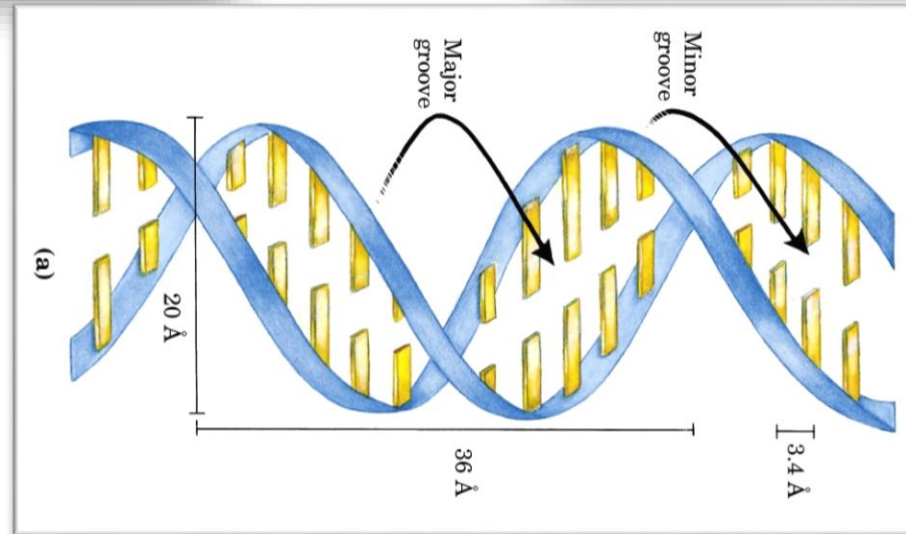


**ΑΠΟ ΤΗ ΓΕΝΕΤΙΚΗ ΣΤΗ ΓΟΝΙΔΙΩΜΑΤΙΚΗ, ΤΗΝ ΕΠΙ-ΜΕΤΑ ΚΑΙ  
ΠΑΝ-ΓΟΝΙΔΙΩΜΑΤΙΚΗ ΚΑΙ ΤΙΣ ΕΦΑΡΜΟΓΕΣ ΤΟΥΣ ΣΤΗΝ  
ΓΕΩΡΓΙΑ, ΤΗΝ ΔΙΑΤΡΟΦΗ ΚΑΙ ΤΗΝ ΠΡΟΣΤΑΣΙΑ ΤΗΣ ΥΓΕΙΑΣ**

**Αθανάσιος Τσαυτάρης**

# GENETIKH





# Γενετική → Γονιδιωματική

Αυτόματη  
αλληλούχιση

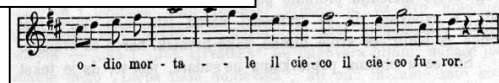


λογισμικό

Αναγνώριση βάσης  
Ποιότητα αλληλουχίας  
Απομάκρυνση φορέα  
Σύνδεση αλληλουχιών

>Gene

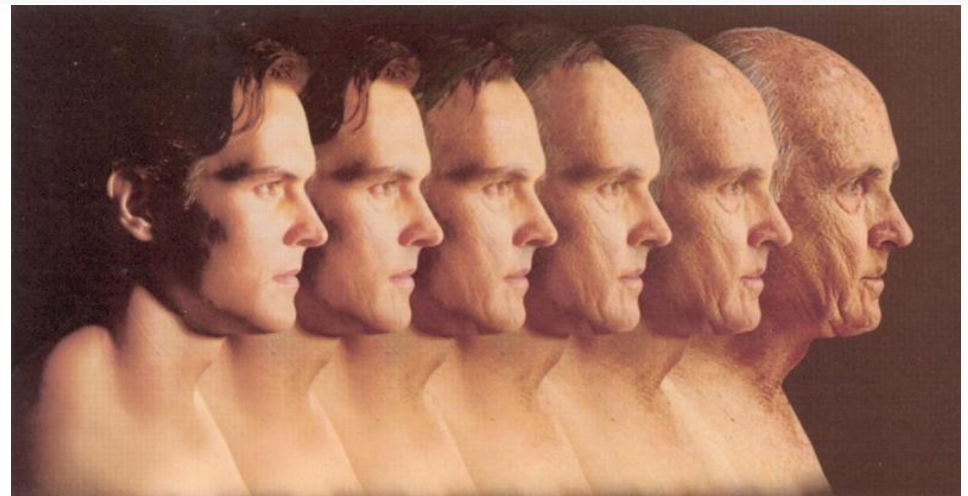
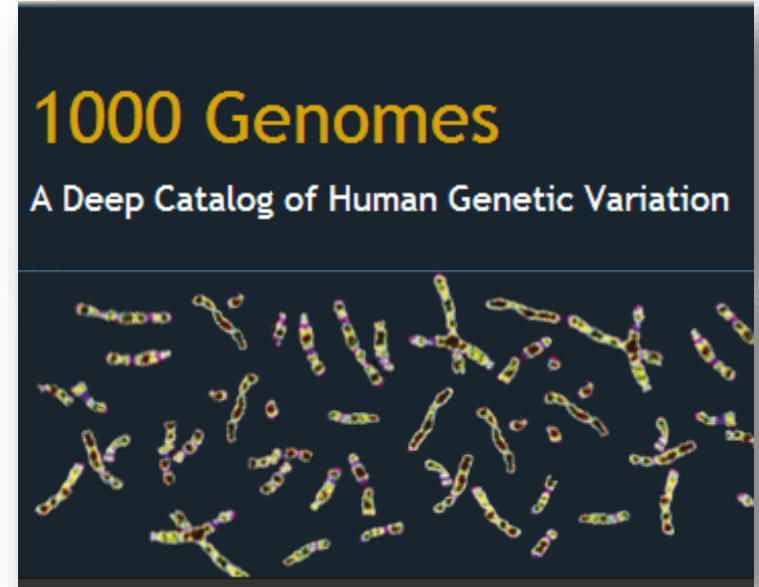
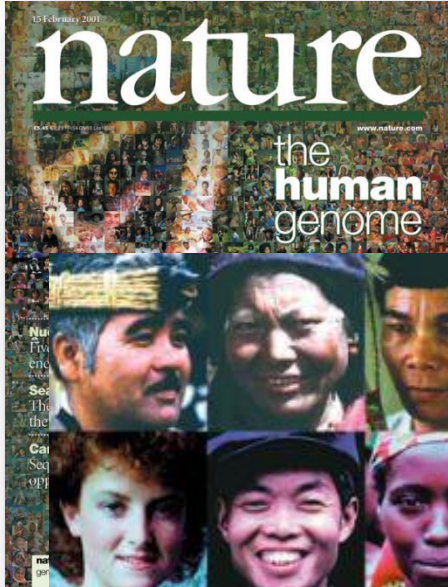
```
ACCTGTCAGTGTCAACTG
CTTCAATAGCTAATGCTAG
GCTCGATAATCGCTGGCC
TCAGCTCAGTCT
```

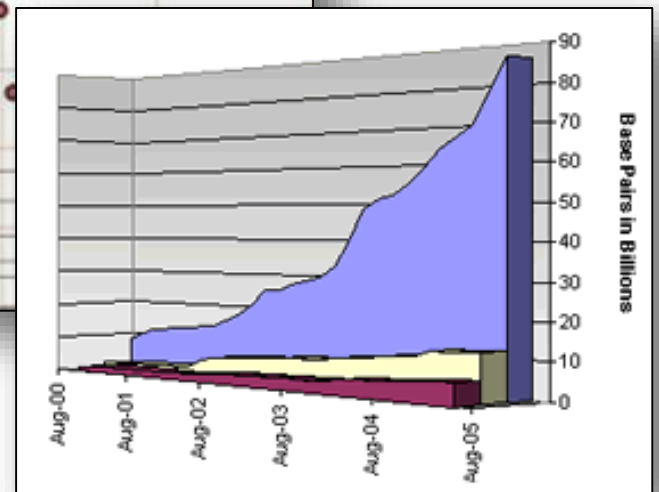
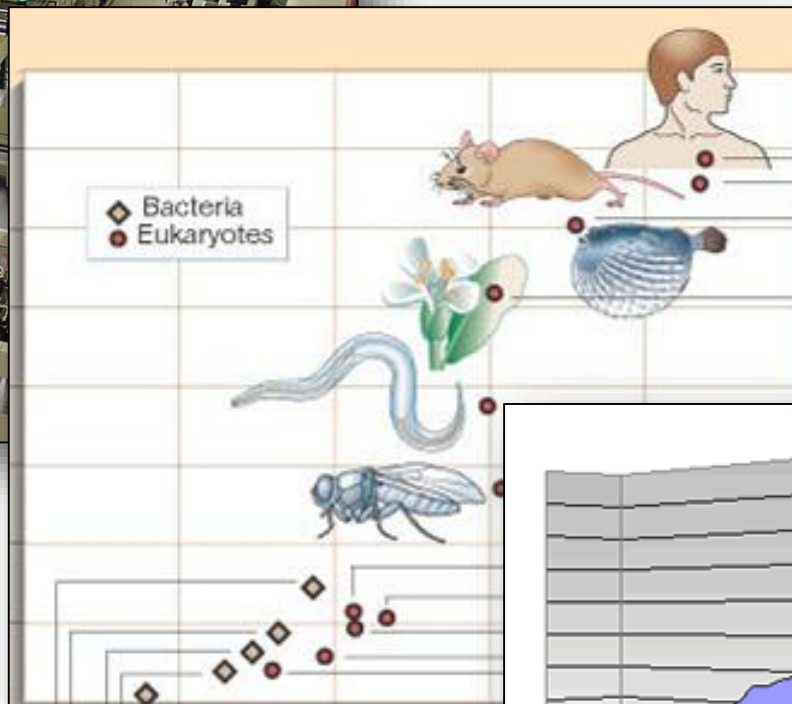
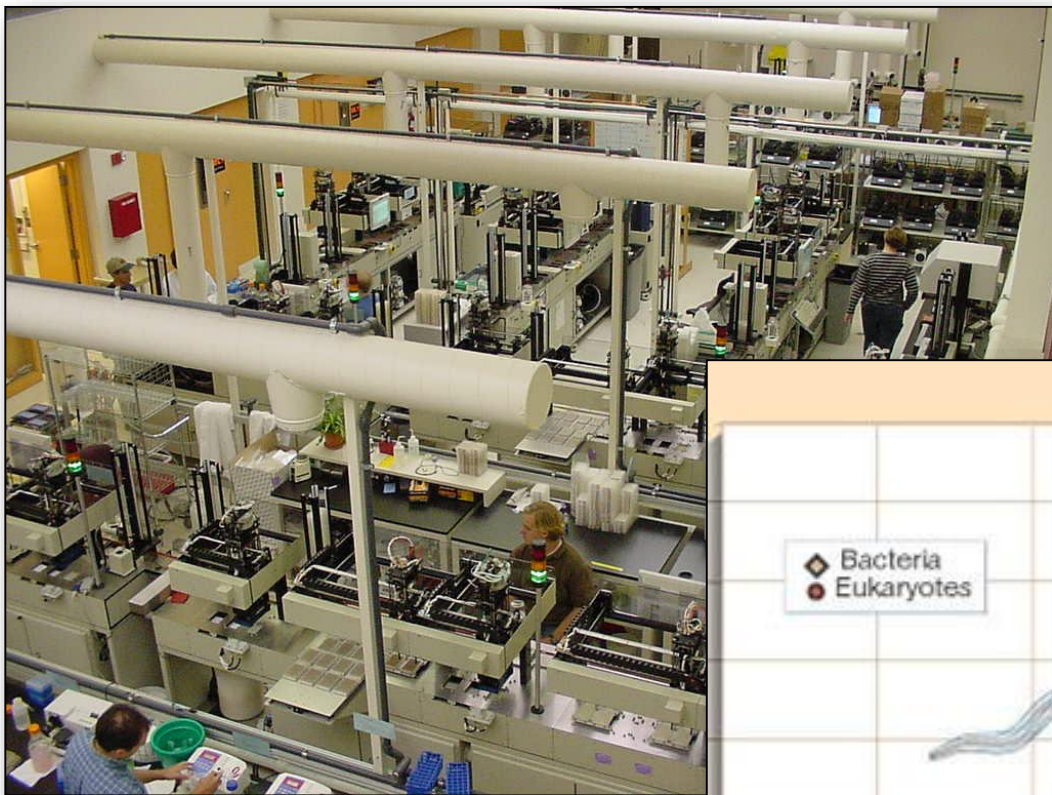


και πιο σημαντικοί από όλους τους ελληνικούς  
μεσα στις γιορτές τις  
λυμπίας επέβαλλε το κύρος

0100000000000101000001010000001001  
1000000000000000000000000000000000  
00001101000000000000000001010100000  
000000001100001110001100001100010000  
111101111101111101111100000000000000  
000000000000000100000000000000000001  
000011000011000011100011000100000001  
011110111110111110000000000000000000  
00000000000010000011000000000011111  
0010000000100000001000001000000110  
00100001100000000000000110011000000  
100000010000010000000100000100000  
000000100000010000010000001000000  
01100000000010001110101100000000001  
000100001011101001011011000000100111  
010100000111011001000000101000001111  
001010100111000000001010101000000000010  
000001111111000000000011000000110000000

# ΤΟ ΑΝΘΡΩΠΙΝΟ ΓΟΝΙΔΙΩΜΑ





NGS



By [Jeremy Hsu \(/author/jeremy-hsu\)](#)

Posted 25 Mar 2015 | 15:47 GMT

When the first Viking explorers began settling Iceland, none could have imagined that



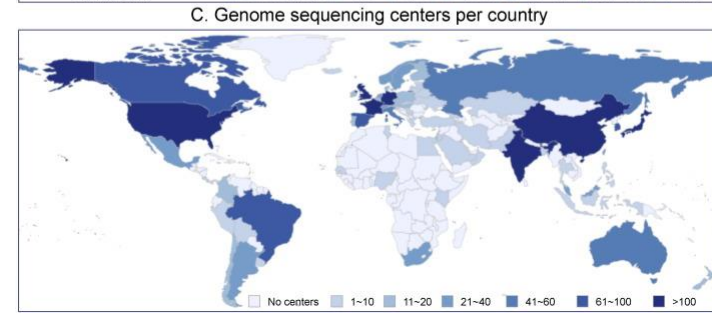
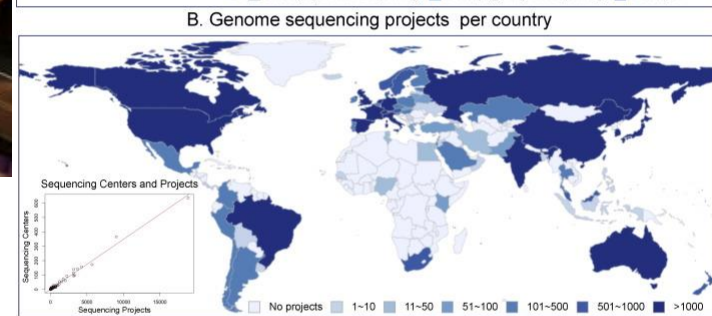
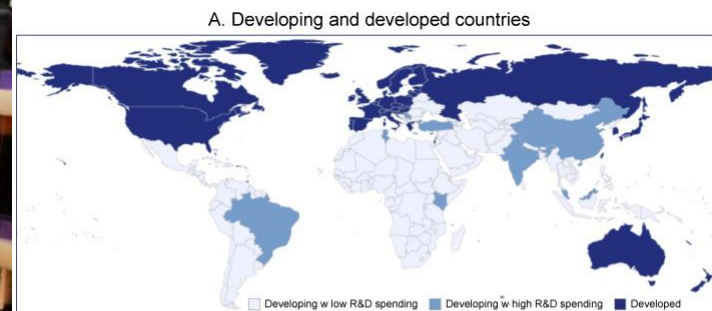
Photo: Chris Lund

The blood of a thousand Icelanders.

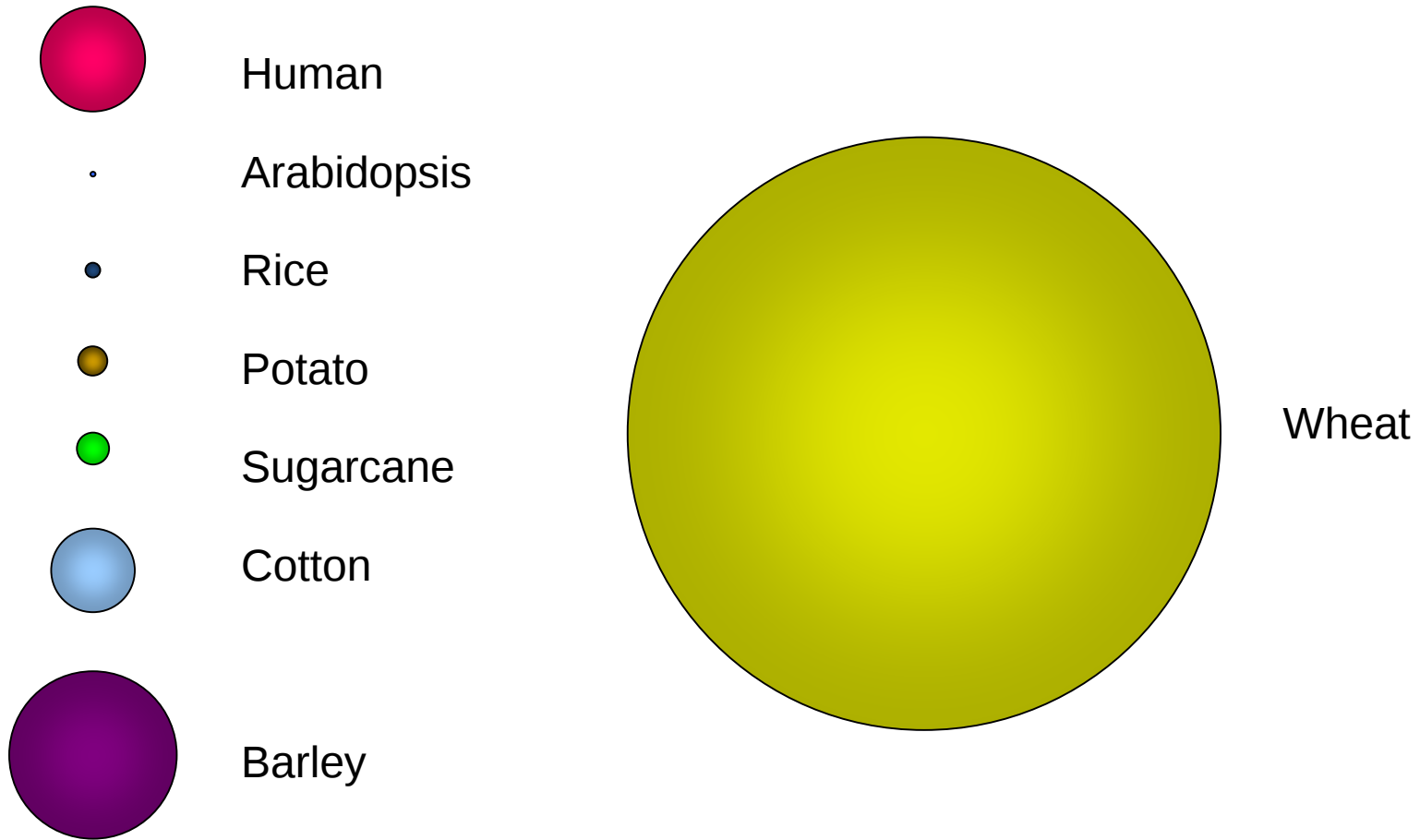
## Large-scale whole-genome sequencing of the Icelandic population

Daniel F Gudbjartsson, Hannes Helgason, Sigurjon A Gudjonsson, Florian Zink, Asmundur Oddson, Arnaldur Gylfason, Soren Besenbacher, Gisli Magnusson, Bjarni V Halldorsson, Eirikur Hjartarson, Gunnar Th Sigurdsson, Simon N Stacey, Michael L Frigge, Hilma Holm, Jona Saemundsdottir, Hafdis Th Helgadóttir, Hrefna Johannsdóttir, Gunnlaugur Sigfusson, Gudmundur Thorgeirsson, Jon Th Sverrisson, Solveig Gretarsdóttir, G Bragi Walters, Thorunn Rafnar, Bjarni Thjodleifsson, Einar S Bjornsson *et al.*

*Nature Genetics* 47, 435–444 (2015) doi:10.1038/ng.3247

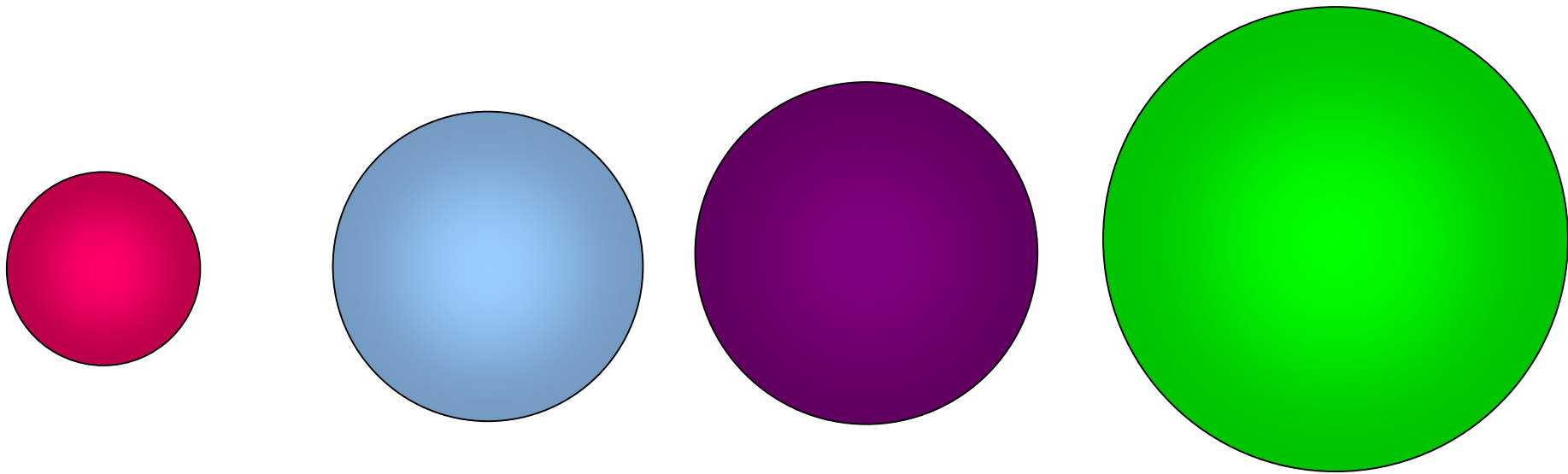


# Plant Genomes – Haploid Size



Diameter proportional to genome haploid genome size

# Plant Genomes – Total Size



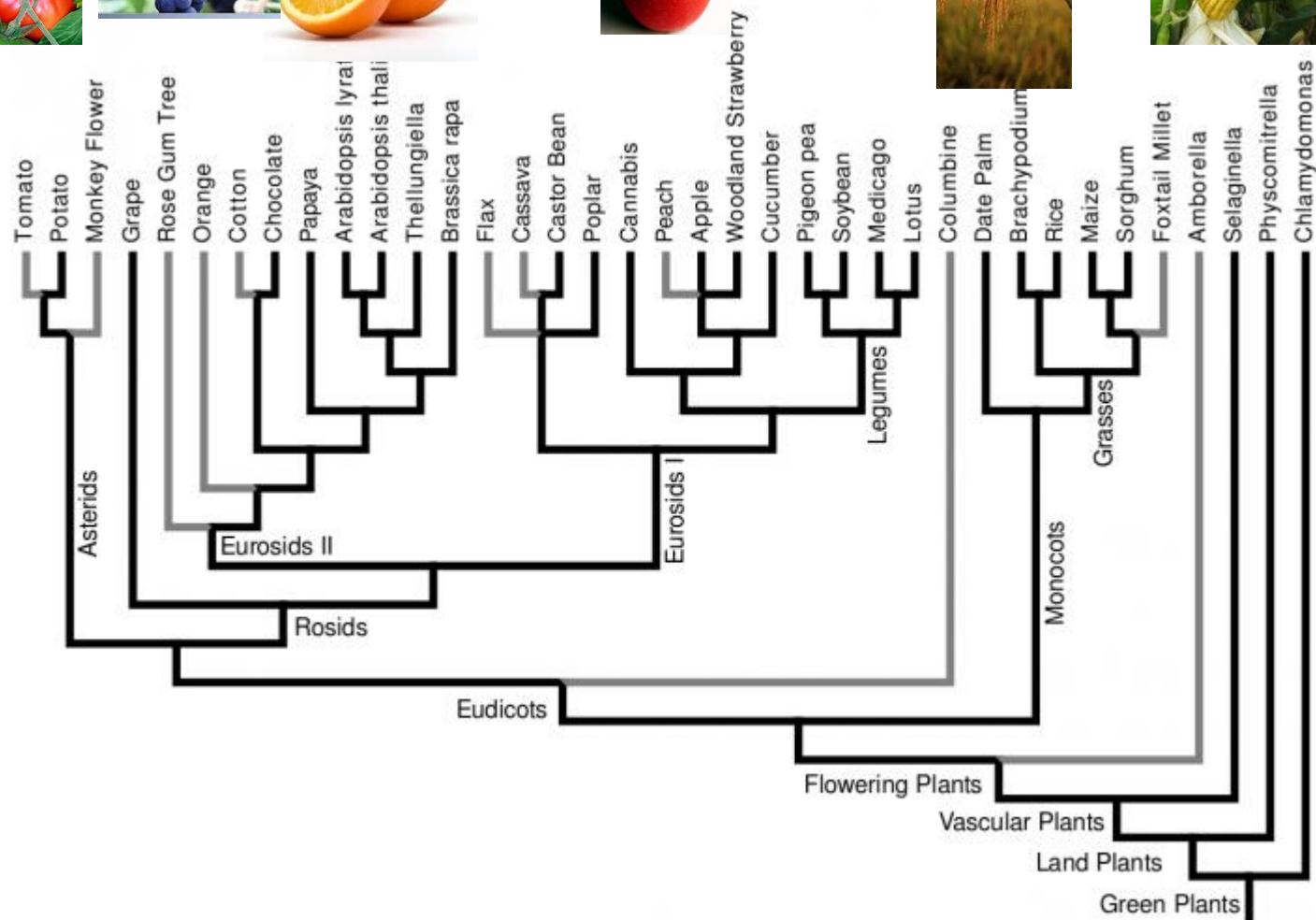
Human

Cotton

Barley

Sugarcane

Wheat



---

The draft genome of watermelon (*Citrullus lanatus*) and resequencing of 20 diverse accessions



---

Resequencing of 31 wild and cultivated soybean genomes identifies patterns of genetic diversity and selection



---

Genome-wide patterns of genetic variation among elite maize inbred lines

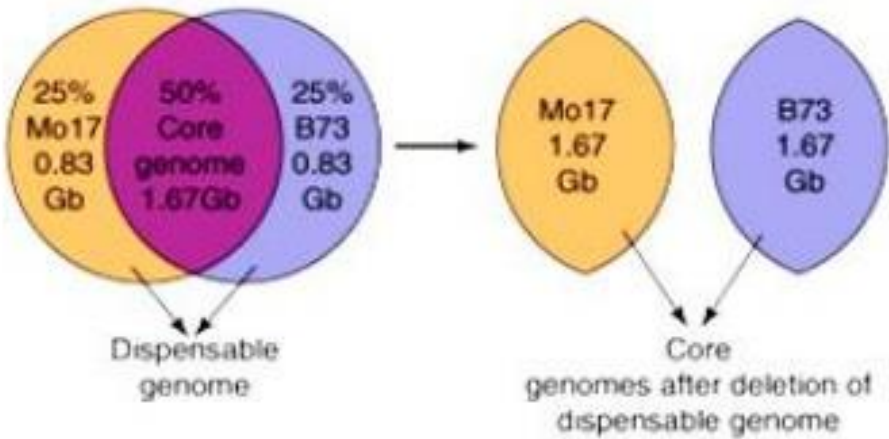
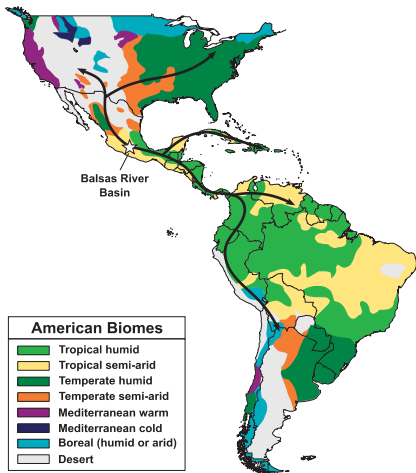
LARGE-SCALE BIOLOGY ARTICLE

Insights into the Maize Pan-Genome  
and Pan-Transcriptome<sup>WOPEN</sup>

Candice N. Hirsch,<sup>a,b,1</sup> Jillian M. Foerster,<sup>c,2</sup> James M. Johnson,<sup>c,3</sup> Rajandeep S. Sekhon,<sup>c,d</sup> German Muttoni,<sup>c,4</sup>  
Brienne Vaillancourt,<sup>a,b</sup> Francisco Peñagaricano,<sup>e</sup> Erika Lindquist,<sup>f</sup> Mary Ann Pedraza,<sup>f</sup> Kerrie Barry,<sup>f</sup>  
Natalia de Leon,<sup>c,d</sup> Shawn M. Kaeppler,<sup>c,d</sup> and C. Robin Buell<sup>a,b,5</sup>

*De novo* assembly of soybean wild relatives for  
pan-genome analysis of diversity and agronomic traits

- **Pan-genome:** The set of all genes present in the  
genomes of a group of organisms
- **Core genome:** shared among individuals.
  - **Dispensable genome:** an individual-specific or partially-shared  
among individuals.



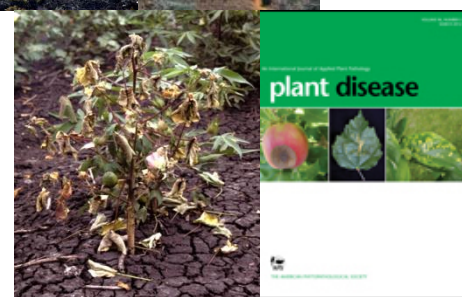
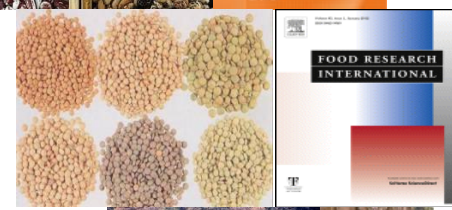
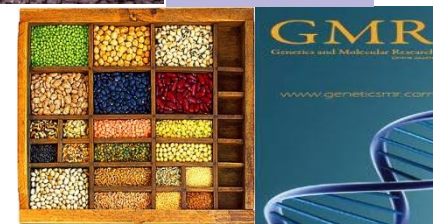
From: Morgante et al. Current Opinion in Plant Biology 10, 149-155 (2007)

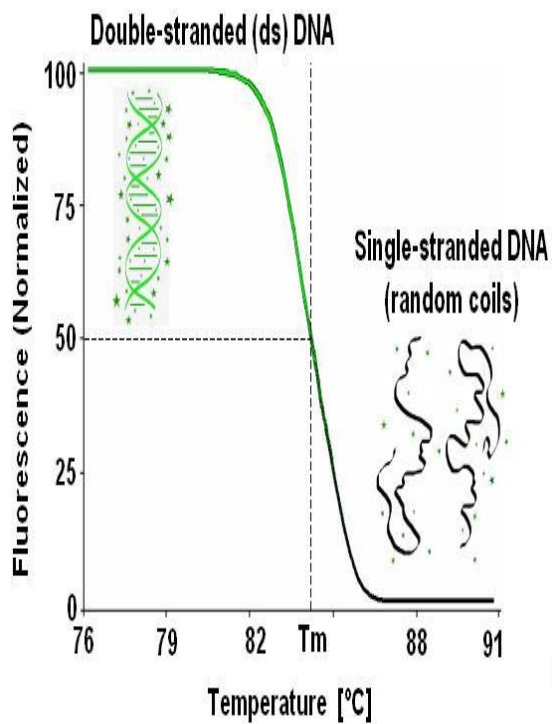
# High-resolution genetic mapping of maize pan-genome sequence anchors

Fei Lu<sup>1</sup>, Maria C. Romay<sup>1</sup>, Jeffrey C. Glaubitz<sup>1</sup>, Peter J. Bradbury<sup>2</sup>, Robert J. Elshire<sup>1</sup>, Tianyu Wang<sup>3</sup>, Yu Li<sup>3</sup>, Yongxiang Li<sup>3</sup>, Kassa Semagn<sup>4</sup>, Xuecai Zhang<sup>5</sup>, Alvaro G. Hernandez<sup>6</sup>, Mark A. Mikel<sup>6,7</sup>, Ilya Soifer<sup>8</sup>, Omer Barad<sup>8</sup> & Edward S. Buckler<sup>1,2</sup>

In addition to single-nucleotide polymorphisms, structural variation is abundant in many plant genomes. The structural variation across a species can be represented by a 'pan-genome', which is essential to fully understand the genetic control of phenotypes. However, the pan-genome's complexity hinders its accurate assembly via sequence alignment. Here we demonstrate an approach to facilitate pan-genome construction in maize. By performing 18 trillion association tests we map 26 million tags generated by reduced representation sequencing of 14,129 maize inbred lines. Using machine-learning models we select 4.4 million accurately mapped tags as sequence anchors, 1.1 million of which are presence/absence variations. Structural variations exhibit enriched association with phenotypic traits, indicating that it is a significant source of adaptive variation in maize. The ability to efficiently map ultrahigh-density pan-genome sequence anchors enables fine characterization of structural variation and will advance both genetic research and breeding in many crops.

[illegible]

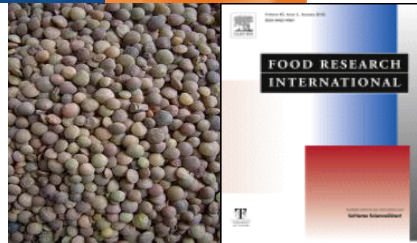
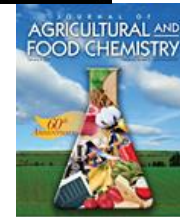
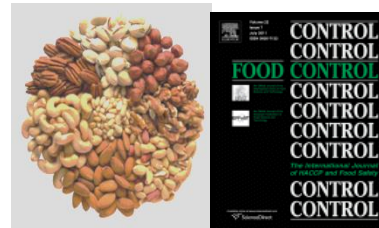
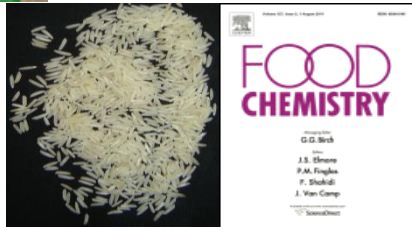
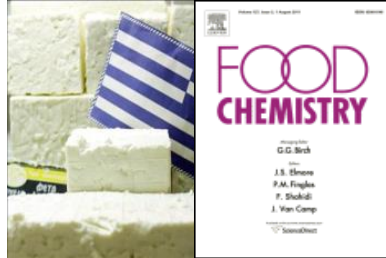




Ποικιλία /Είδος

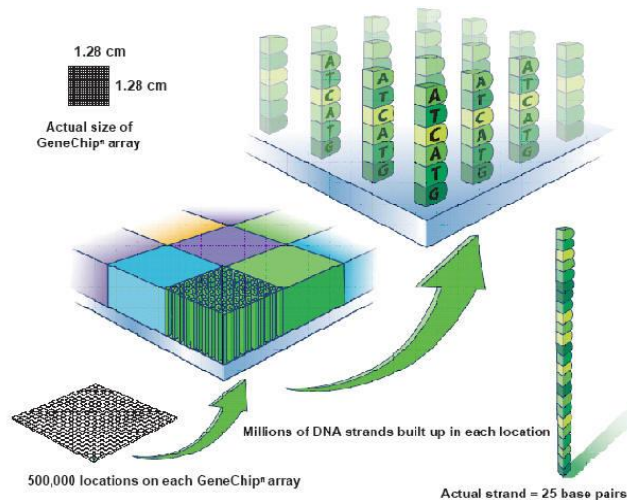
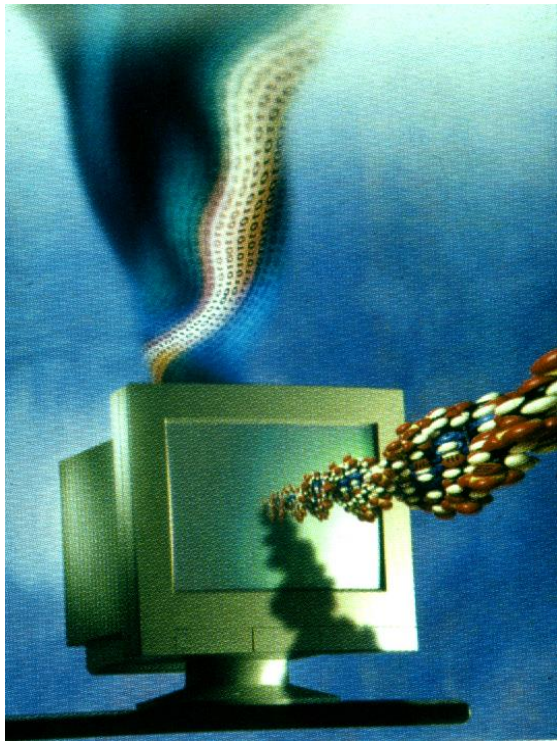
HRM ανάλυση

Τελικό προϊόν



WORK IN PROGRESS

# ΒΙΟΠΛΗΡΟΦΟΡΙΚΗ



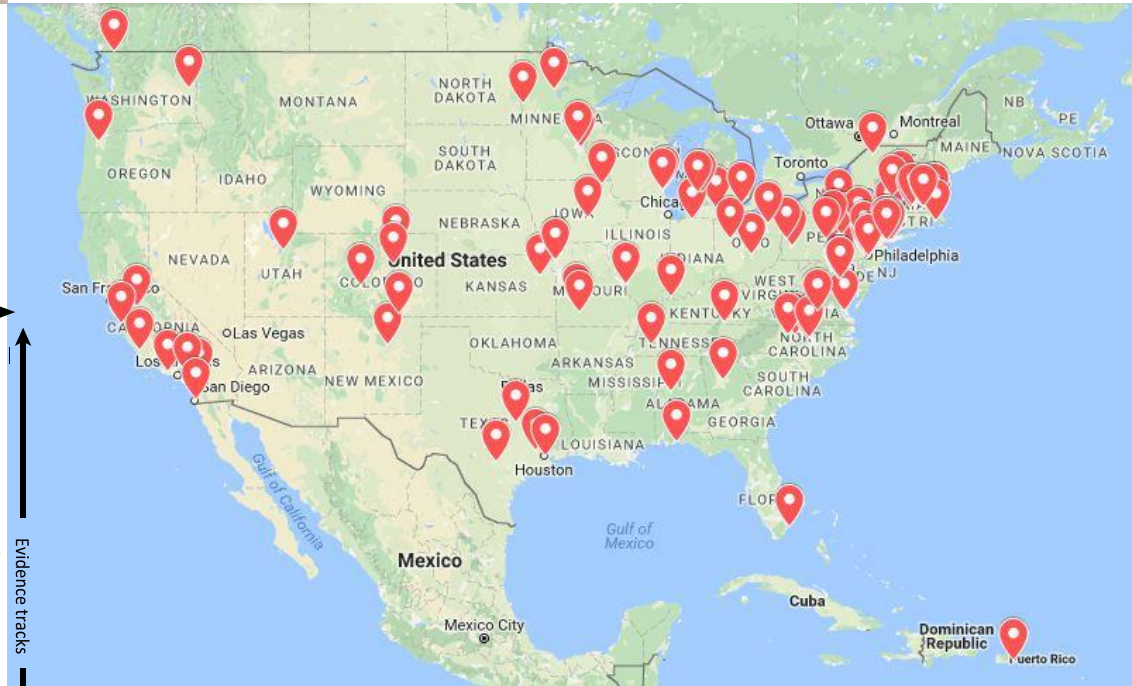
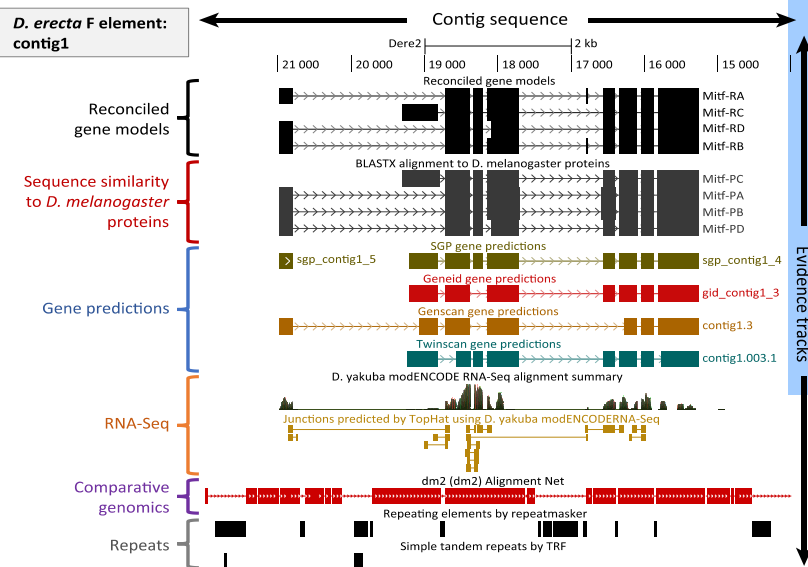




## Trends in Genetics

### Scientific Life

The GEP:  
Crowd-Sourcing  
Big Data Analysis  
with Undergraduates



# ΓΕΝΕΤΙΚΗ



# ΕΠΙΓΕΝΕΤΙΚΗ

Κληρονομήσιμη αλλαγή χαρακτήρων που περιλαμβάνει αλλαγή στην αλληλουχία του DNA

Κληρονομήσιμη αλλαγή χαρακτήρων που δεν περιλαμβάνει αλλαγή στην αλληλουχία του DNA

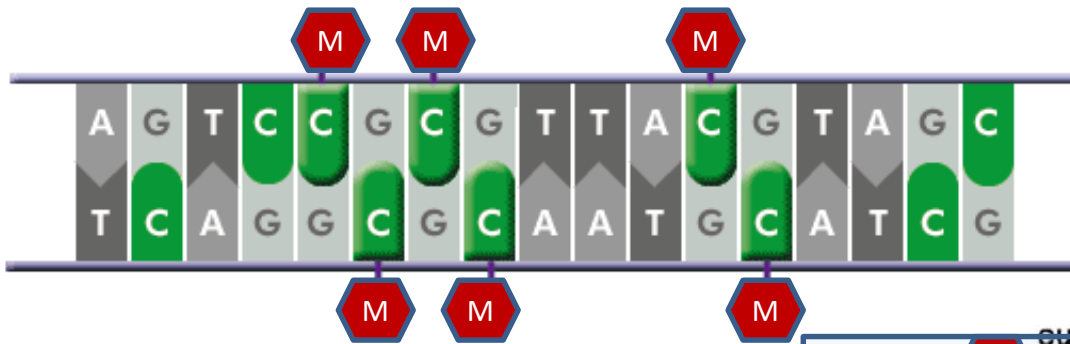


ΚΑΛΟΣ

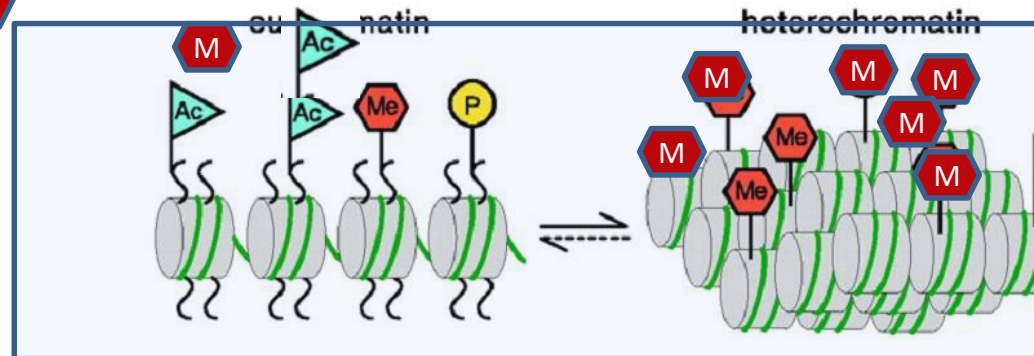
ΠΑΝΩΡΑΙΑ

ΚΑΚΟΣ

ΩΡΑΙΑ



Καλός  
Κάλος

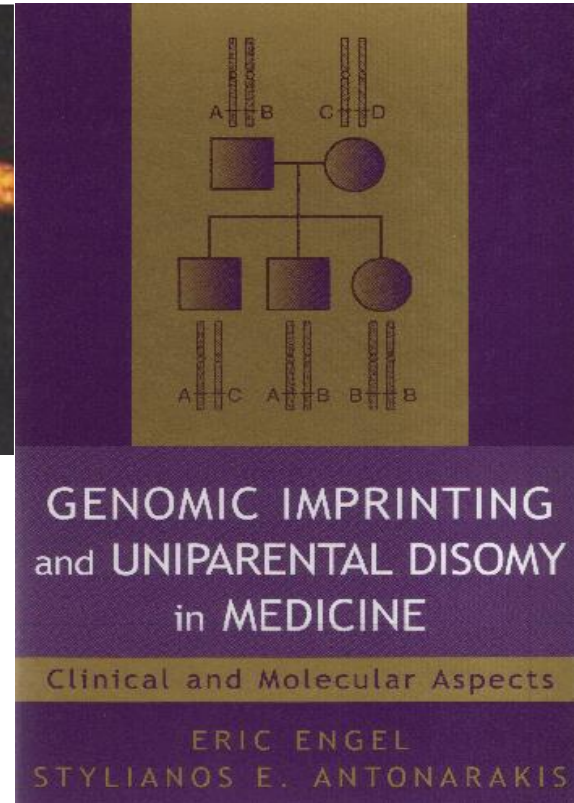


# Γονική αποτύπωση



Μικρός καρπός

Μεγάλος καρπός



# Imprinting στο καλαμπόκι

A

Mendelian  $A1/a1$

maize ear



B

Imprinting  $R^r/r$



kernel color  
kernel number



purple

332



yellow

110

:



purple

256



mottled

145



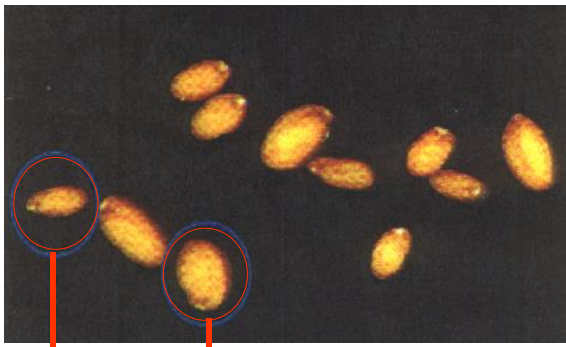
yellow

113

:

:





**Small Seed**

**Large Seed**



# Βιβλιογραφία

**The Dutch famine and schizophrenia spectrum disorders**

[Hoek HW](#), [Brown AS](#), [Susser E](#)

Soc Psychiatry Psychiatr Epidemiol. 1998 Aug;33(8):373-9

**Prenatal exposure to the 1944-45 Dutch 'hunger winter' and addiction later in life.**

[Franzek EJ](#), [Sprangers N](#), [Janssens AC](#), [Van Duijn CM](#), [Van De Wetering BJ](#)

Addiction. 2008 Mar;103(3):433-8. Epub 2008 Jan 8

**Rates of adult schizophrenia following prenatal exposure to the Chinese famine of 1959-1961**

[St Clair D](#), [Xu M](#), [Wang P](#), [Yu Y](#), [Fang Y](#), [Zhang F](#), [Zheng X](#), [Gu N](#), [Feng G](#), [Sham P](#), [He L](#)

JAMA. 2005 Aug 3;294(5):557-62

**Epigenetic regulation in psychiatric disorders.**

[Tsankova N](#), [Renthal W](#), [Kumar A](#), [Nestler EJ](#).

*Nat Rev Neurosci.* 2007 May;8(5):355-67

LTR Hypomethylated

When to Intervene??

LTR Hypermethylated

Yellow  
Mouse



Agouti  
Mouse

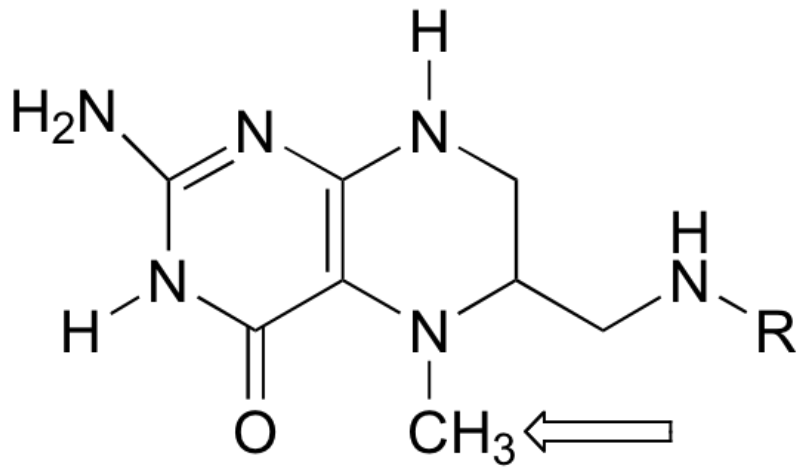
High risk cancer, diabetes,  
obesity & reduced lifespan



Lower risk of cancer, diabetes,  
obesity and prolonged life

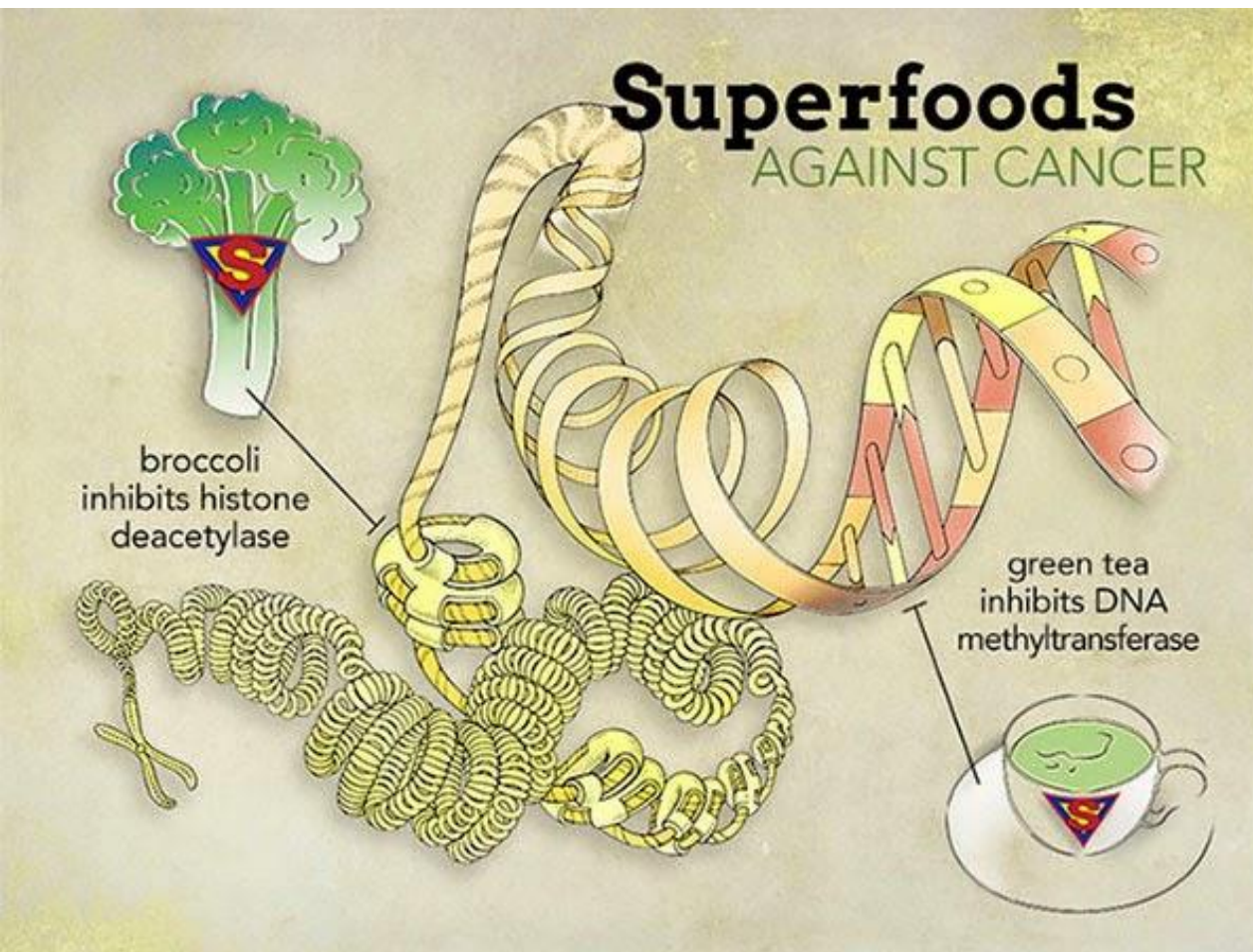
Maternal Supplements with zinc methionine  
betaine choline, folate B<sub>12</sub>

Cooney et al. J Nutr 132:2393S (2002)



5-methyltetrahydrofolate



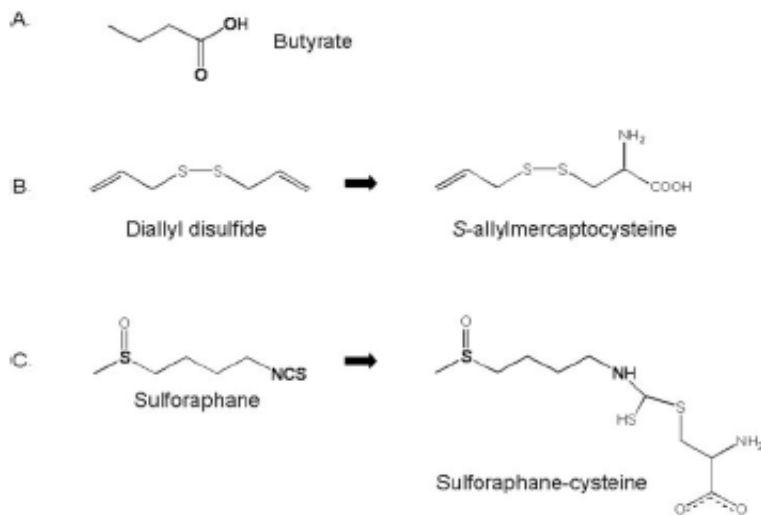


- ΒΡΟΥΒΕΣ
- ΜΟΥΣΤΑΡΔΑ
- ΡΑΔΙΚΙΑ
- ΡΕΠΑΝΑΚΙΑ
- ΖΩΧΟΙ
- ΡΟΚΑ
- ΣΤΑΜΝΑΓΚΑΘΙ

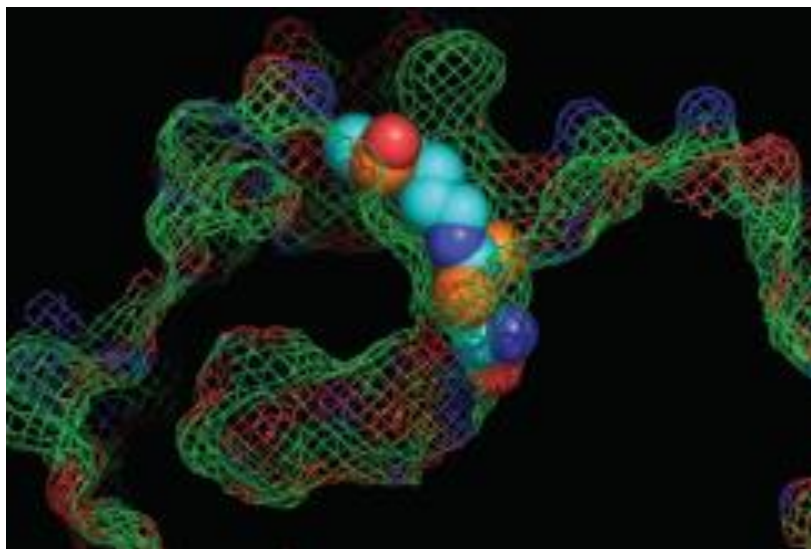
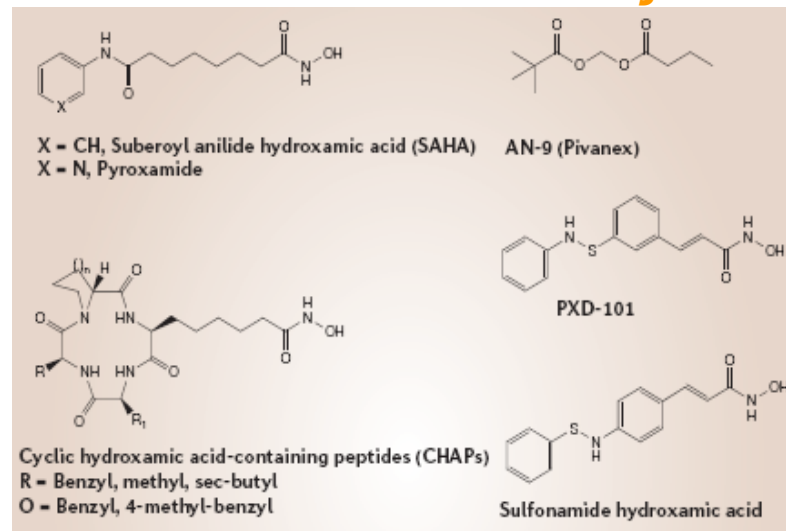
ΞΥΔΙ

# ΑΝΑΣΤΟΛΕΙΣ ΤΗΣ ΑΠΟΑΣΕΤΥΛΑΣΗΣ

## Φυσικοί αναστολείς



## Συνθετικοί αναστολείς



# Epigenetic Bioactive compounds in plants



**Artichoke**  
(Silymarin)



**Oleander**  
(Oleanderin)



**Tomato**  
(Lycopene)



**Garlic**  
(Diallyl sulfide, ajoene,  
S-allyl cysteine, allicin)



**Carrots**  
( $\beta$ -carotenes)



**Tea**  
(Catechins)



**Red grapes**  
(Resveratrol)



**Red chilli**  
(Capsaicin)



**Turmeric**  
(Curcumin)



**Cloves**  
(Eugenol &  
isoeugenol)



**Honey-bee propolis**  
(Caffeic acid, CAPE)



**Cruciferous  
vegetables**  
(Sulforaphane)



**Pomegranate**  
(Ellagic acid)



**Ginger**  
(6-Gingerol)



**Basil**  
(Ursolic acid)



**Fennel,**  
(Anethol)



**Soybean**  
(Genistein)



**Aloe**  
(Emodin)

# ΓΟΝΙΔΙΩΜΑΤΙΚΗ



# ΜΕΤΑΓΟΝΙΔΙΩΜΑΤΙΚΗ

## Evolution of Mammals and Their Gut Microbes

Ruth E. Ley,<sup>1</sup> Micah Hamady,<sup>2</sup> Catherine Lozupone,<sup>1,3</sup> Peter J. Turnbaugh,<sup>1</sup> Rob Roy Ramey,<sup>4</sup> J. Stephen Bircher,<sup>5</sup> Michael L. Schlegel,<sup>6</sup> Tammy A. Tucker,<sup>6</sup> Mark D. Schrenzel,<sup>6</sup> Rob Knight,<sup>3</sup> Jeffrey I. Gordon<sup>1\*</sup>



Briefings in Functional Genomics Advance Access published December 18, 2014



Briefings in Functional Genomics, 2014, 1–6

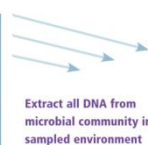
doi: 10.1093/bfpg/elu049  
Letter to the Editor



**Functional marker development is challenged by the ubiquity of endophytes—a practical perspective**

Birgit Arnholdt-Schmitt, Vera Valadas and Matthias Döring

### THE METAGENOMICS PROCESS



**DETERMINE WHAT THE GENES ARE (Sequence-based metagenomics)**

- Identify genes and metabolic pathways
- Compare to other communities
- and more...

**DETERMINE WHAT THE GENES DO (Function-based metagenomics)**

- Screen to identify functions of interest, such as vitamin or antibiotic production
- Find the genes that code for functions of interest
- and more...

# Ο άνθρωπος και τα βακτήρια

10

τρισεκατομμύρια  
κύτταρα

100

τρισεκατομμύρια βακτήρια  
(ολιγοπλάσματα διαφορετικού είδους)

23.000

γονίδια

## ΟΙ ΑΣΘΕΝΕΙΕΣ ΜΕ ΤΙΣ ΟΠΟΙΕΣ ΣΧΕΤΙΖΟΝΤΑΙ

### Παχυσαρκία

Στους παχύσαρκους παρατηρείται υπερανάπτυξη ενός τύπου βακτηρίου (Lactobacillus) σε σχέση με όλα τα υπόλοιπα.

### Υποσιτισμός

Μερικές φορές τα βακτήρια δεν καταφέρνουν να διασπάσουν τους υδατάνθρακες και τις υδατοδιαλυτές ουσίες με τις οποίες τρεφόμαστε.

### Υπέρταση

Τα βακτήρια του πεπτικού συστήματος παράγουν φορμικό οξύ το οποίο «υποδεικνύει» στα νεφρά πόσο αλκάλι πρέπει να απορροφήσουν από το αίμα.

### Διαβήτης ενηλίκων

Εικάζεται πως τα βακτήρια επηρεάζουν στην αποσπασματικότητα της ινσουλίνης αναφορικά με τη διάσπαση των σακχαρών του αίματος.

### Προβλήματα ανάπτυξης του εγκεφάλου

Εικάζεται πως κάποιες τοξίνες που παράγονται από βακτήρια του πεπτικού συστήματος μπορεί να επηρεάσουν την ανάπτυξη του εγκεφάλου στα μικρά παιδιά.

## ΟΙ ΠΙΟ ΚΟΙΝΕΣ ΜΟΡΦΕΣ ΒΑΚΤΗΡΙΑΚΩΝ ΚΥΤΤΑΡΩΝ

1 μικρόμετρο



Κόκκος

Βάκιλος

Σπειρίδιο

Σπειροχαίτη

## ΠΟΥ ΒΡΕΚΟΝΤΑΙ

Αυτιά

Μύτη

Στόμα

Δέρμα

## ΑΠΟ ΠΟΥ ΠΡΟΕΡΧΟΝΤΑΙ

Τα βακτήρια του στόματος και του εντέρου από ό,τι τρώμε.

Η σύνθεση τους ποικίλλει ανάλογα με τη διατροφική συνήθεια του κάθε ανθρώπου.

## ΟΙ ΛΕΠΟΥΡΓΙΕΣ ΤΟΥΣ

### ΕΠΙΤΡΕΠΟΥΝ

την πέψη απεικόνιζοντας ενώσεις που ο άνθρωπος οργανισμός δεν θα μπορούσε να διασπάσει και των οποίων η διατροφική αξία καλύπτει με το 10% των θερμίδων που ένας άνθρωπος καταναλώνει σε ημερήσια βάση.

### ΚΑΤΑΠΟΛΕΜΟΥΝ

τα επιβλαβή για την υγεία μας βακτήρια.

### ΠΑΡΑΓΟΥΝ

- Βιταμίνες στο έντερό μας
- Φολικό οξύ
- Βιταμίνη B2
- Βιταμίνη B12

## The Economist

το τελευταίο τεύχος του βρετανικού περιοδικού είναι αφιερωμένο στις πιο πρόσφατες ανακαλύψεις σχετικά με τις λειτουργίες των μικροβίων που συμβιώνουν μαζί μας: «Το 99% των κυττάρων του ανθρώπινου σώματος είναι βακτήρια».



Εντέρο

Τα βακτήρια του δέρματος, από ό,τι αγγίζουμε

Γεννητικά όργανα

# Oral Microbiome

The community of microbes living in the oral cavity performs multiple functions. While the microbial composition for individuals is relatively stable, it can vary substantially among individuals.<sup>54</sup> Altered oral microbiomes are informative of health status, such as nutritional deficiencies<sup>55</sup> and cardiovascular disease.<sup>56</sup>

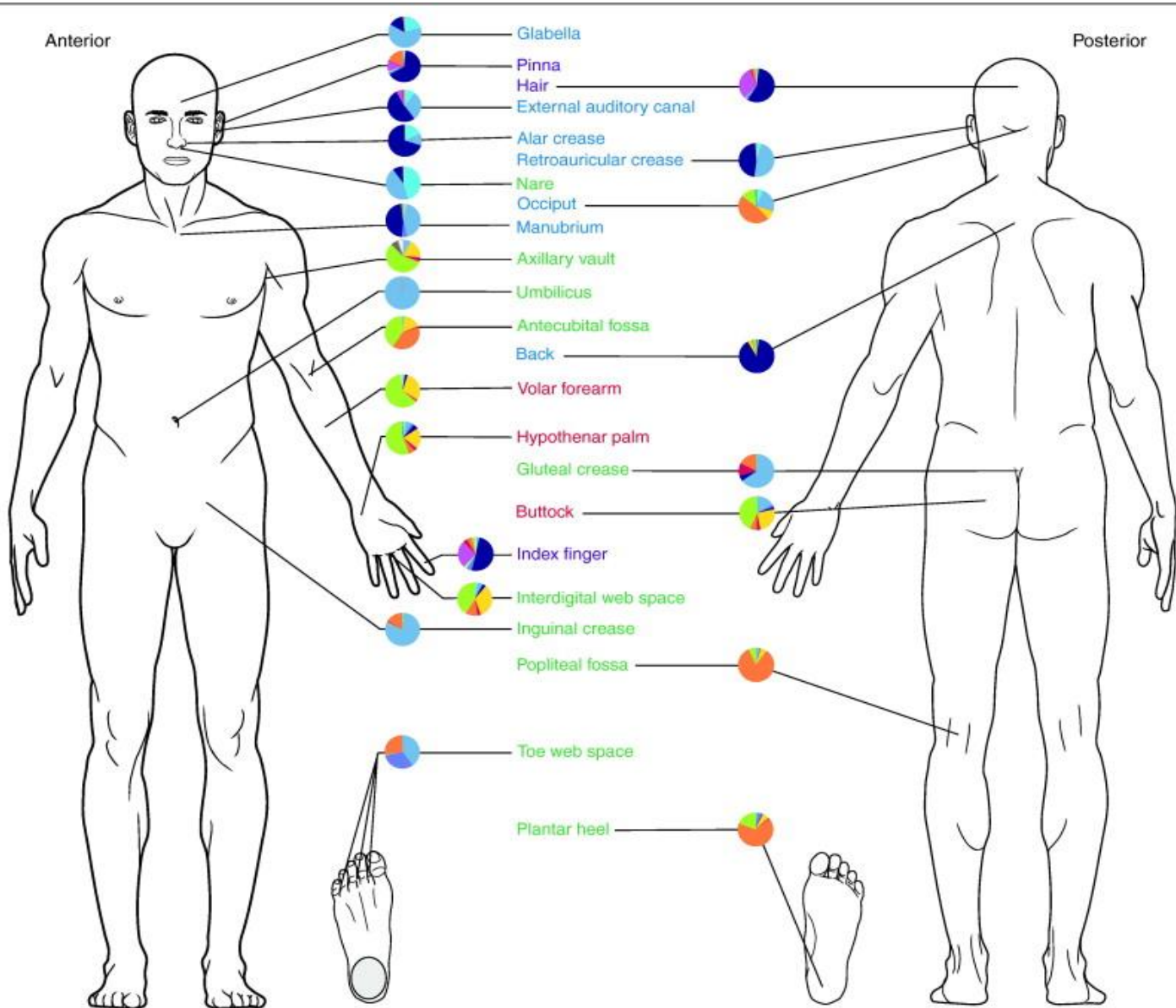
The microbial communities in the oral cavity are organized in compartments and biofilms. Excessive buildup can form plaque and cause oral diseases. Metagenomic studies have identified specific metabolic pathways of oral disease.<sup>57</sup> During oral diseases—such as chronic periodontitis, dental caries, and gingivitis—the subgingival microbiome undergoes dynamic changes that are associated with infection of dental implants by oral pathogens<sup>58</sup> and smoking.<sup>59</sup> These changes can be monitored to assess disease progression and therapy effectiveness.<sup>60</sup>



During oral diseases—such as chronic periodontitis, dental caries, and gingivitis—the subgingival microbiome undergoes dynamic changes that can be monitored to assess disease progression and therapy effectiveness.



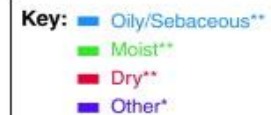
Periodontitis.



Pie charts



Skin site description



# Molecular cartography of the human skin surface in 3D

Amina Bouslimani<sup>a,1</sup>, Carla Porto<sup>a,1</sup>, Christopher M. Rath<sup>a,1</sup>, Mingxun Wang<sup>b</sup>, Yurong Guo<sup>c</sup>, Antonio Gonzalez<sup>d,e</sup>, Donna Berg-Lyon<sup>d,e</sup>, Gail Ackermann<sup>d,e</sup>, Gitte Julie Moeller Christensen<sup>a,f</sup>, Teruaki Nakatsuji<sup>g</sup>, Lingjuan Zhang<sup>g</sup>, Andrew W. Borkowski<sup>g</sup>, Michael J. Meehan<sup>a</sup>, Kathleen Dorrestein<sup>a</sup>, Richard L. Gallo<sup>g</sup>, Nuno Bandeira<sup>a,b,h,2</sup>, Rob Knight<sup>b,c,d,e,i,2</sup>, Theodore Alexandrov<sup>a,j,k,l,2</sup>, and Pieter C. Dorrestein<sup>a,m,n,o,2</sup>

<sup>a</sup>Skaggs School of Pharmacy and Pharmaceutical Sciences, <sup>b</sup>School of Medicine, <sup>c</sup>Division of Dermatology, and Departments of <sup>m</sup>Biochemistry, <sup>n</sup>Pharmacology, and <sup>o</sup>Chemistry, University of California, San Diego, La Jolla, CA 92037; <sup>d</sup>Department of Computer Science and Engineering and <sup>e</sup>Center for Computational Mass Spectrometry, University of California, San Diego, La Jolla, CA 92093; <sup>f</sup>Department of Chemistry and Biochemistry, <sup>g</sup>BioFrontiers Institute, and <sup>h</sup>Howard Hughes Medical Institute, University of Colorado at Boulder, Boulder, CO 80309; <sup>i</sup>Department of Biomedicine, Aarhus University, DK-8000 Aarhus C, Denmark; <sup>j</sup>Center for Industrial Mathematics, University of Bremen, 28359 Bremen, Germany; <sup>k</sup>SCiLS GmbH, 28359 Bremen, Germany; <sup>l</sup>European Molecular Biology Laboratory, Meyerhofstrasse 1, 69117 Heidelberg, Germany

Edited by Jerrold Meinwald, Cornell University, Ithaca, NY, and approved March 6, 2015 (received for review December 30, 2014)

## Data collection

### Sampling

Female & male individuals  
~400 spots on a half-body



### Analytics

Detection of metabolites,  
lipids, and peptides  
(MS, MS/MS)

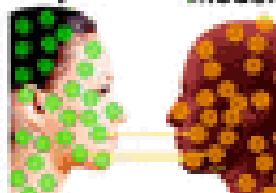
Detection of bacteria  
(16S rRNA sequencing)



## Maps generation

### 3D modelling

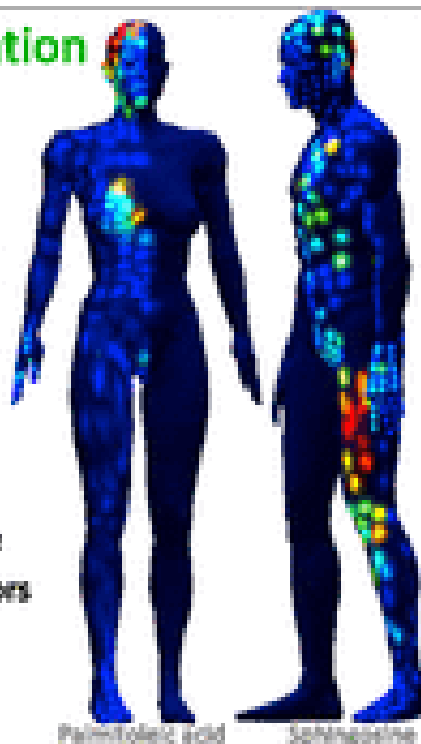
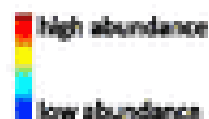
Sampling → 3D  
spots model



### Maps rendering

For a taxon or  
a molecular feature

Abundances → colors



## Interpretation

### Data analysis

Overview (PCA)

Microbe-molecule colocalization  
(Pearson correlation)

Microbial & molecular diversity  
(Shannon index)

### Molecular analysis

Structural identification  
(molecular networks)

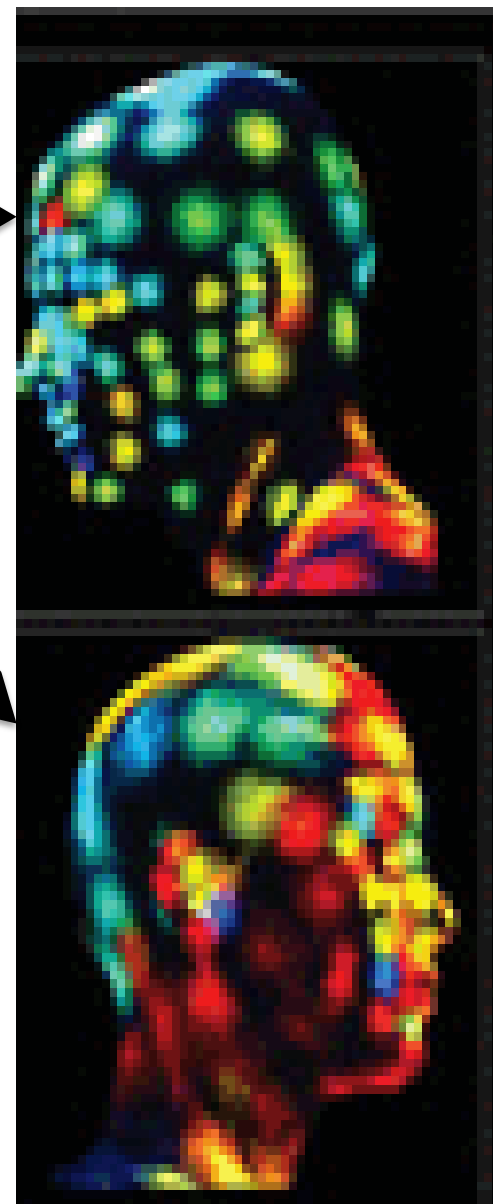
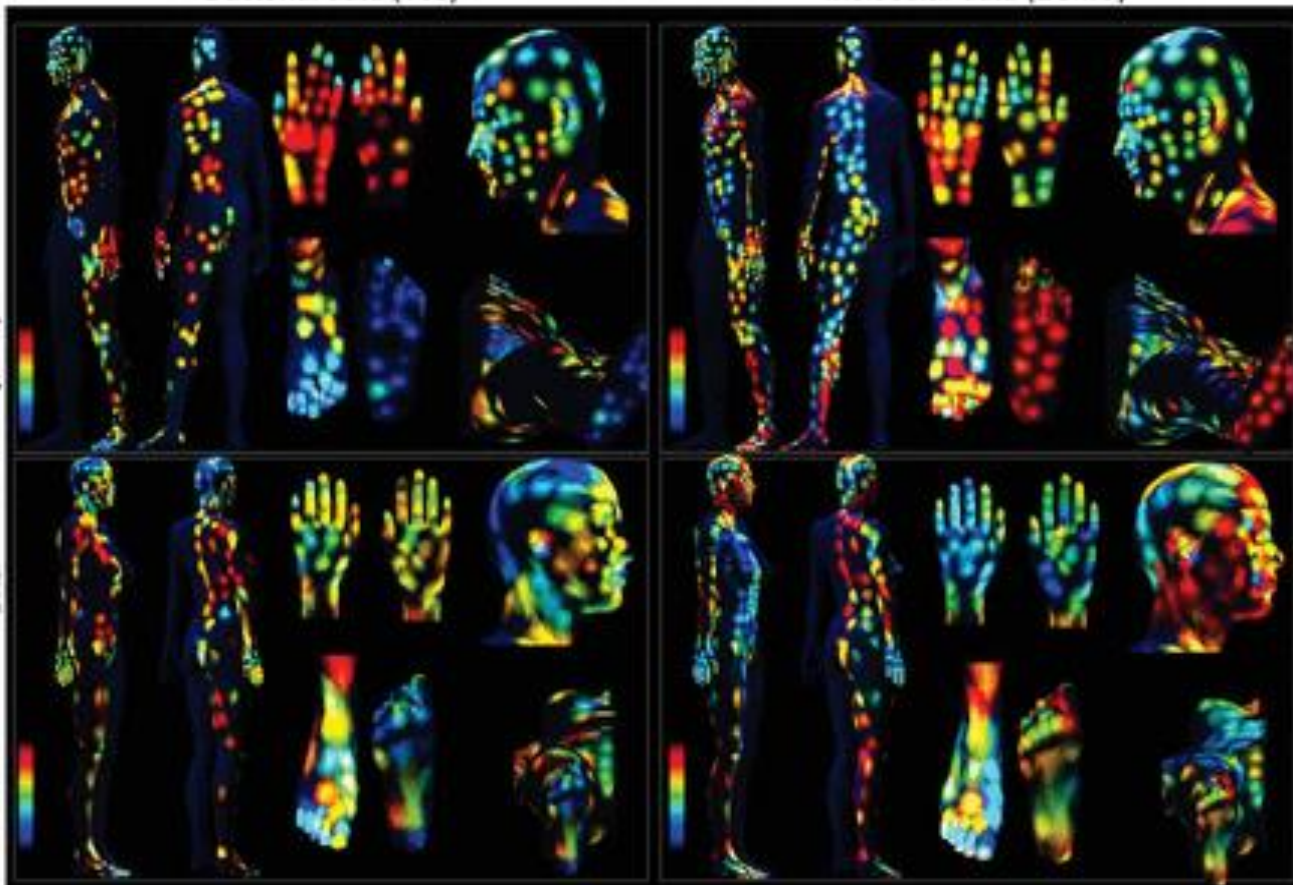


Establishing molecular origin  
(in vitro, chemical standards)

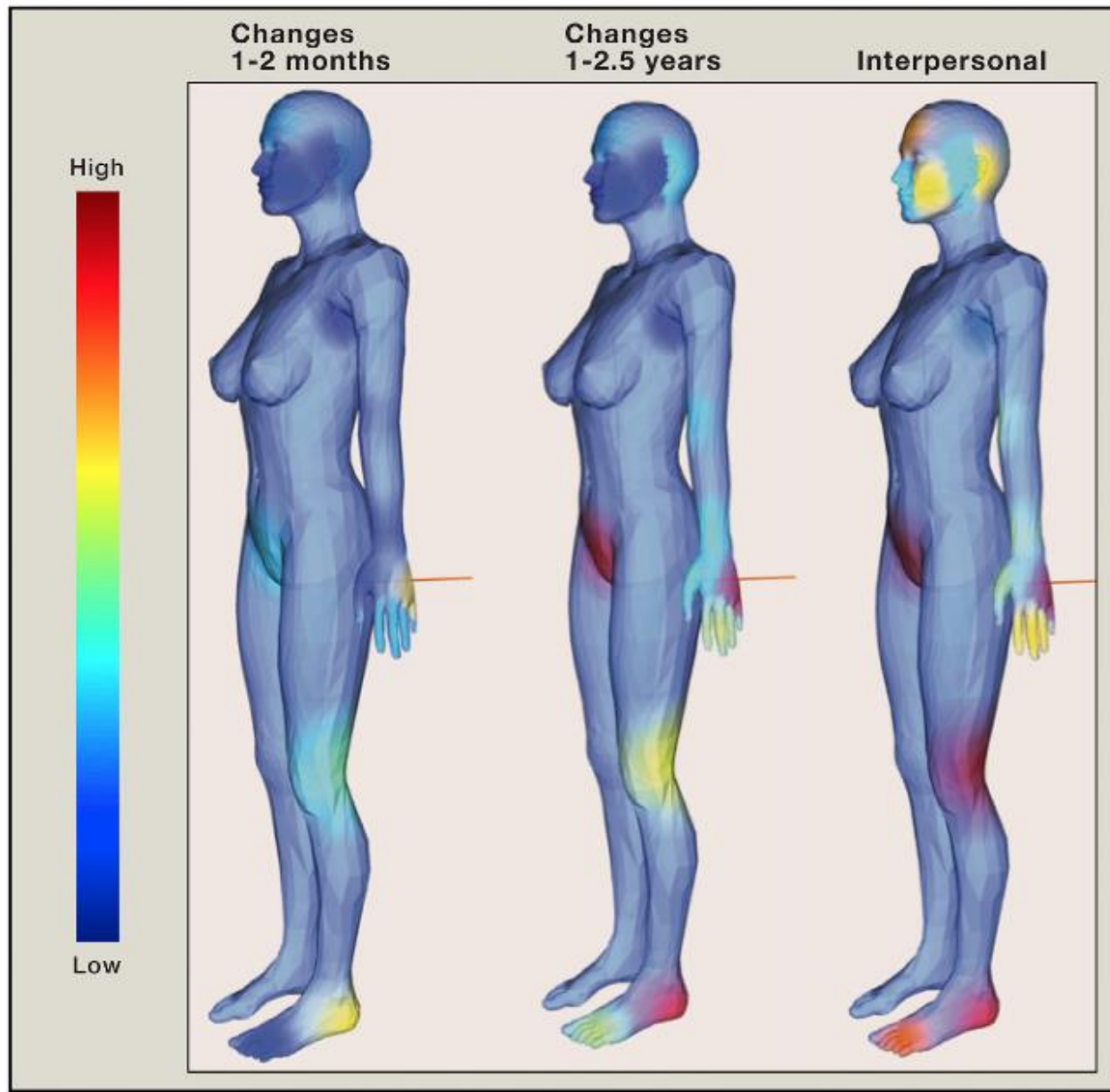
Bacterial data (16s)

Molecular data (LCMS)

Shannon diversity maps



## Microbial Skin Inhabitants: Friends Forever

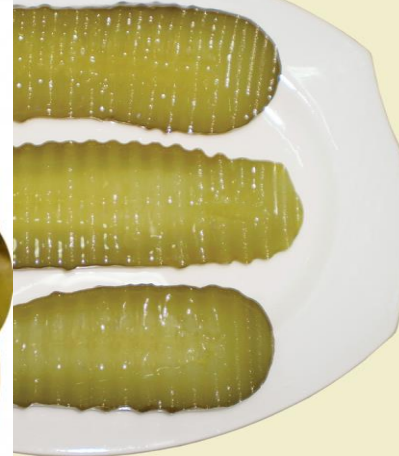




ΓΟΝΙΔΙΩΜΑΤΙΚΗ



ΜΕΤΑΓΟΝΙΔΙΩΜΑΤΙΚΗ



ΓΟΝΙΔΙΩΜΑΤΙΚΗ

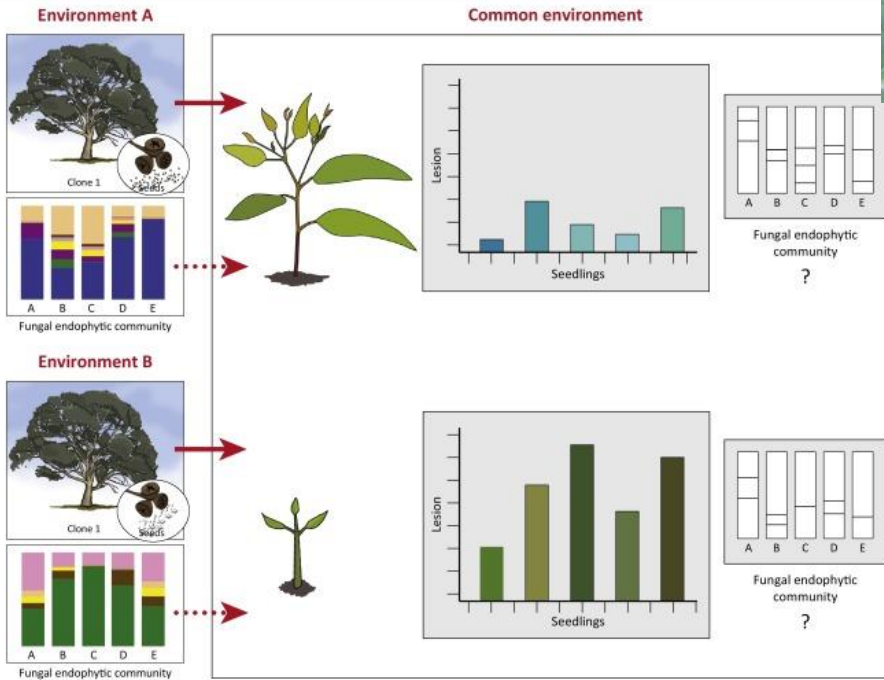


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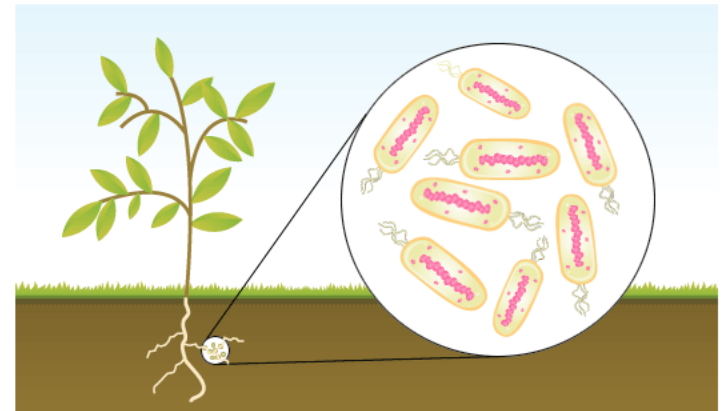


# Back to the Future of Soil Metagenomics





TRENDS in Plant Science







## Bioagent

*Agrobacterium radiobacter* strain K1026  
*A. radiobacter* strain K84  
*Azospirillum brasilense*/*Azotobacter chroococcum*  
*A. brasilense*  
*B. subtilis* MB1600  
*B. subtilis* strain FZB24  
*Bacillus chlororaphis* 63-28  
*Bacillus cereus* BPO1  
*Bacillus pumilus* GB 34  
*B. pumilus* QST2808  
*B. subtilis* GB03  
*Bacillus amyloliquefaciens* GB99  
*Bacillus licheniformis* SB3086  
*Burkholderia cepacia*  
*P. fluorescens* A506  
*Pseudomonas syringae* ESC-100  
*Pseudomonas chlororaphis*  
*Pseudomonas cepacia*  
*Streptomyces griseovirdis* K61  
*B. subtilis* + *B. amyloliquefaciens*  
*Pseudomonas* spp. + *Azospirillum* spp.

## Trade Name/Formulation

Nogall,  
 Galltrol, Diegall  
 Gmax Nitromax  
 Azo-Green  
 BaciGold, HiStick N/T, Subtilex  
 Rhizo-Plus, Serenade, Rhapsody, Taegro, Tae-Technical  
 AtEze  
 Pix plus  
 Concentrate; YieldShield  
 Sonata ASO, Ballard  
 Companion, System 3, Kodiak, Kodiak HB, Epic  
 Quantum 4000  
 EcoGuard, Green Releaf  
 Blue Circle, Deny, Intercept  
 BlightBan A506, Conquer, Victus  
 Bio-Save 10, 11, 100, 110, 1000, and 10 LP  
 Cedomon  
 Intercept  
 Mycostop  
 Bio Yield  
 BioJet

**Cerall® und Cedomon®**

Gibt es auf Ihren Gemüsesämlingen Fälle von Stängelrand-, Fäulnis-,  
 Nestsack- und Stängelkrankheit sowie Septoria? Möchten Sie sich das  
 schützen?  
 Dann helfen wir Ihnen gerne unsere zwei Produkte Cerall® und Cedomon®  
 vor, denn das Auftreten dieser Krankheiten kann auch im ökologischen oder  
 integrierten Landbau erfolgreich verhindert werden.

Cerall® und Cedomon® schützen durch ihr breites Wirkungsspektrum und  
 die sehr hohe Wirksamkeit und führen zu sicheren Erträgen mit hoher  
 Qualität. Die biologischen Saatgutpräparate Cerall® und Cedomon® enthalten  
 das natürliche Bakterium *Pseudomonas chlororaphis*. Durch die Besetzung  
 kommt es zu einer flächendeckenden Besiedlung der Saatgutoberfläche,  
 wodurch der Lebensraum der Krankheitserreger allgemein stark verringert  
 wird.

Cerall® und Cedomon® zeichnen sich durch eine sehr gute  
 Pflanzenverträglichkeit aus und sind bienen- und nützlingsschonend.

Eine anwendungsfertige Formulierung und eine einfache Applikation sind die  
 Vorteile dieser beiden Produkte. Eine lange Lagerfähigkeit des getrockneten  
 Saatgutes (bis zu 3 Jahre ohne Wirkungsverlust) sind gegeben.

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Intrachem Bio Deutschland GmbH & Co. KG  
 Kellereistraße 22  
 51525 Bad Godesberg

# ΓΟΝΙΔΙΩΜΑΤΙΚΗ



# ΜΕΤΑΓΟΝΙΔΙΩΜΑΤΙΚΗ

Cell Systems  
Article

## Geospatial Resolution of Human and Bacterial Diversity with City-Scale Metagenomics

Ebrahim Afshinnikoo,<sup>1,2,3,21</sup> Cem Meydan,<sup>1,2,21</sup> Shanin Chowdhury,<sup>1,2,4</sup> Dyala Jaroudi,<sup>1,2</sup> Collin Boyer,<sup>1,2</sup> Nick Bernstein,<sup>1,2</sup> Julia M. Maritz,<sup>5</sup> Darryl Reeves,<sup>1,2,6</sup> Jorge Gandara,<sup>1,2</sup> Sagar Chhangawala,<sup>1,2</sup> Sofia Ahsanuddin,<sup>1,2,7</sup> Amber Simmons,<sup>1,2</sup> Timothy Nessel,<sup>8</sup> Bharathi Sundares,<sup>8</sup> Elizabeth Pereira,<sup>8</sup> Ellen Jorgensen,<sup>9</sup> Sergios-Orestis Kolokotronis,<sup>10</sup> Nell Kirchberger,<sup>1,2</sup> Isaac Garcia,<sup>1,2</sup> David Gandara,<sup>1,2</sup> Sean Dhanraj,<sup>7</sup> Tanzina Nawrin,<sup>7</sup> Yogesh Saleore,<sup>1,2,6</sup> Noah Alexander,<sup>1,2</sup> Priyanka Vijay,<sup>1,2,6</sup> Elizabeth M. Hénaff,<sup>1,2</sup> Paul Zumbo,<sup>1,2</sup> Michael Walsh,<sup>11</sup> Gregory D. O'Mullan,<sup>3</sup> Scott Tighe,<sup>12</sup> Joel T. Dudley,<sup>13</sup> Anya Dunaif,<sup>14</sup> Sean Ennis,<sup>15,16</sup> Eoghan O'Halloran,<sup>15</sup> Tiago R. Magalhaes,<sup>15,16</sup> Braden Boone,<sup>17</sup> Angela L. Jones,<sup>17</sup> Theodore R. Muth,<sup>7</sup> Katie Schneider Paolantonio,<sup>5</sup> Elizabeth Alter,<sup>18</sup> Eric E. Schadt,<sup>13</sup> Jeanne Garbarino,<sup>14</sup> Robert J. Prill,<sup>19</sup> Jane M. Carlton,<sup>5</sup> Shawn Levy,<sup>17</sup> and Christopher E. Mason<sup>1,2,20,\*</sup>

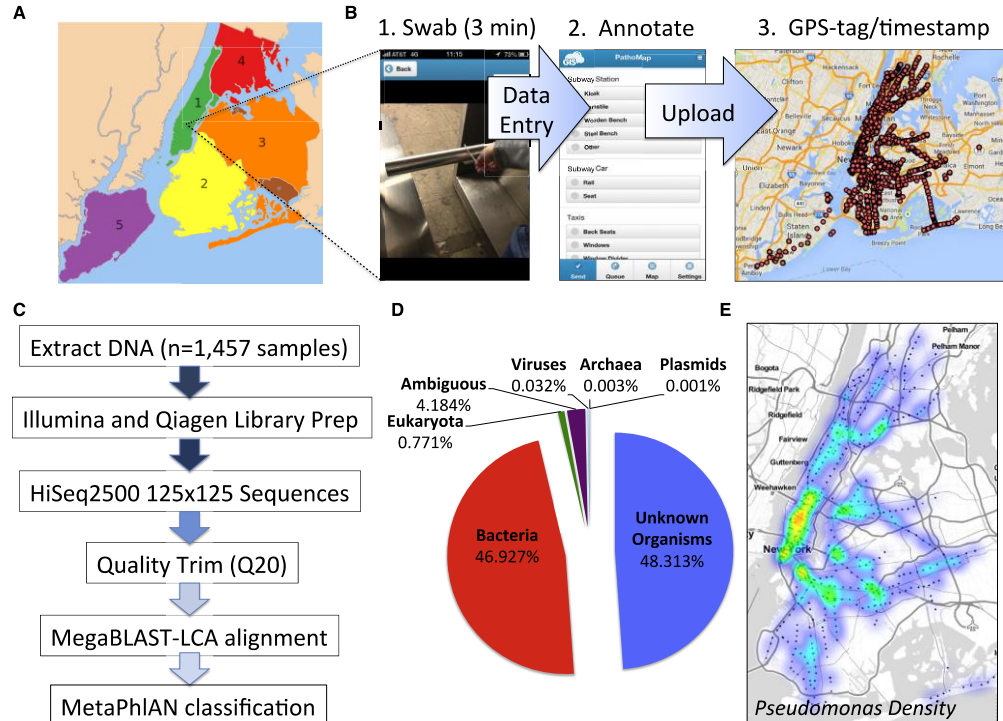


Figure 1. The Metagenome of New York City

# Are we all identical?

Elderly



Pregnant



Celiac



Overweight



Cancer patient



Babies



Athlete



Kidney patient



Young person



Diabetic



# Οργάνωση της Γεωργικής Παραγωγής

ΣΠΟΡΑ

ΣΥΓΚΟΜΙΔΗ

ΚΑΤΑΝΑΛΩΣΗ

## ΔΗΜΙΟΥΡΓΙΑ ΝΕΩΝ ΠΟΙΚΙΛΙΩΝ

- Δημιουργία παραλ/κότητας
- Επιλογή επιθυμητών γενοτύπων
- Αναπολλαπλασιασμός

1<sup>ο</sup>

## ΚΑΛΛΙΕΡΓΕΙΑ

- Όλες οι καλλιεργητικές φροντίδες για την προστασία και την θρέψη του φυτού

2<sup>ο</sup>

## ΜΕΤΑΠΟΙΗΣΗ

- Διαλογή
- Μηχανική, Φυσική, Χημική Επεξεργασία
- Συσκευασία-Τυποποίηση
- Διαφήμιση-Διάθεση

3<sup>ο</sup>



# ΤΥΧΑΙΟ

## WHEAT VARIETIES

ACHELOOS (ΑΧΕΛΩΟΣ)

ACHERON (ΑΧΕΡΩΝ)

AIGES (ΑΙΓΕΣ)

ALFIOS (ΑΛΦΕΙΟΣ)

APOLLONIA

APOTEOSI

ARACHTHOS (ΑΡΑΧΘΟΣ)

AXIOS (ΑΞΙΟΣ)

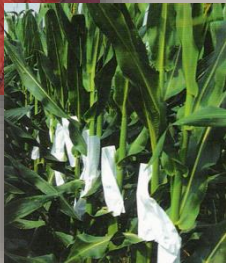
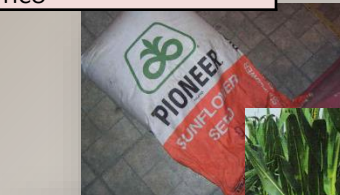
CENTAURO

DIO (ΔΙΟ)

.....

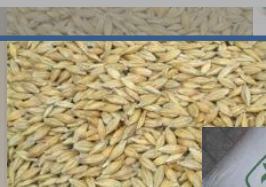
VERDI

VERTICO



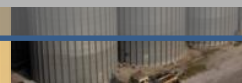
# ΤΥΧΑΙΟ

## Fine mapping and marker-assisted selection (MAS) of a low glutelin content gene in rice

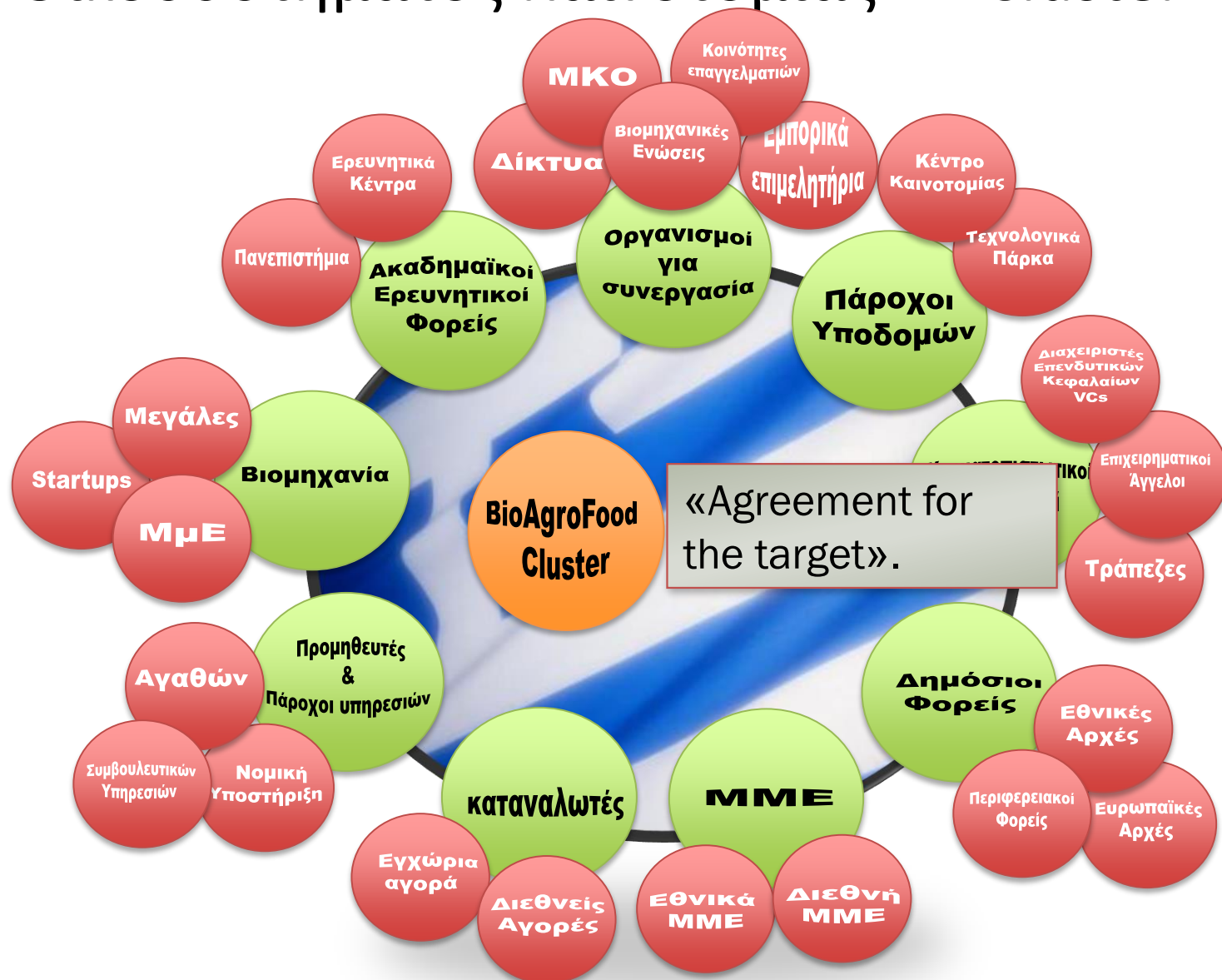


### WHEAT VARIETIES

|                     |
|---------------------|
| ACHELOOS (ΑΧΕΛΩΟΣ)  |
| ACHERON (ΑΧΕΡΩΝ)    |
| AIGES (ΑΙΓΕΣ)       |
| ALFIOS (ΑΛΦΕΙΟΣ)    |
| APOLLONIA           |
| APOTEOSI            |
| ARACHTHOS (ΑΡΑΧΘΟΣ) |
| AXIOS (ΑΞΙΟΣ)       |
| CENTAURO            |
| DIO (ΔΙΟ)           |
| .....               |
| VERDI               |
| VERTICO             |



# Τα συστατικά για τη δημιουργία ενός Οικοσυστήματος Καινοτομίας - > Cluster



**ΕΥΧΑΡΙΣΤΩ ΓΙΑ ΤΗΝ ΠΡΟΣΟΧΗ ΣΑΣ**

# DNA barcoding-Biodiversity identification and discovery

## Use of DNA barcodes to identify flowering plants

W. John Kress<sup>\*,†</sup>, Kenneth J. Wurdack<sup>\*,†</sup>, Elizabeth A. Zimmer<sup>\*</sup>, Lee A. Weigt<sup>†</sup>, and Daniel H. Janzen<sup>‡</sup>

<sup>\*</sup>Department of Botany and <sup>†</sup>Laboratories of Analytical Biology, National Museum of Natural History, Smithsonian Institution, P.O. Box 37012, Washington, DC 20013-7012; and <sup>‡</sup>Department of Biology, University of Pennsylvania, Philadelphia, PA 19104

Contributed by Daniel H. Janzen, April 15, 2005

Methods for identifying species by using short orthologous DNA sequences, known as "DNA barcodes," have been proposed and initiated to facilitate biodiversity studies, identify juveniles, associate sexes, and enhance forensic analyses. The cytochrome c

paper is not to debate the validity of using barcodes for plant identification, but rather to determine appropriate DNA regions for use in flowering plants.

A portion of the mitochondrial CO1 gene was deliberately

Spot the difference: orchids can be distinguished with a single DNA sequence.



## Botanical identities

## DNA Barcoding—a Windfall for Tropical Biology?

W. John Kress<sup>1</sup> and David L. Erickson

OPEN ACCESS Freely available online

## A Two-Locus Global DNA Barcode for Land Plants: The *rbcL* Gene Complements

NEWSFOCUS



TAXONOMY

## Wanted: A Barcode for Plants

## DNA barcodes: Genes, genomics, and bioinformatics

W. John Kress<sup>\*</sup> and David L. Erickson

Department of Botany, MRC-166, National Museum of Natural History, Smithsonian Institution, P.O. Box 37012, Washington, DC 20013-7012

It is not a coincidence that DNA barcoding has developed in concert with genomics-based investigations. DNA barcoding (a tool for rapid species identification based on DNA

DNA Barcoding

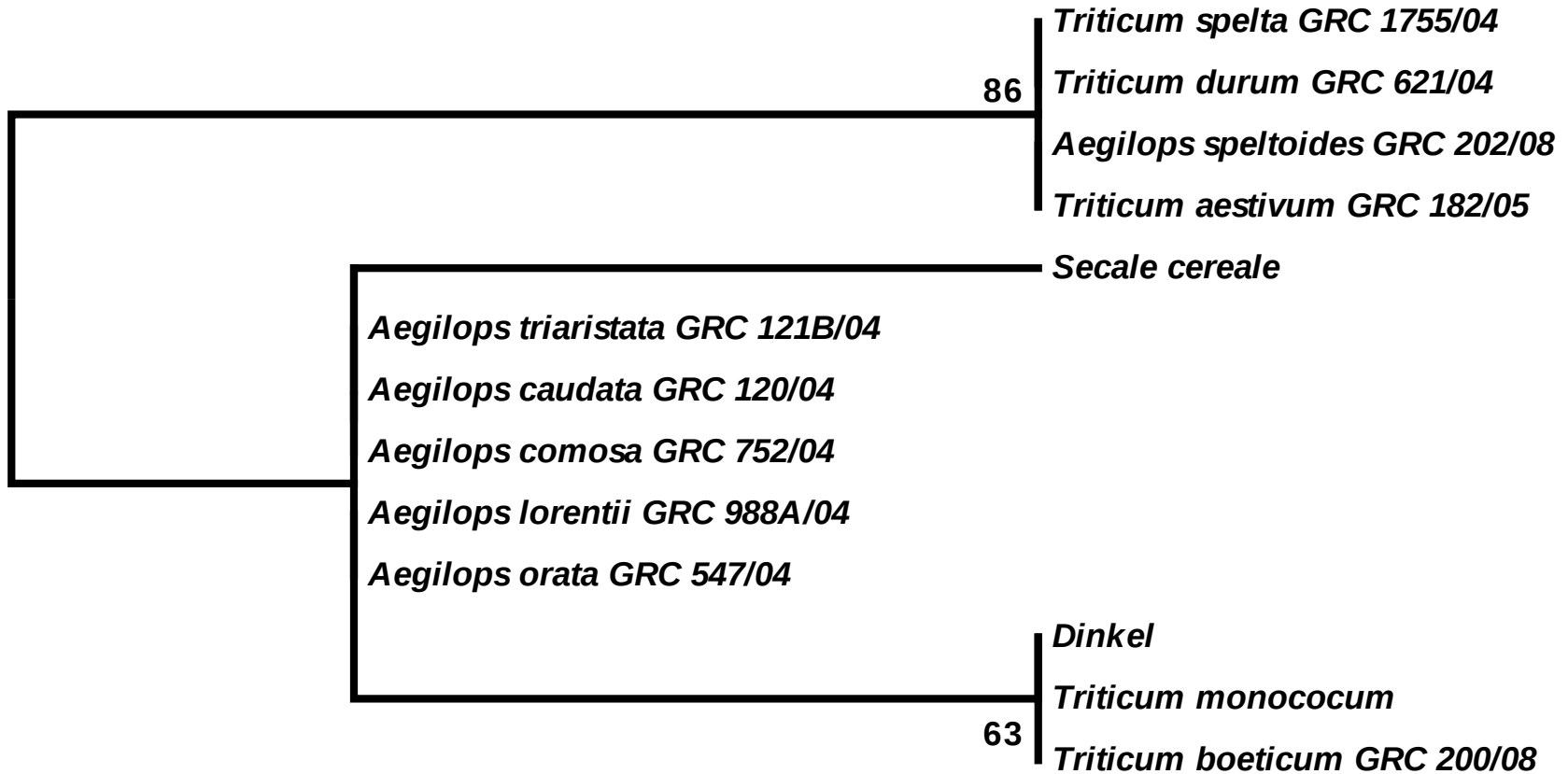


COMMENTARY

# Triticaceae



# Triticaceae



0.0002

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

***Dinkel***  
***Secale\_cereale***  
***Triticum\_monococum***

# A chromosome-based draft sequence of the hexaploid bread wheat (*Triticum aestivum*) genome

The International Wheat Genome Sequencing Consortium (IWGSC)\*,†

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## Ερευνητές αποκωδικοποιούν το γονιδίωμα του σιταριού

Σκοπός η καλύτερη διατροφή του παγκόσμιου πληθυσμού

ΥΓΕΙΑ

15:22 • 18/07/2014



## A chromosome conformation capture ordered sequence of the barley genome

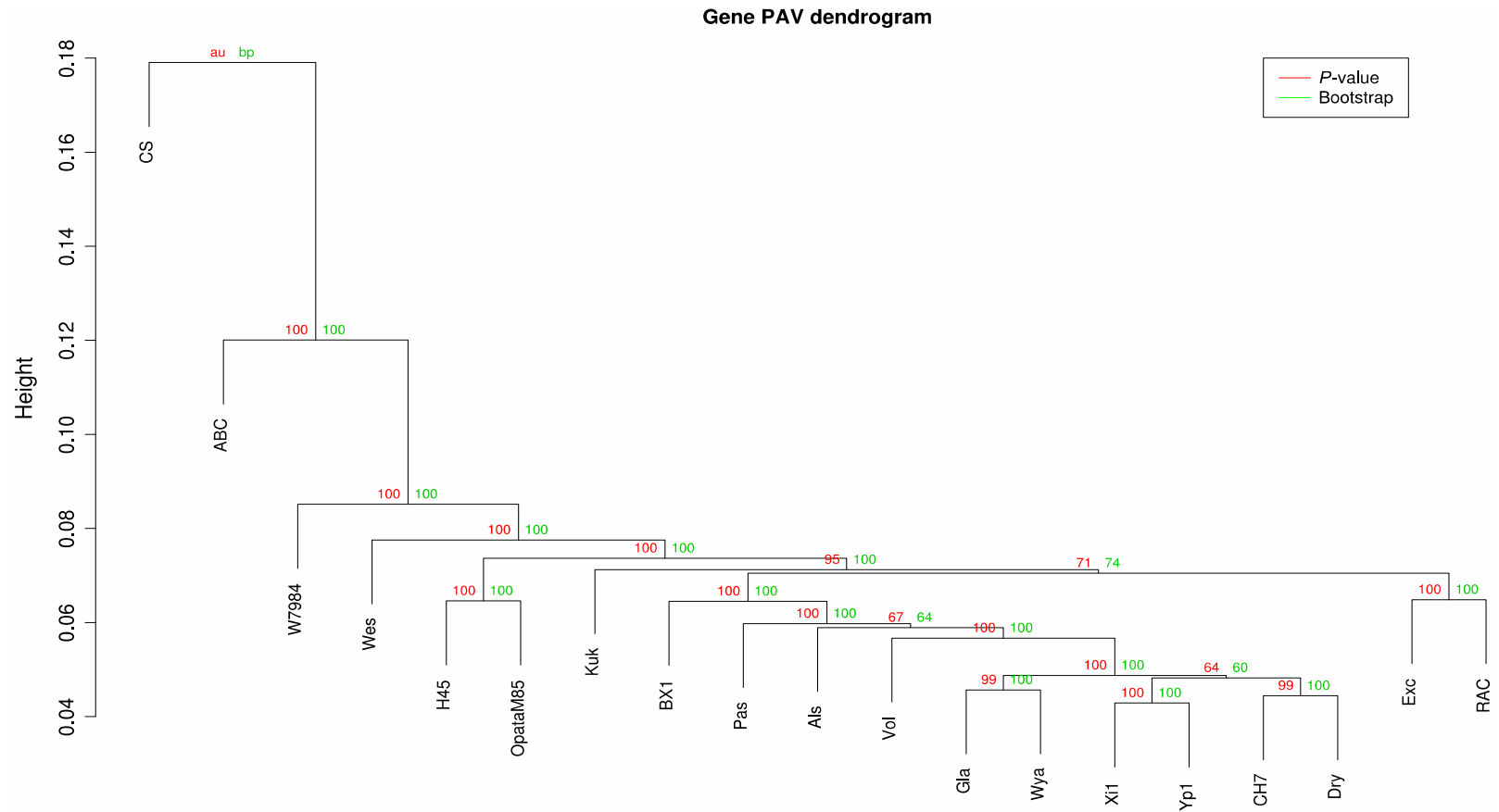
### Διαβάστηκε το DNA του κριθαριού

ΔΗΜΟΣΙΕΥΣΗ: 27/04/2017 10:08 |



RESOURCE

# The pangenome of hexaploid bread wheat



**Figure 2.** Dendrogram of the 19 cultivars based on the presence–absence variation of genes in each cultivar.