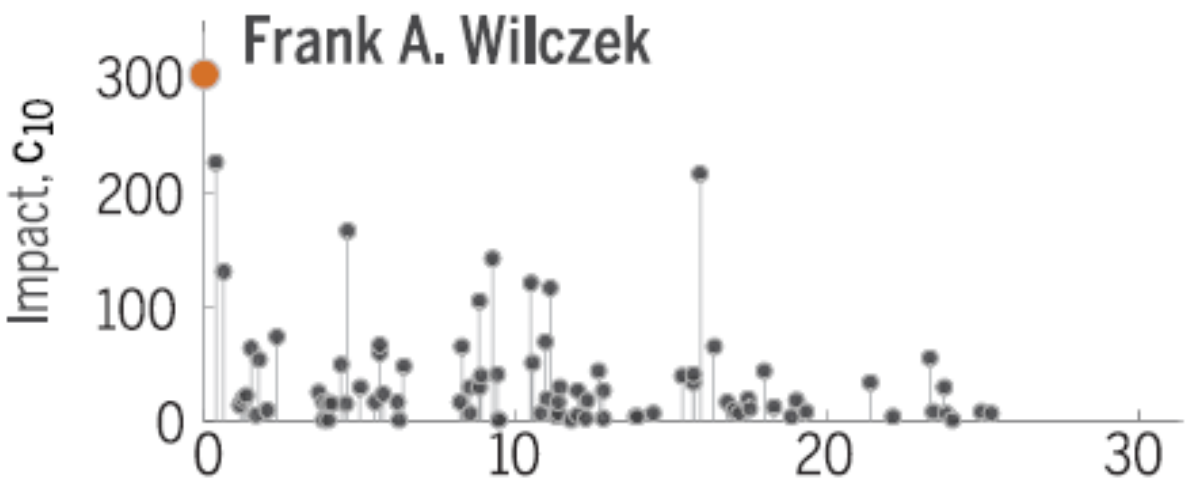
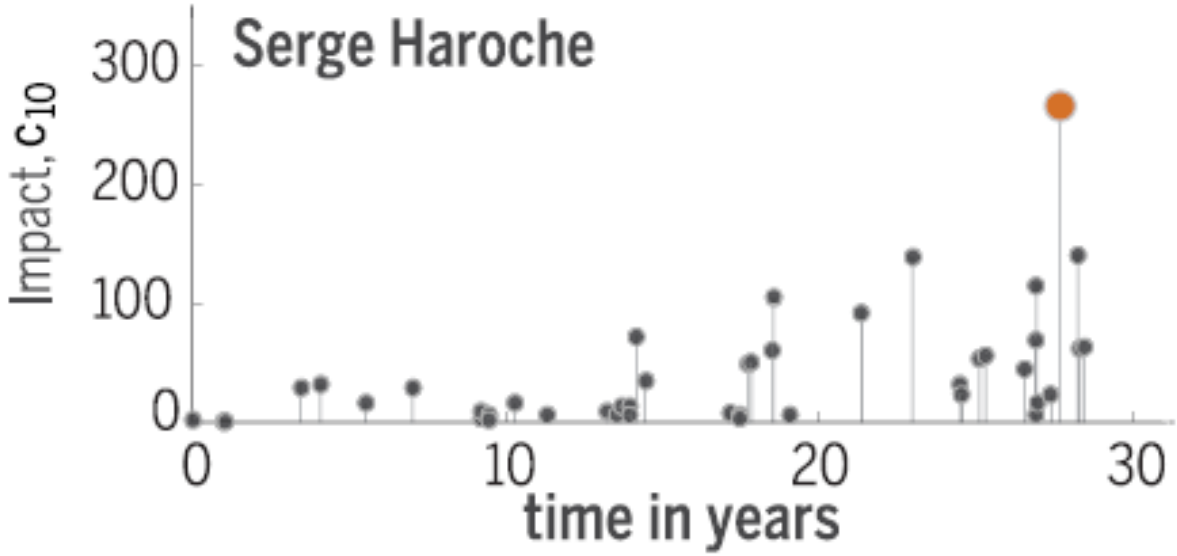
Productivity in scientific careers

Nobel Prize in Physics in 2004



Nobel Prize in Physics in 2012



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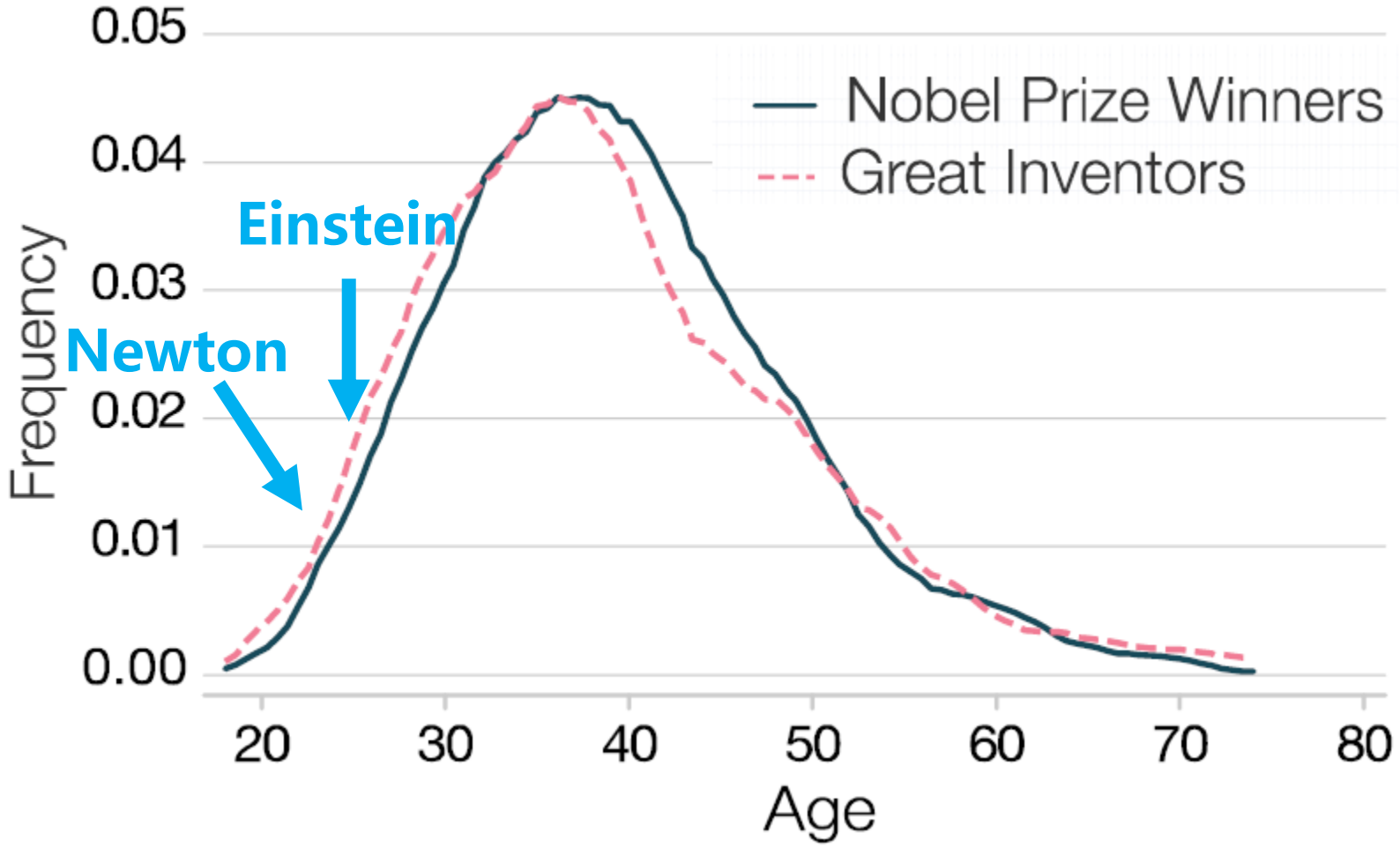
Great innovations in 30-40s



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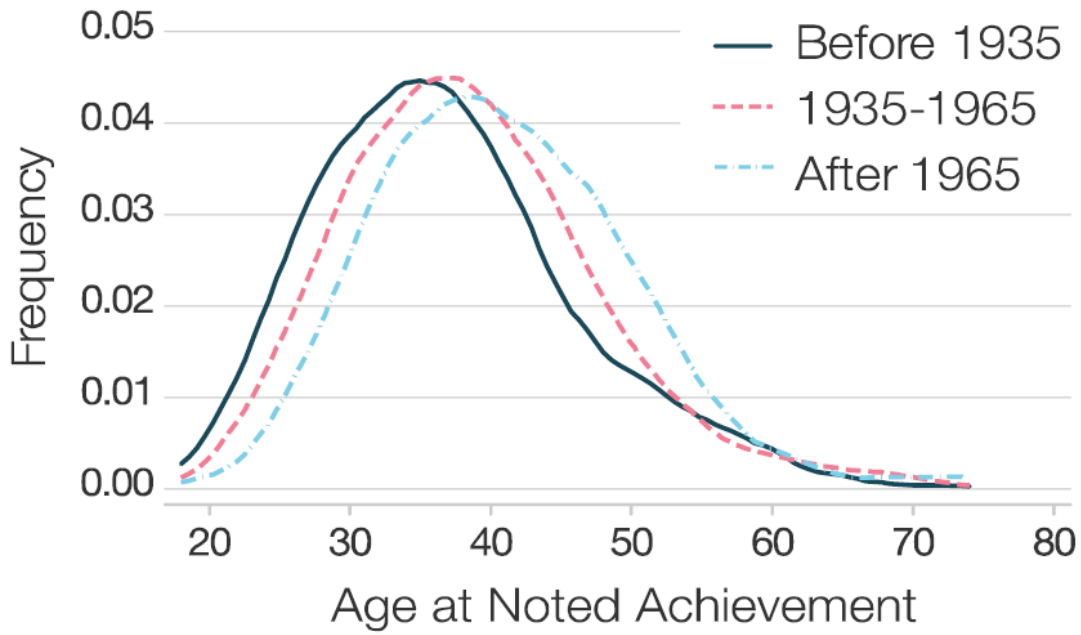
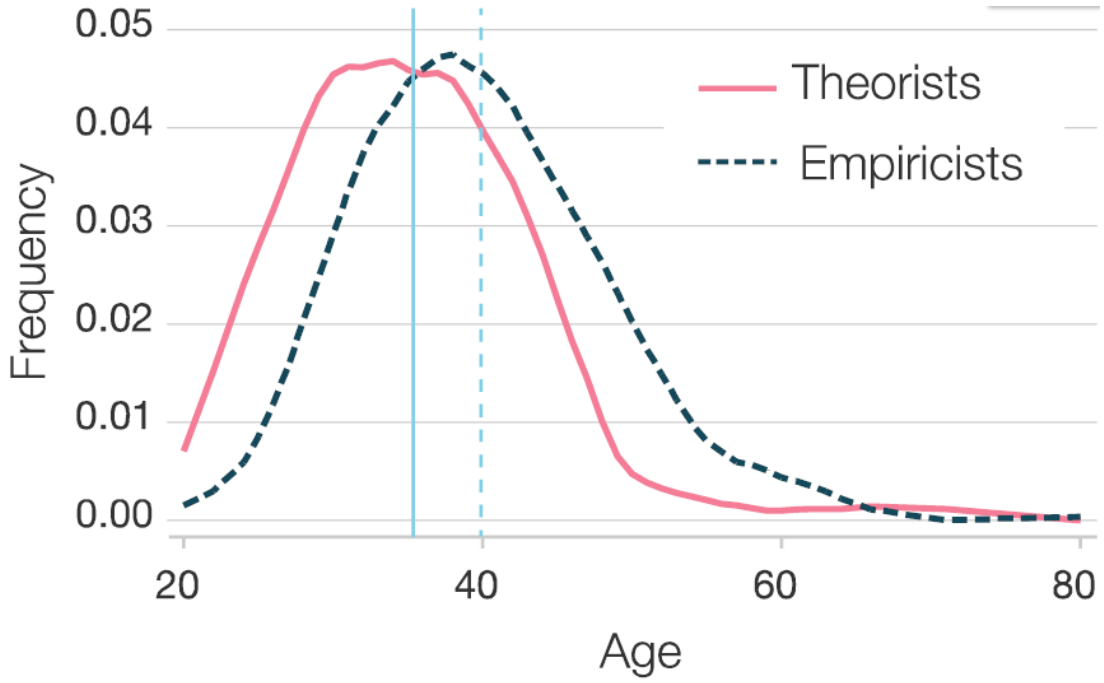
Age of great innovation

Shift during past century



Difference between careers



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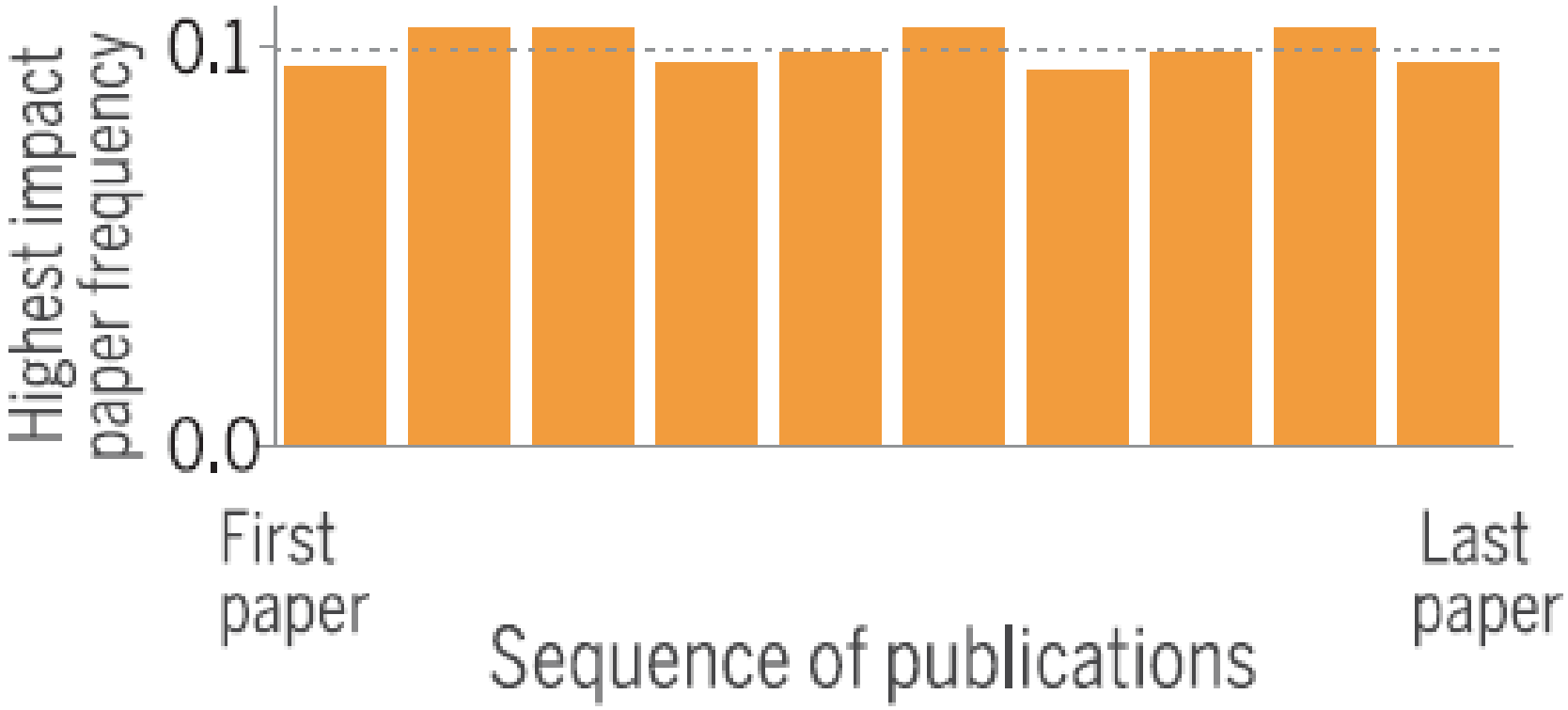
Productivity in scientific careers



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Summary

- **Innovation**: Left bare, truly innovative and highly interdisciplinary ideas may not reach maximum scientific impact. To enhance their impact, **novel ideas** should be placed **in the context of established knowledge**.
- **Persistence**: A scientist is never too old to make a major discovery, as long as he or she **stays productive**.
- **Collaboration**: Research is shifting to teams, so **engaging in collaboration** is beneficial. Works by small teams tend to be more disruptive, whereas those by big teams tend to have more impact.

- **Credit**: Most credit will go to the coauthors with **the most consistent track record** in the domain of the publication.
- **Funding**: Although review panels acknowledge innovation, they **ultimately tend to discount it**. Funding agencies should ask reviewers to assess innovation, not only expected success.

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Questions

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