Rabbi Joseph Kelman ob”m April 1,1927-June 27, 2009 (ה' תמוז, תשס"ט)

Rabbanit Ruth Kelman ob”m August 20, 1933 - June 12, 1999 (כח' סיון, תשנ"ט)

The Genetic History and Future of the Jewish People

The Genetic History and Future of the Jewish People

Is there a Jewish People ?

Can we learn about human history from DNA?

What can we learn about the past history of Jews from the DNA of contemporary Jews?

Are there societal, political, legal, health, halachic implications that might impact on the future?

Back to the future!

Case 1

30 year old Israeli woman is to marry an Israeli Jewish man in Israel. The woman immigrated at the age 12 from the Ukraine under the "Law of Return". There is documentation for Jewish identity of her paternal grandfather, but no comparable record as her maternal side.

The Rabbinical Courts in Israel refuse to grant a marriage permit. She carries out private DNA testing which shows that her mitochondrial (maternally transmitted) DNA is of the K1a1b1a sublineage shared with 1.5 millions of established Jews, while was found only in one non-Jew(?) subject from west Ukraine in a 13500 non-Jewish European sample set .

- **Does the woman need conversion?**

Case 2

26 year old religiously observant Kohen (AA) was introduced to the 22 old year daughter (BB) of a Kohen (CC), who had married a divorcee, rendering the daughter halachically a "Chalala" and hence forbidden to marry BB.

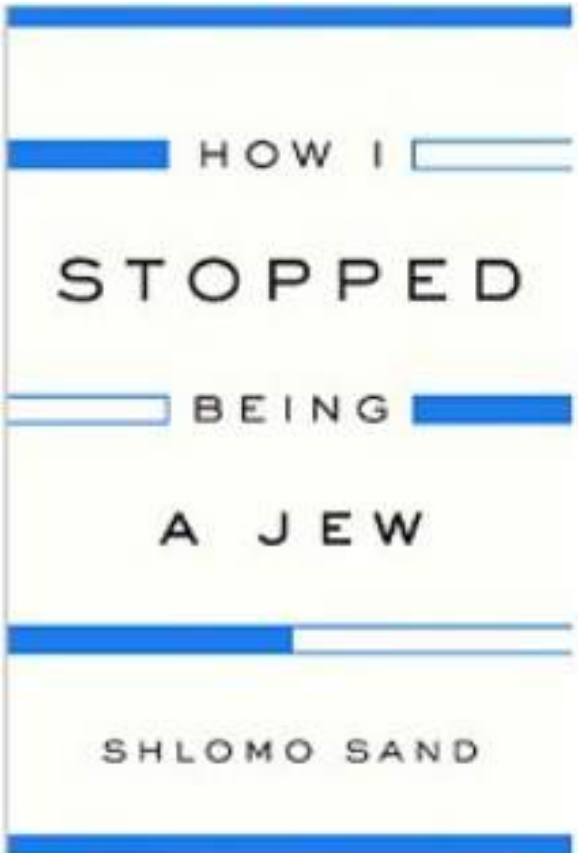
AA asked the following question: if Y chromosome DNA marker testing shows that AA and CC come from paternal genealogic lineages which diverged long before the time of Biblical Aaron HaKohen, then one or both of us is not from the "seed of Aaron".

- **Is the scientific rationale valid?**
- **Are there halachic implications?**

Secondary question: How many Kohanim are needed for a valid Pidyon HaBen

The Genomic History of the Jewish People

Is there a Jewish People ?



Shlomo Sand

Hillel Halkin
"Indecent Proposal"
Book Review
January 9, 2010

The Genetic History of the Jewish People

Is there a Jewish People ?

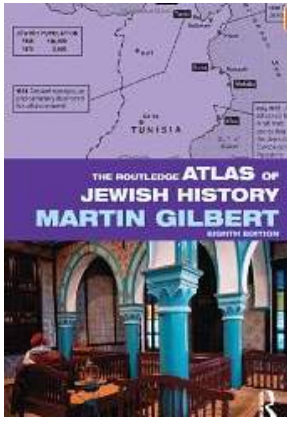
Martin Gilbert z”l

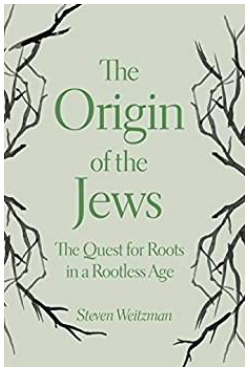
Sergio Della Pergola

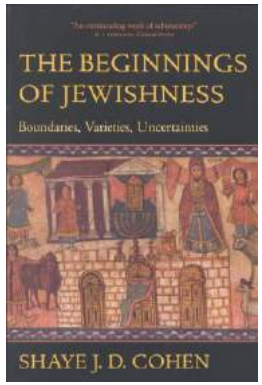
Tudor Parfitt

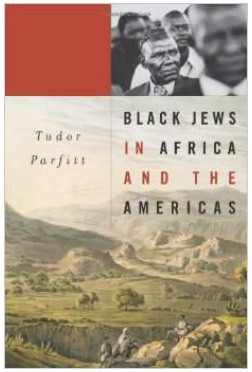
Steven Weitzman

Shaye Cohen









many other…….

Can we learn about human history from DNA?

- DNA marker evidence indicates that all humans are part of one extended family
- DNA marker evidence indicates that Jews scattered across most Diaspora communities are members of a branch of this extended family originating in the Near East ~ 3,000 years ago

But more complex than that!

the power *of* DNA:

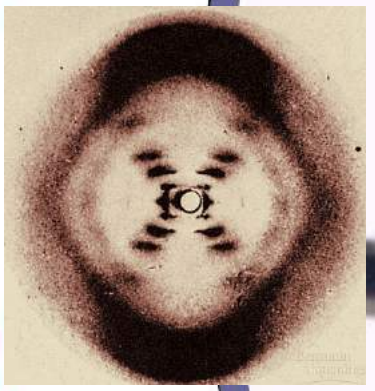
Biological Sciences

Medical Genetics

Genetic Archaeology:

- **Genetic Anthropology: Human Origins**
- **Population Genetics: Demographics, Communities**
- **Genetic Genealogy: Families, Lost Relatedness, Forensics**

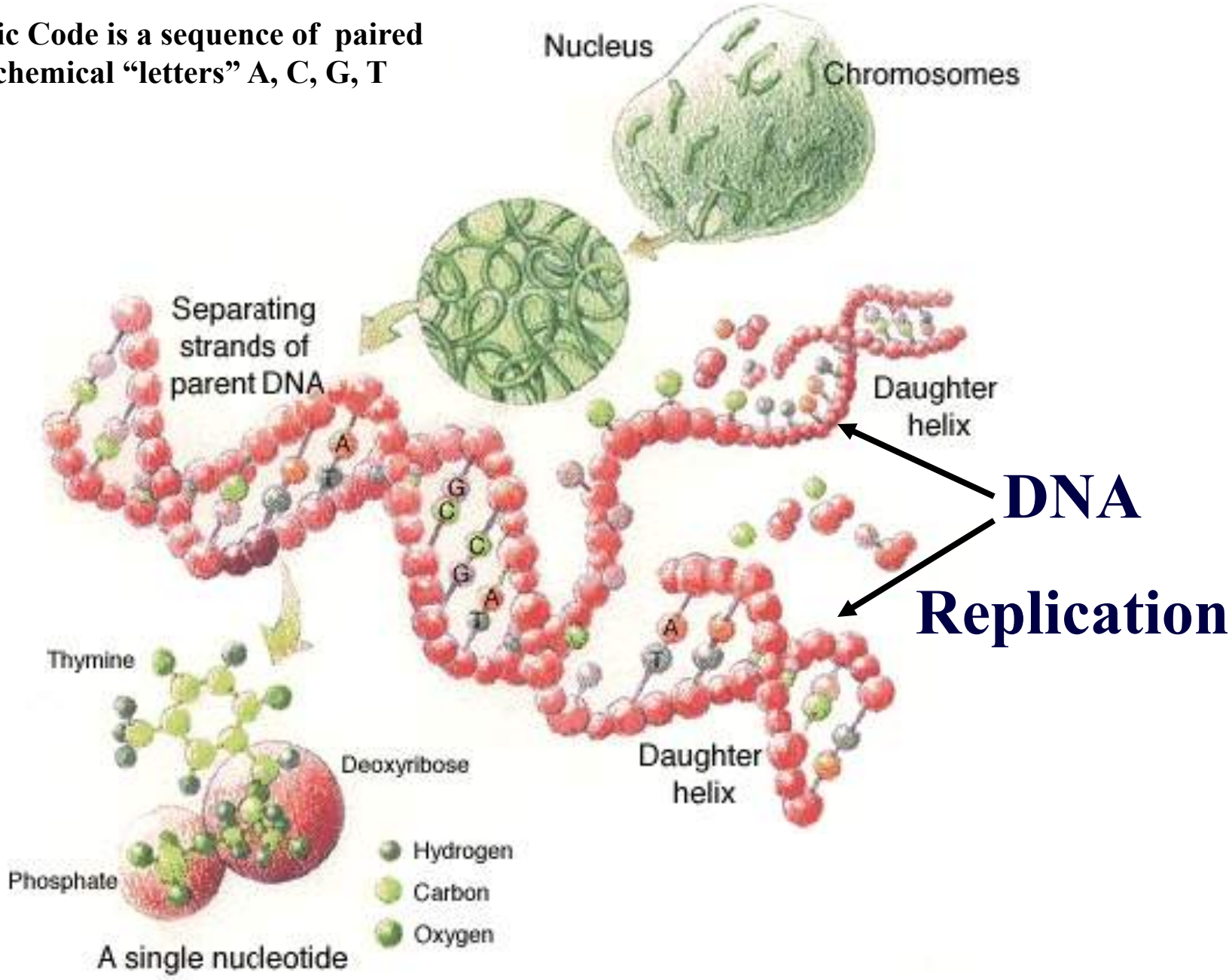
Discovery of DNA



Rosalind Franklin

The Double Helix

Genetic Code is a sequence of paired biochemical "letters" A, C, G, T



DNA Replication

Precise → no errors

boring world full of identical copies of same sequence

Errors → richness of living diversity

price: illness

ורפוא ירפא..

…and you shall surely heal

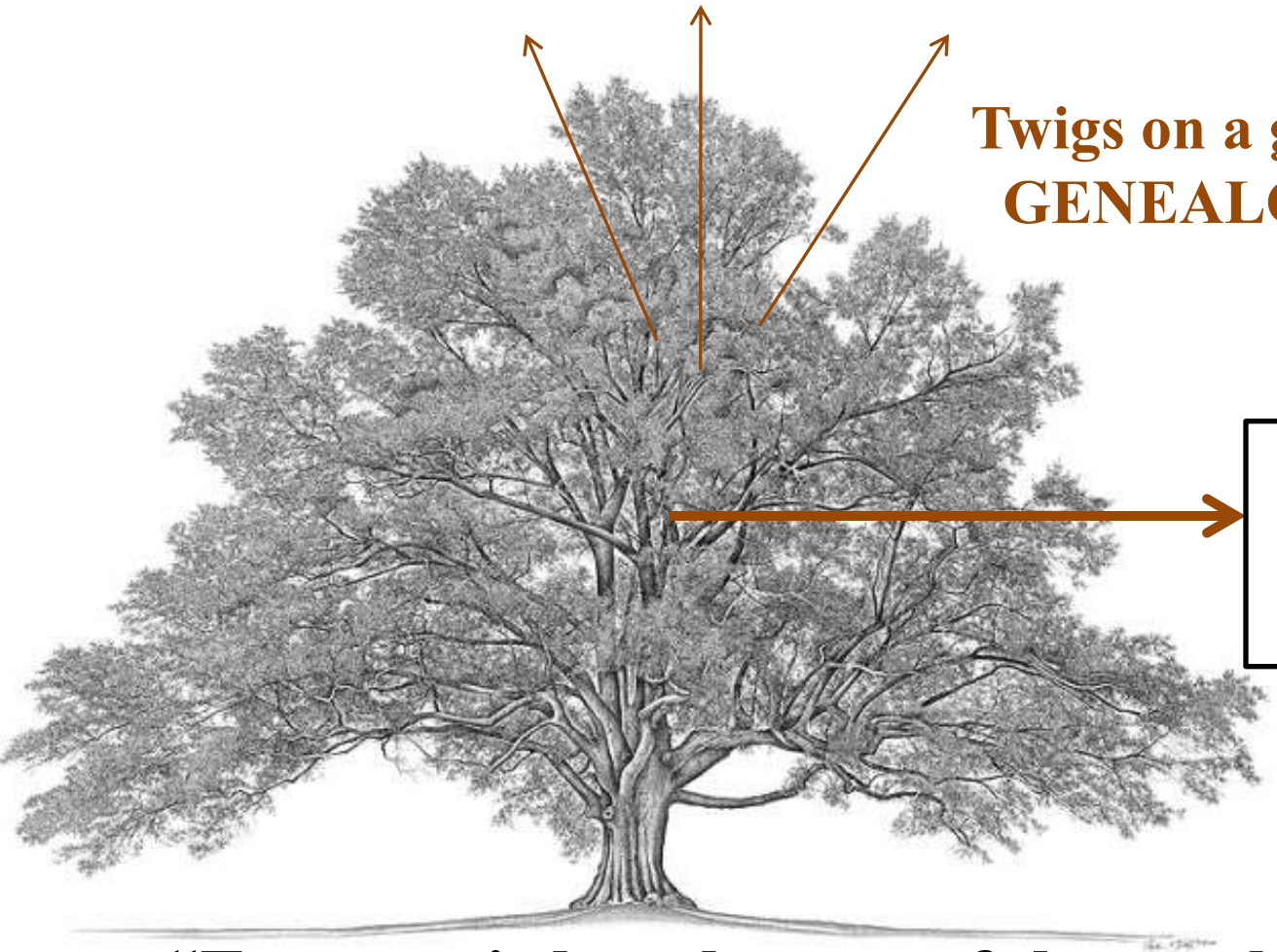
Exodus 21, 18

Mutations and Markers

Most (~95%) errors in DNA replication are "silent": Do not cause differences in appearance or behaviour or disease, but they can be detected as markers by DNA analysis

These markers are used in Population Genetics to trace ancestries and to map real disease causing mutations

STRs:
TWIG MARKERS



Twigs on a given Branch define
GENEALOGIC LINEAGES

SNPs:
BRANCH
MARKERS

“For man is but the tree of the earth”

Deuteronomy 20:19

Location of Genomic DNA Markers

Chromosomes in nucleated cells

mtDNA (outside of nucleus)

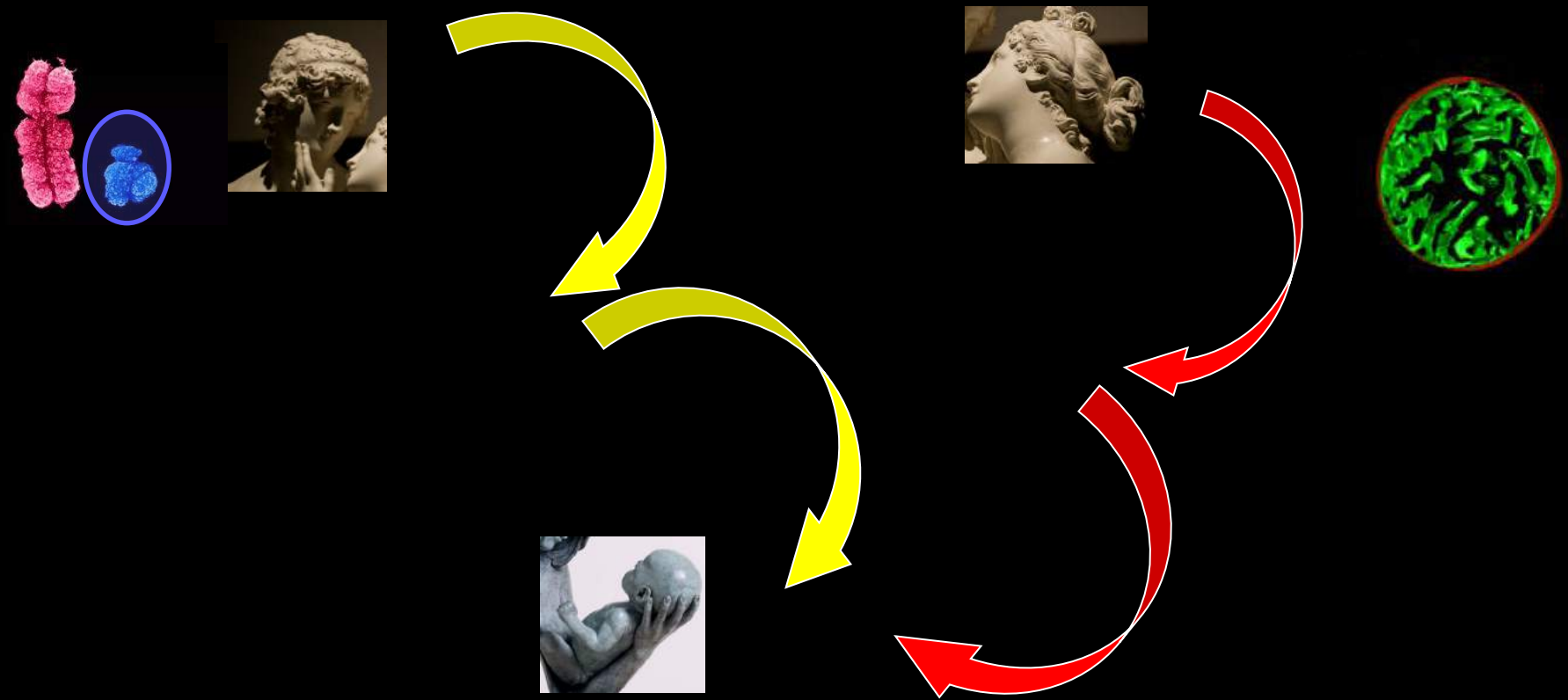
Adapted from Dinour

Y Chromosome markers only in males

Mitochondrial markers only transmitted by females

Reconstructing Ancestry

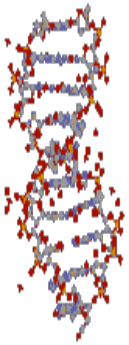
Individuals who share the same set of markers for a given DNA region share a common ancestry at that genomic region



If the markers are on the Y-chromosome – shared paternal ancestry

If the markers are on mitochondrial DNA – shared maternal ancestry

It Began with the Cohanim



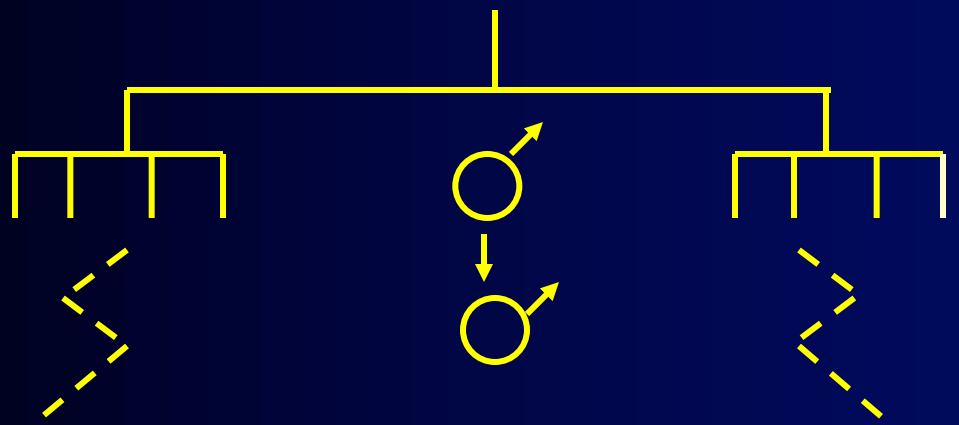
“And take unto thee, Aaron thy brother, and his sons with him, from among the children of Israel, that he may minister unto me in the priest’s office...” Exodus 28,2

http://www.jewsnews.co.il/2014/05/19/the-fascinating-jewish-story-behind-the-star-trek-vulcan-salute/

Credit: Stephen Gryfe

Aaron

past



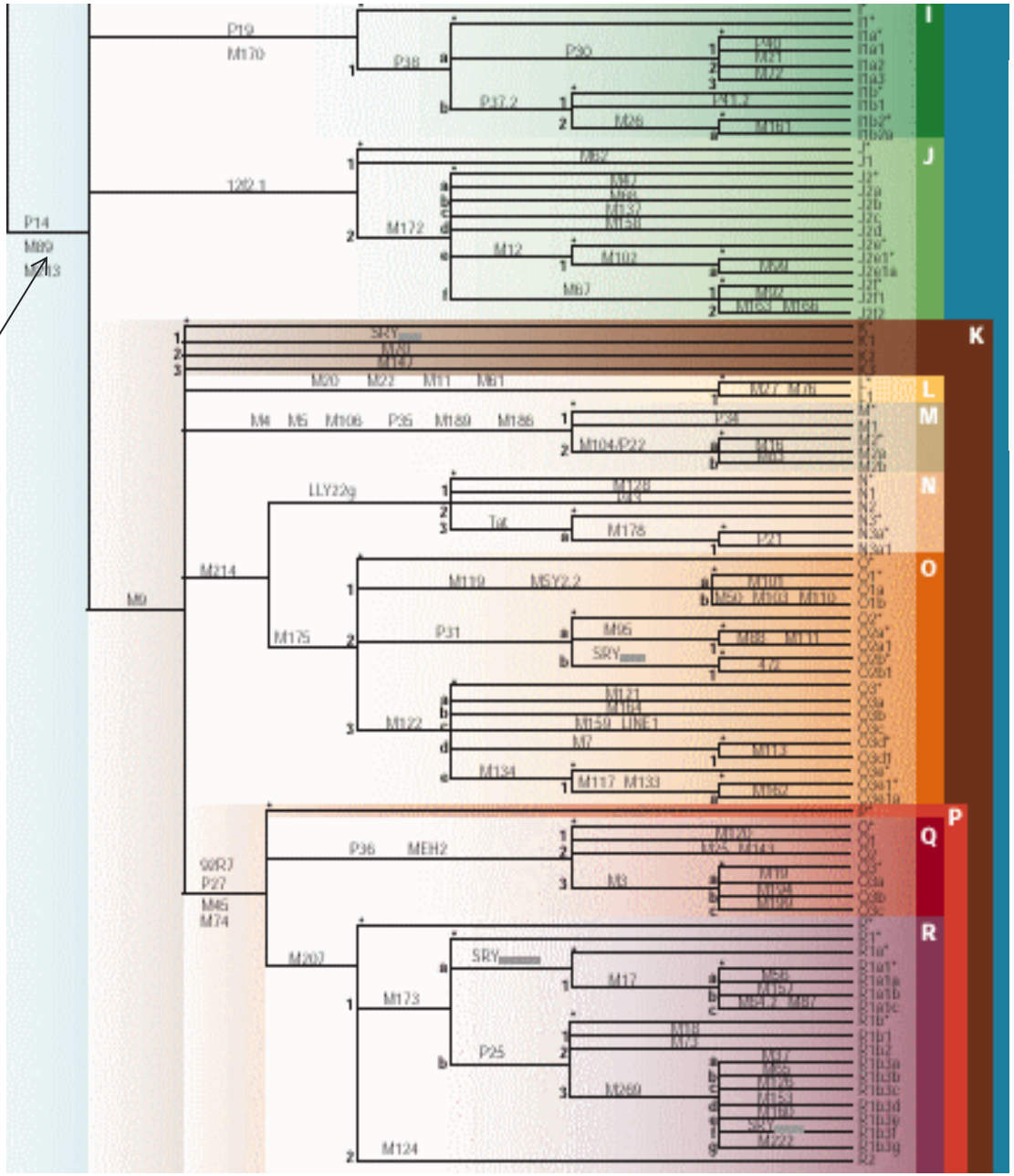
~350,000 Cohanim (Jewish Priests)	
Non-Ashkenazi	Ashkenazi

present

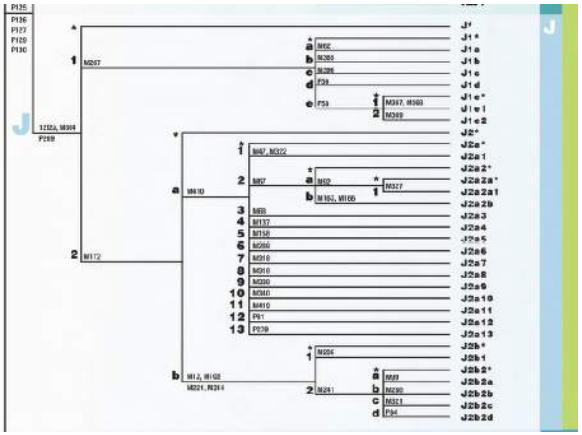
HYPOTHESIS: Y-chromosomes of historically and geographically dispersed Cohanim should be more alike than Y's of other groups and more alike than are their autosomes

(p.s. anyone can do this today and check in 100 generations)

root

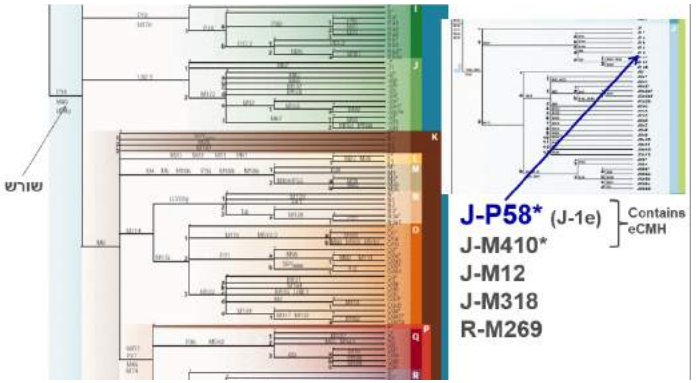


Y-Lineage Tree



Y-Chromosome Global Haplogroup Tree (Branches)

Will the Kohanim be dispersed among many or few branches?



SCIENTIFIC CORRESPONDENCE

nature

Y chromosomes of Jewish priests

SIR — According to biblical accounts, the Jewish priesthood was established about 3,300 years ago with the appointment of the first Israelite high priest. Designation of Jewish males to the priesthood continues to this day, and is determined by strict patrilineal descent. Accordingly, we sought and found clear differences in the frequency of Y-chromosome haplotypes between Jewish priests and their lay counterparts. Remarkably, the difference is observable in both the Ashkenazic and Sephardic populations, despite the geographical separation of the two communities.

The human Y chromosome has useful properties for studies of molecular evolution[1,2]. Except for the pseudo-autosomal region, it is inherited paternally and does not recombine. It can be used to construct patrilineal genealogy cladograms completer than paternal descent by which male Jews are assigned to the priesthood. Identification as a priest carries with it certain social and religious obligations which have tended to preserve this identity within Jewish communities. Based on surveys of Jewish cemetery gravestones, priests represent approximately 5% of the estimated total male world Jewish population of roughly 7 million (data not shown).

We identified haplotypes of 188 unrelated Y chromosomes using the polymerase chain reaction (PCR) applied to genomic DNA isolated from buccal mucosal swab samples from Israeli, North American and British Jews. We constructed haplotypes using first, the presence or absence of the Y Alu polymorphic (YAP) insert, thought to represent a unique evolutionary event dated to between 29,000 and 340,000 years ago[1,2]; and second, a trast, we found no significant difference in the distribution of alleles for the non-Y-chromosome locus polymorphism D1S191 (data not shown). These Y-chromosome haplotype differences confirm a distinct paternal genealogy for Jewish priests.

We further identified subjects as being of Ashkenazic or Sephardic origin. This refers to the two chief, separate communities which developed within the diaspora during the past millennium[3]. As shown in the table, the same haplotype distinction can be made between priests and lay members within each population. This result is consistent with an origin for the Jewish priesthood antedating the division of world Jewry into Ashkenazic and Sephardic communities, and is of particular interest in view of the pronounced genetic diversity displayed between the two communities[4]. This conclusion is further supported by the relative preponderance of the YAP⁻, DYS19B haplotype in both populations, suggesting that this may have been the founding modal haplotype of the Jewish priesthood.

Taken together, our findings define a set of Y chromosomes of recent common origin. Differences which have accumulated in the genomic DNA of the Y chromosomes of Jewish priests during the relatively short time since the establishment of the priesthood, should be useful in defining rates and mechanisms of Y-chromosome evolution.

Karl Skorecki
Sara Selig
Shraga Blazer
Bruce Rappaport Faculty of Medicine and Research Institute and Rambam Medical Centre, Technion-Israel Institute of Technology.

HAPLOTYPE FREQUENCY F(standard error)

Alleles	All		Ashkenazic		Sephardic	
	Cohen n=68	Israelite n=120	Cohen n=44	Israelite n=81	Cohen n=24	Israelite n=39
YAP⁻ DYS19 A	0.162 (0.045)	0.091 (0.026)	0.205 (0.061)	0.074 (0.029)	0.083 (0.056)	0.129 (0.054)
B	0.544 (0.060)	0.325 (0.042)	0.454 (0.075)	0.321 (0.052)	0.709 (0.093)	0.333 (0.075)
C	0.162 (0.045)	0.300 (0.042)	0.227 (0.063)	0.272 (0.049)	0.042 (0.041)	0.359 (0.077)
D	0.088 (0.035)	0.083 (0.024)	0.091 (0.044)	0.111 (0.035)	0.083 (0.056)	0.026 (0.024)
E	0.029 (0.020)	0.017 (0.012)	0.000 —	0.026 (0.017)	0.083 (0.056)	0.000 —
YAP⁺ DYS19 (all)	0.015 (0.014)	0.184 (0.035)	0.023 (0.024)	0.197 (0.045)	0.000 —	0.153 (0.057)

- **A remarkably limited number of Y-chromosome lineages shared among Kohanim from temporally and geographically dispersed Diaspora communities**

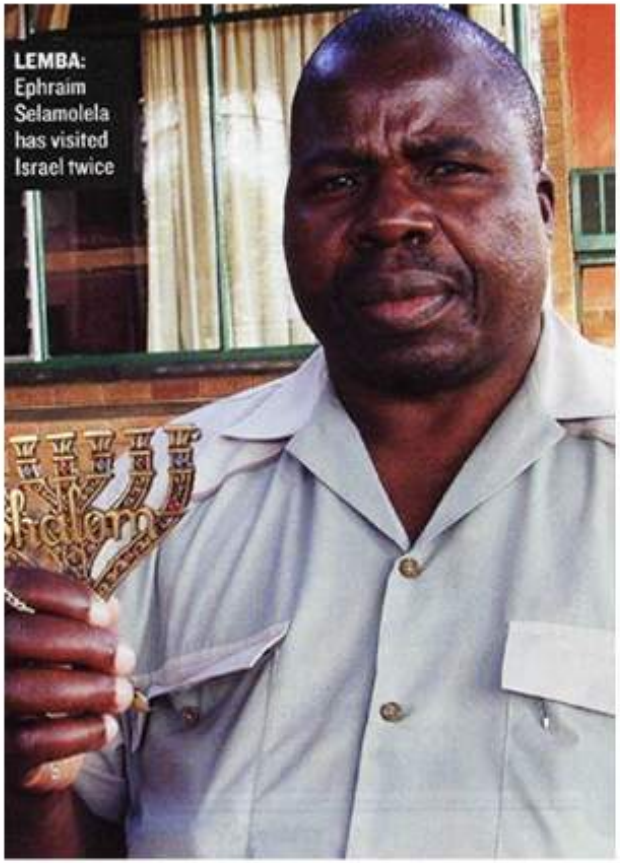
- **The largest such branch coalesces to a founder ~3,200 ybp with a Levant origin and is designated by a suite of markers defining the signature: "Cohen Modal Haplotype" (eCMH)**

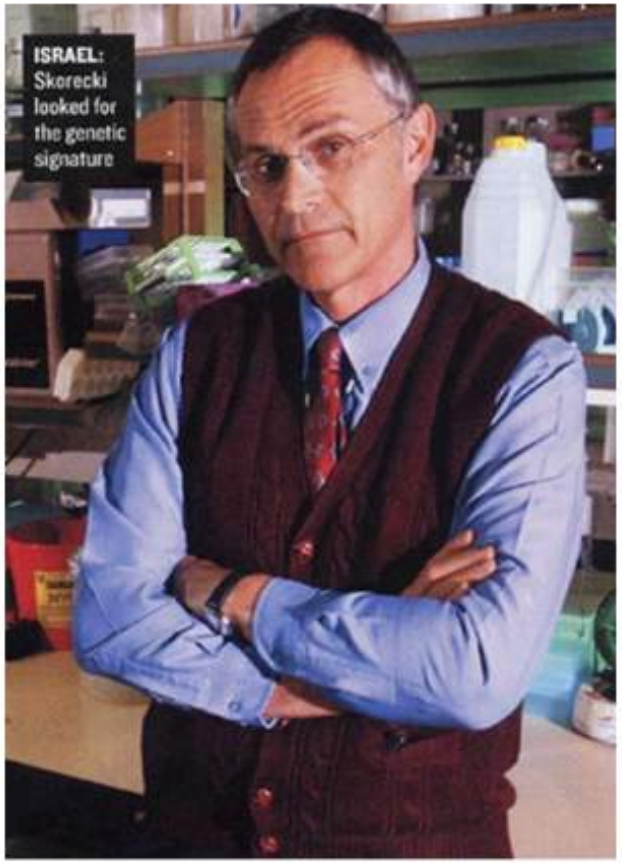
- **Consistent over more than 20 years of research which gave rise to several consumer genetic genealogic companies:**
  - FamilytreeDNA
  - National Genographic
  - many other

“Lost Tribes and Hidden Jews”

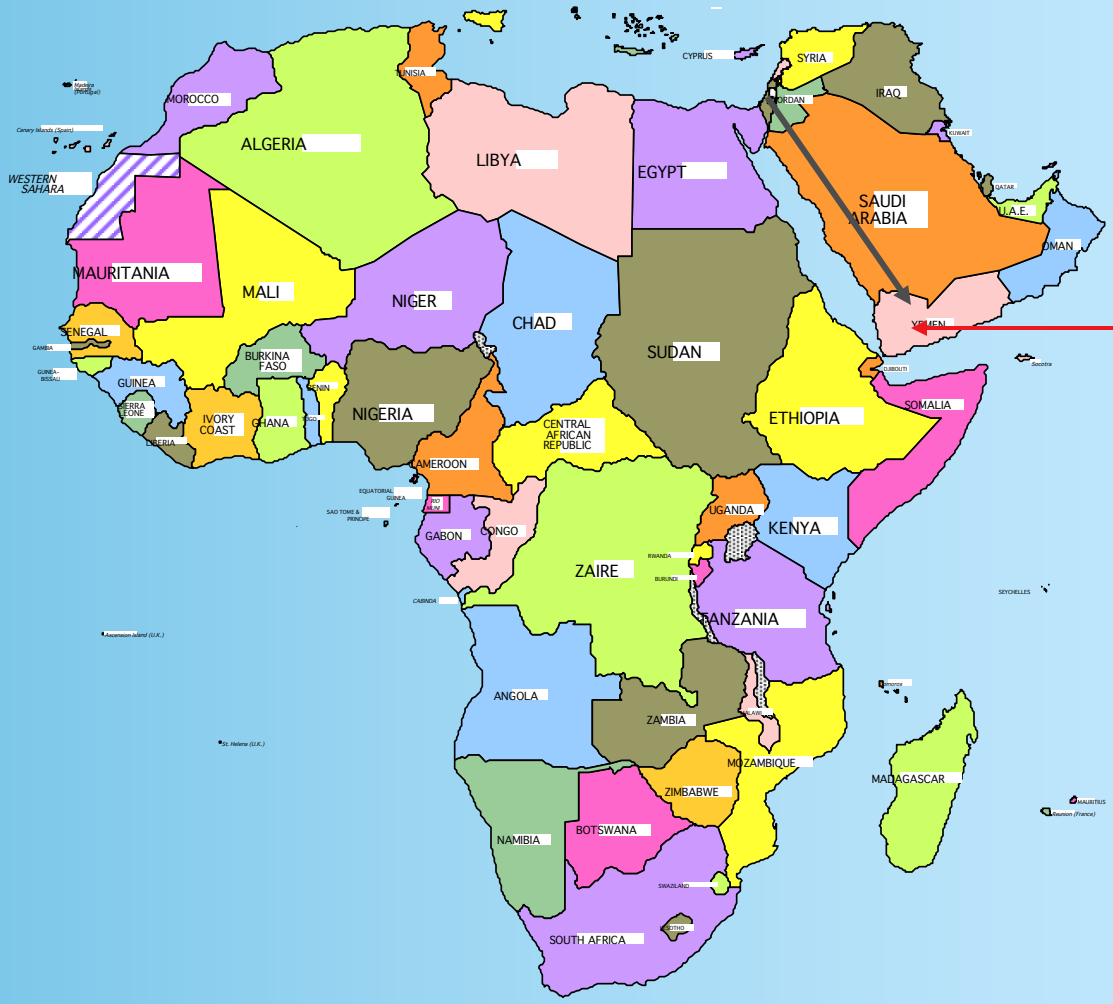
Are They Related?

ON NEWSSTANDS NOW
Newsweek
Our Voices. Your Voices. Every Day.





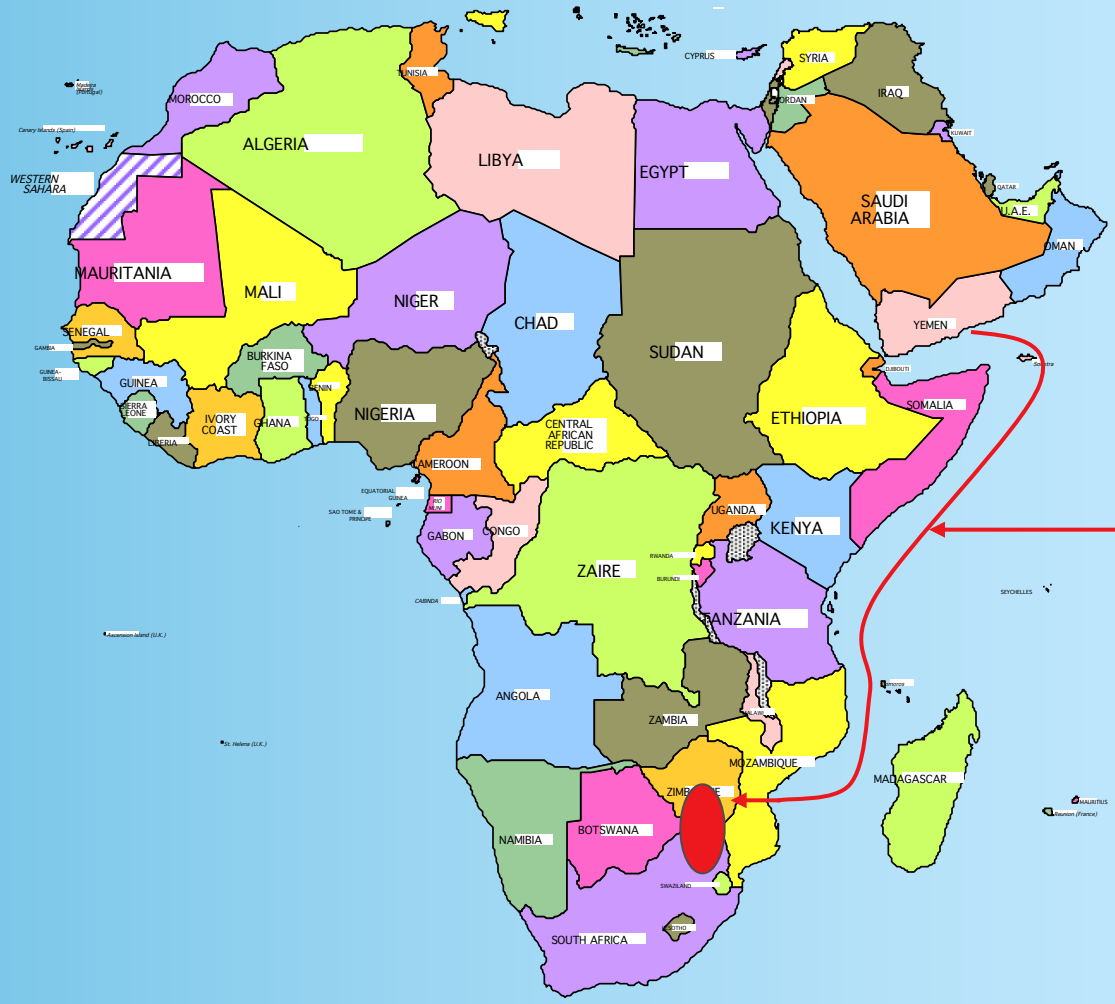
Traditional History of The Lemba



"Buba" led a group out of ancient Judea – to settle in the city of Senna in the Hadramout

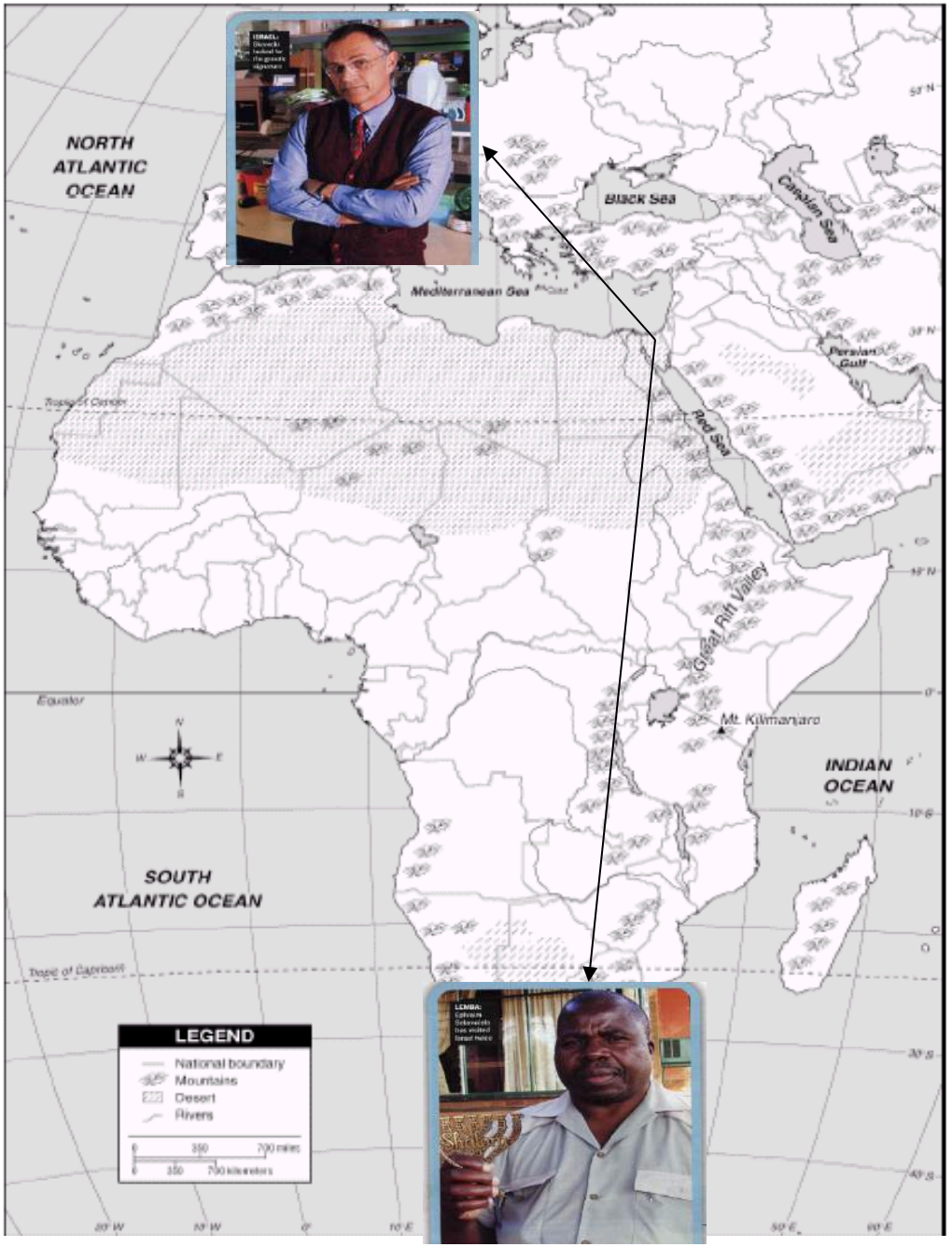
Jewish Deme in Yemen

Traditional History of The Lemba

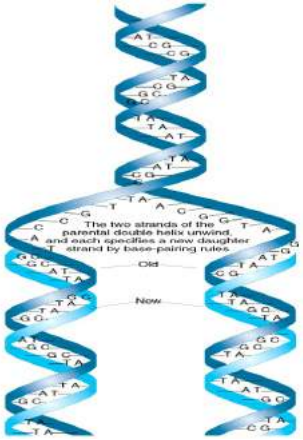


Several Centuries Ago, A Boat of Jewish Men Sailed From Yemen to Southern Africa, Went Inland and Married Local Bantu Women.

Y-chromosome signatures indicate that many Lemba and many Cohanim share highly resolved Near East paternal ancestry



Male genealogic relatedness does not necessarily reflect "genome wide" relatedness nor how each individual will respond to a given medication

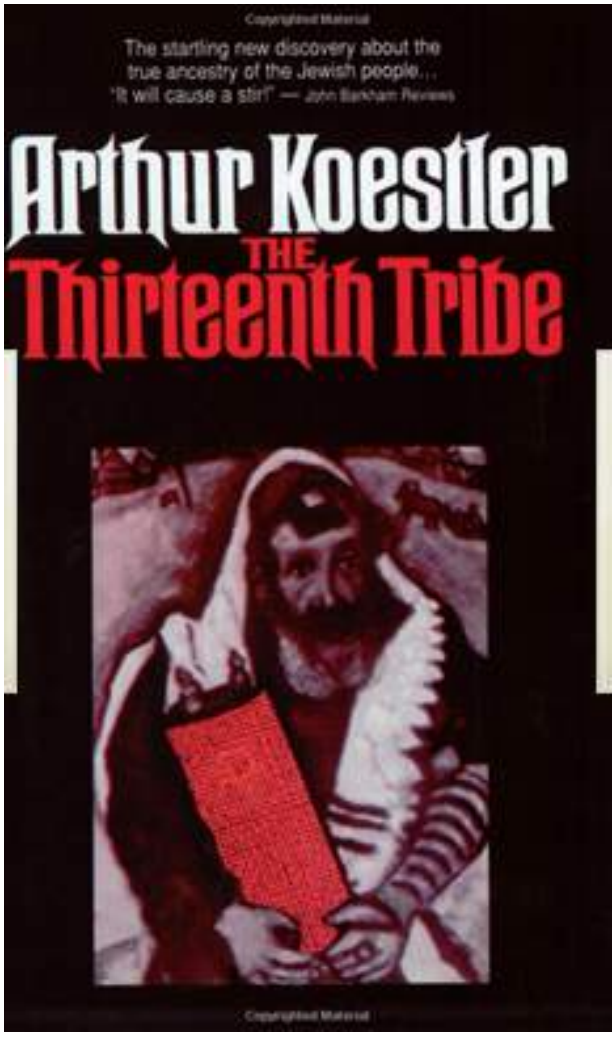


Could not have guessed by physical appearance nor by looking at markers outside of Y

Each Genomic Region has its own Evolutionary History

“Lost Tribes and Hidden Jews”

Are Ashkenazi Jews a “Lost Tribe?”


Copyrighted Material
The startling new discovery about the true ancestry of the Jewish people...
"It will cause a stir!" — John Barham Reviews
Arthur Koestler
THE
Thirteenth Tribe
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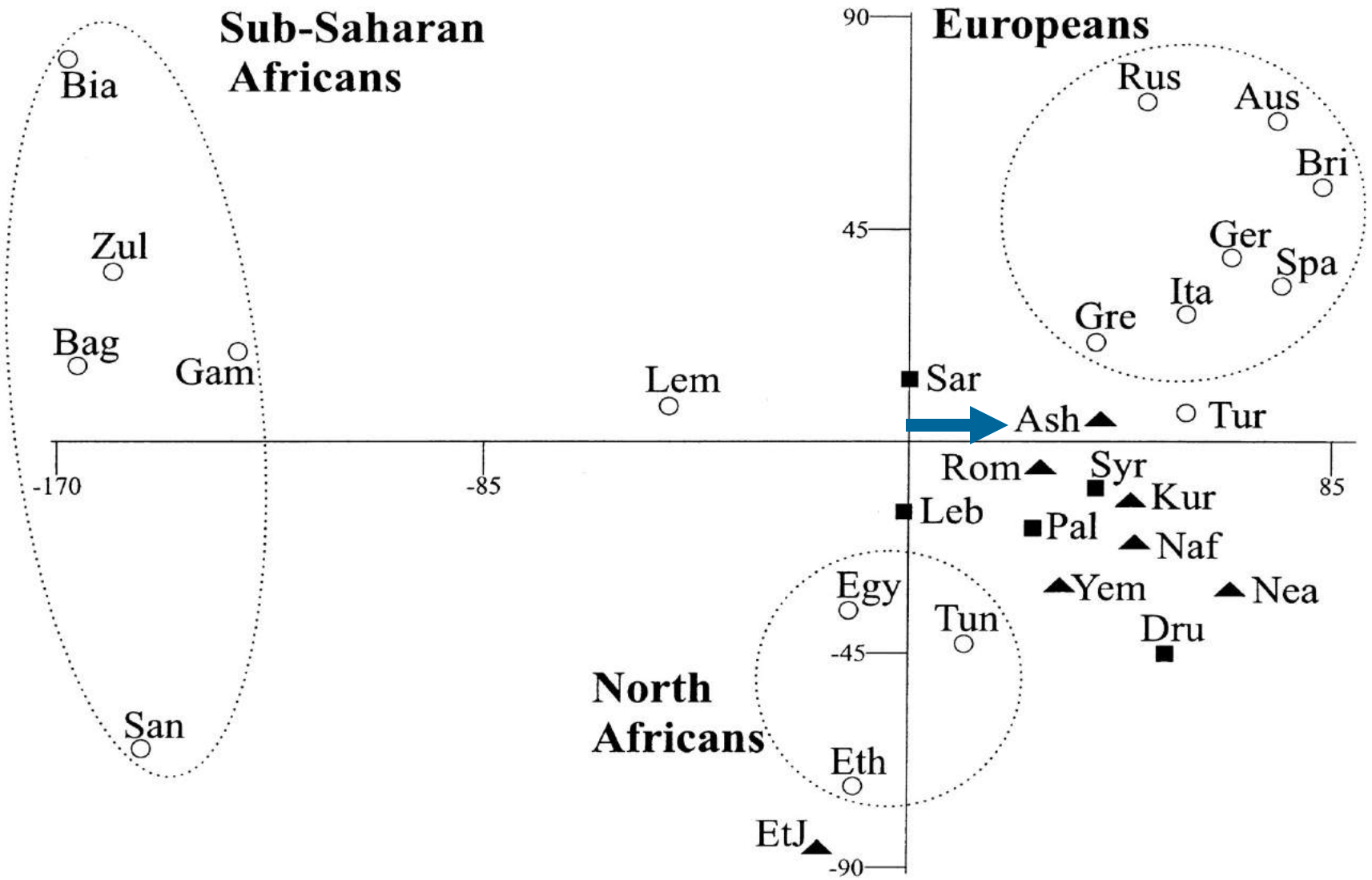
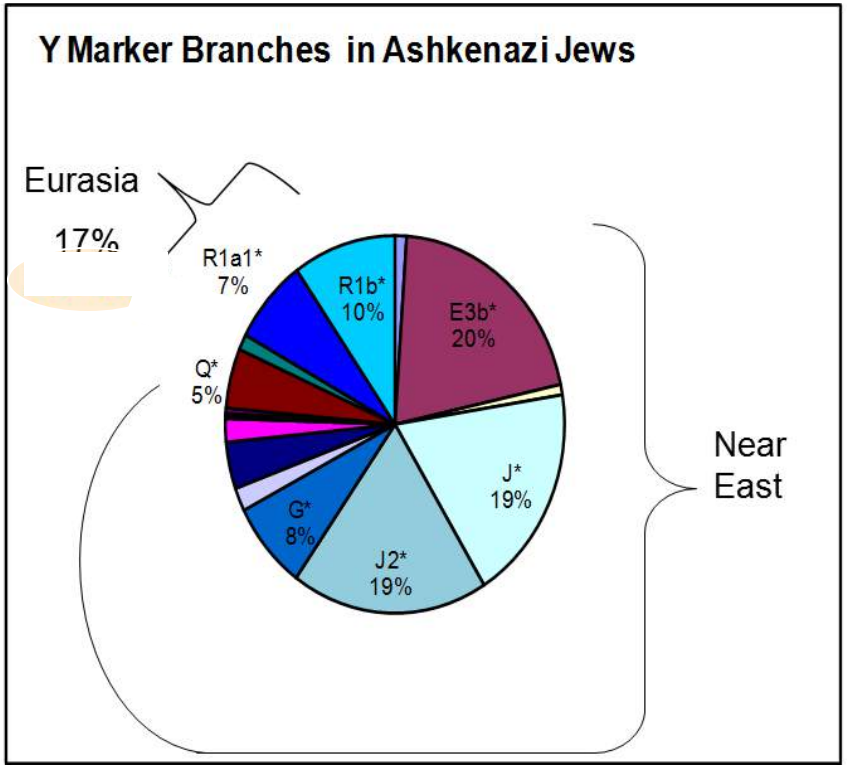
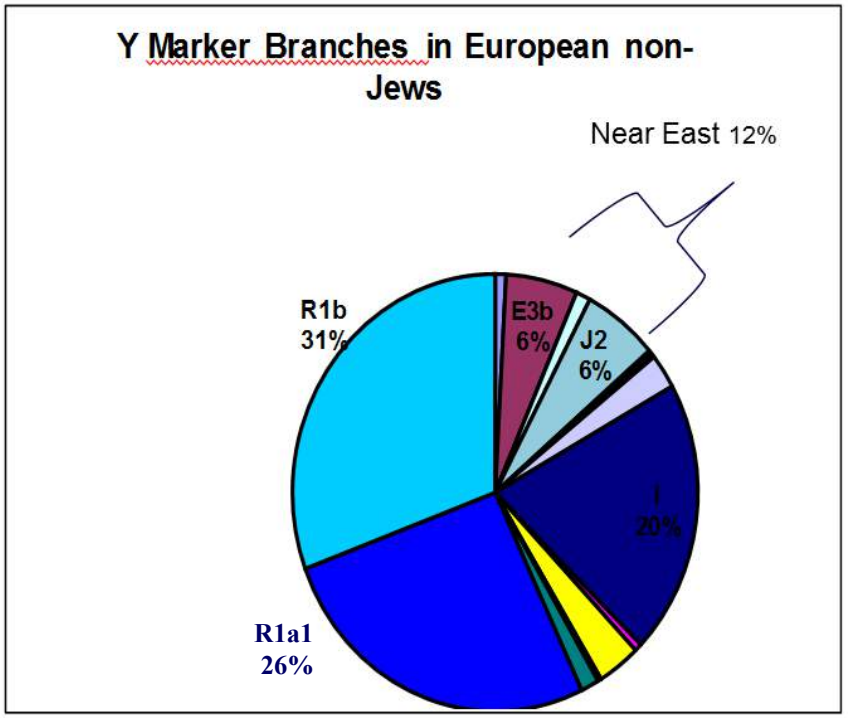
Jewish Diaspora
from the Khazar Empire
(in stripes)
Russia
Belarus
Ukraine
Kazakhstan
Romania
Georgia
Uzbekistan
Turkey
Iran
Israel



Hammer et al. 2000

Y Chromosome (paternal) Marker Branches in Ashkenazi Jews compared to European non-Jews





Ashkenazi Jews:
Mostly Near East Branches
(J, E major founding; G, Q minor founding)

European Non-Jews:
Mostly Eurasian Branches
(R1a1, R1b and I)

ARTICLE

Received 28 Jun 2013 | Accepted 13 Nov 2013 | Published 17 Dec 2013

DOI: 10.1038/ncomms3928 OPEN

Phylogenetic applications of whole Y-chromosome sequences and the Near Eastern origin of Ashkenazi Levites

The R1a l
not of E

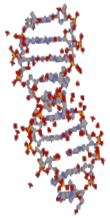
SCIENTIFIC REPORTS
02 November 2017

OPEN

The genetic variation in the R1a clade among the Ashkenazi Levites' Y chromosome

Doron M. Behar[1,2], Lauri Saag[1], Monika Karmin[1], Meir G. Gover[3], Jeffrey D. Wexler[4], Luisa Fernanda Sanchez[2], Elliott Greenspan[2], Alena Kushniarevich[1,5], Oleg Davydenko[5], Hovhannes Sahakyan[1,6], Levon Yepiskoposyan[6], Alessio Boattini[7], Stefania Sarno[7], Luca Pagani[1,8], Shai Carmi[9], Shay Tzur[8,10], Ene Metspalu[1,11], Concetta Bormans[2], Karl Skorecki[10,12], Mait Metspalu[1], Siiri Rootsi[1] & Richard Villems[1,11]

Chromosome Y Genes



Flipping TV Channels

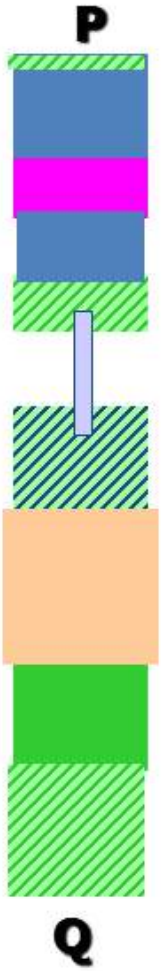
Unwillingness to ask for Directions When Driving

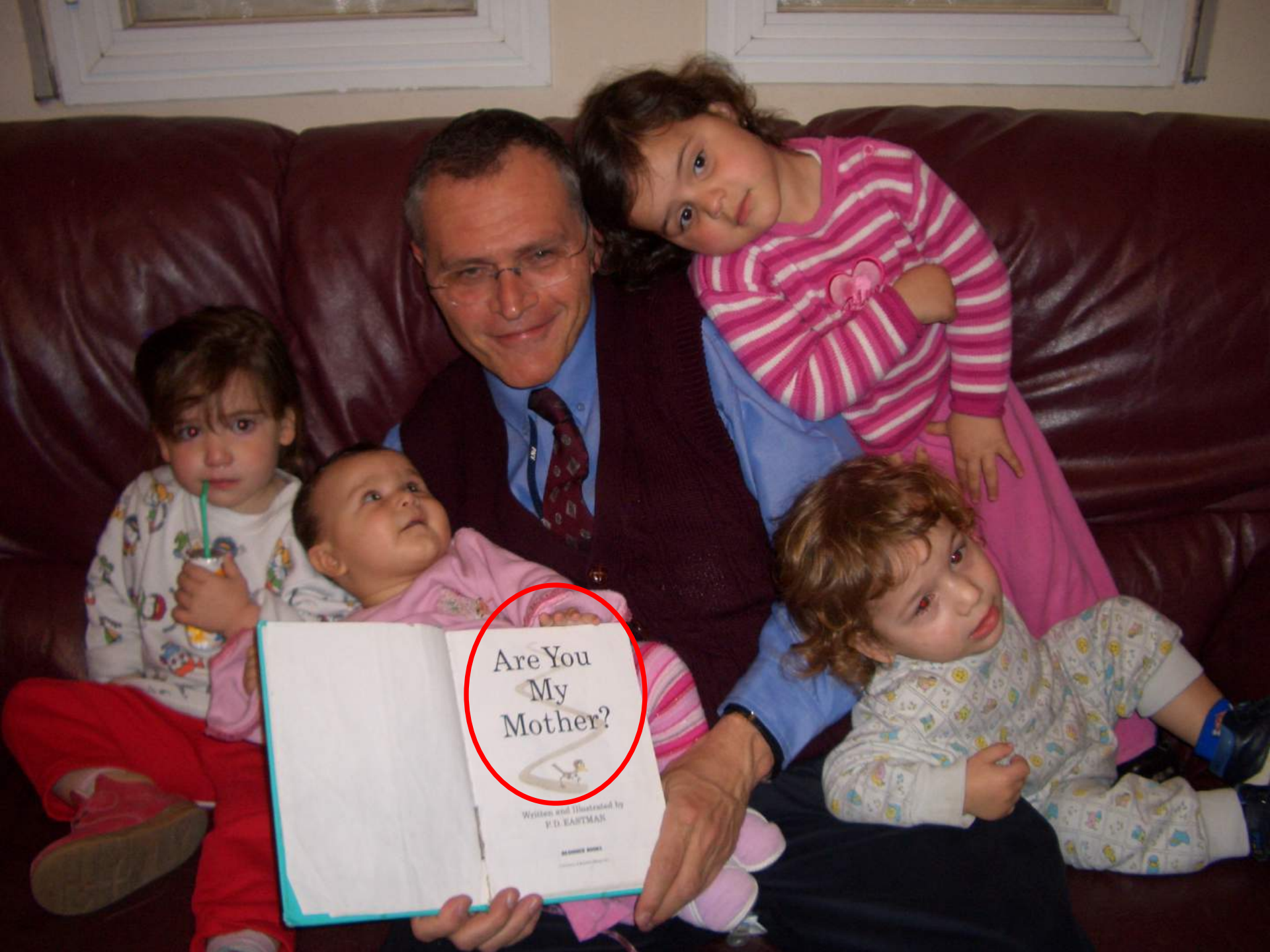
Reluctance to Express Emotions

Memory for Jokes

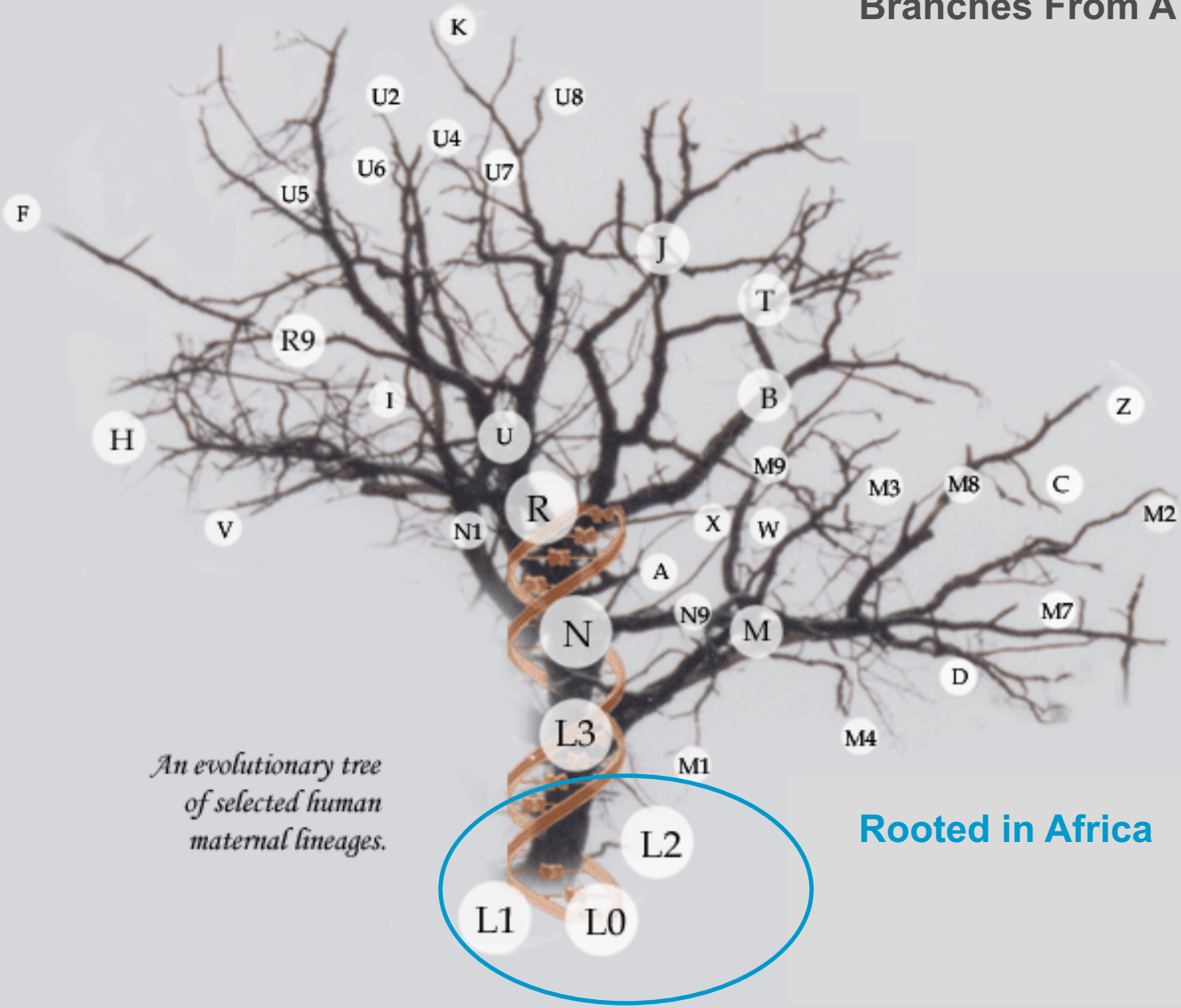
Forgetting Wedding Anniversary dates

Sports Addiction



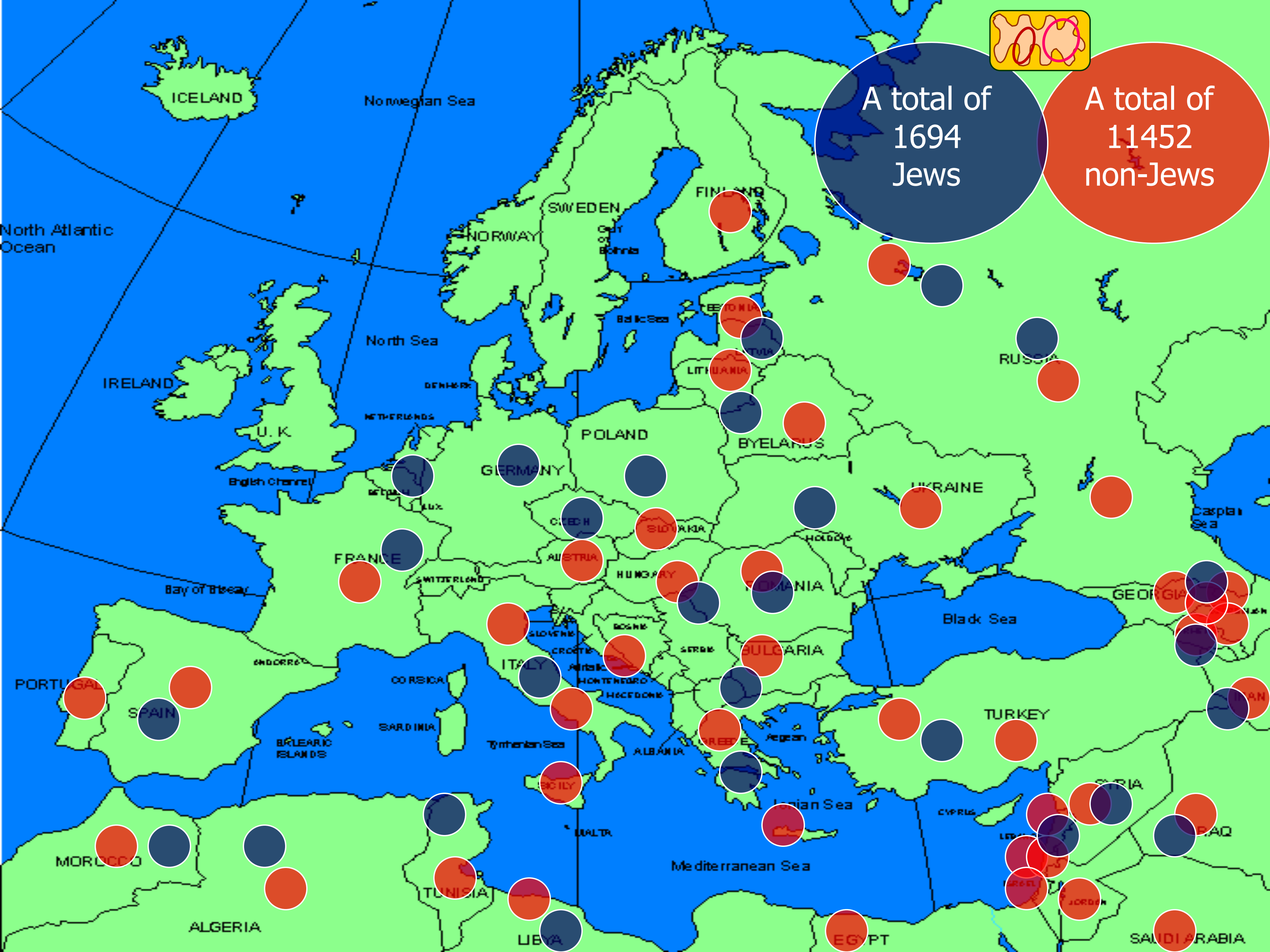

Are You
My
Mother?
Written and Illustrated by
P. D. EASTMAN

Mitochondrial DNA Marker Branches From A to Z



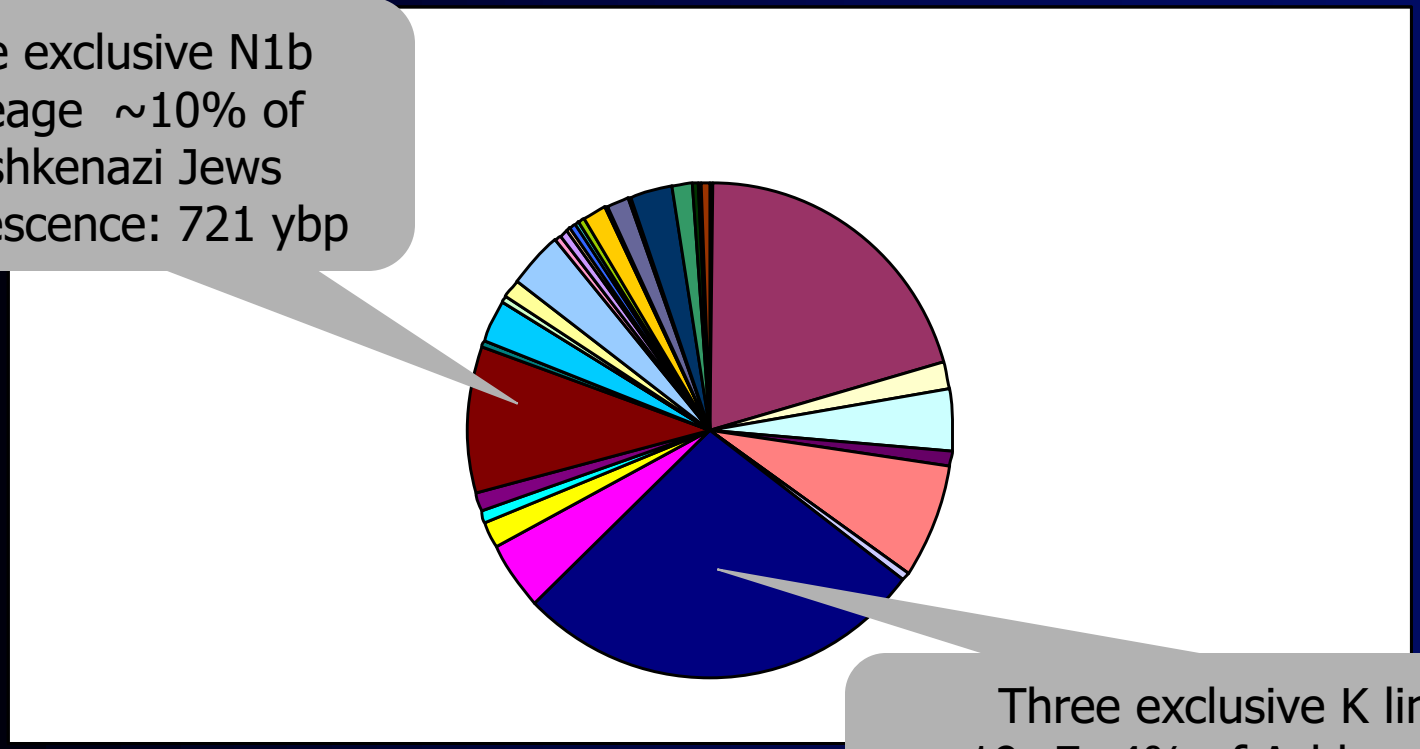
An evolutionary tree of selected human maternal lineages.

Rooted in Africa


A total of 1694 Jews
A total of 11452 non-Jews
ICELAND
Norwegian Sea
North Atlantic Ocean
IRELAND
U.K
North Sea
English Channel
SWEDEN
NORWAY
Gulf of Bothnia
Baltic Sea
POLAND
GERMANY
FRANCE
Bay of Biscay
SPAIN
ITALY
CORSICA
SARDINIA
BALEARIC ISLANDS
Tyrrhenian Sea
HUNGARY
SLOVAKIA
ROMANIA
BULGARIA
ALBANIA
Aegean
Ionian Sea
Mediterranean Sea
UKRAINE
RUSSIA
Caspian Sea
Black Sea
GEORGIA
TURKEY
SYRIA
CYPRUS
JORDAN
SAUDI ARABIA
EGYPT
LIBYA
TUNISIA
ALGERIA
MALTA

Four Founding Mothers of Near East Provenance Gave Rise to ~40% of Contemporary Ashkenazi Jews

One exclusive N1b lineage ~10% of Ashkenazi Jews
Coalescence: 721 ybp



Three exclusive K lineages
19+7+4% of Ashkenazi Jews
Coalescence: 742, 1971, 1971 ybp

These mtDNA haplotypes are of Near East origin

The New York Times

NEW YORK, SATURDAY, JANUARY 14, 2006

New Light On Origins Of Ashkenazi In Europe

By NICHOLAS WADE

A new look at the DNA of the Ashkenazi Jewish population has thrown light on its still mysterious origins.

Until now, it had been widely assumed by geneticists that the Ashkenazi communities of Northern and Central Europe were founded by men who came from the Middle East, perhaps as traders, and by the

A study calls four women the ancestors of 40 percent of Ashkenazi Jews.

women's origins.

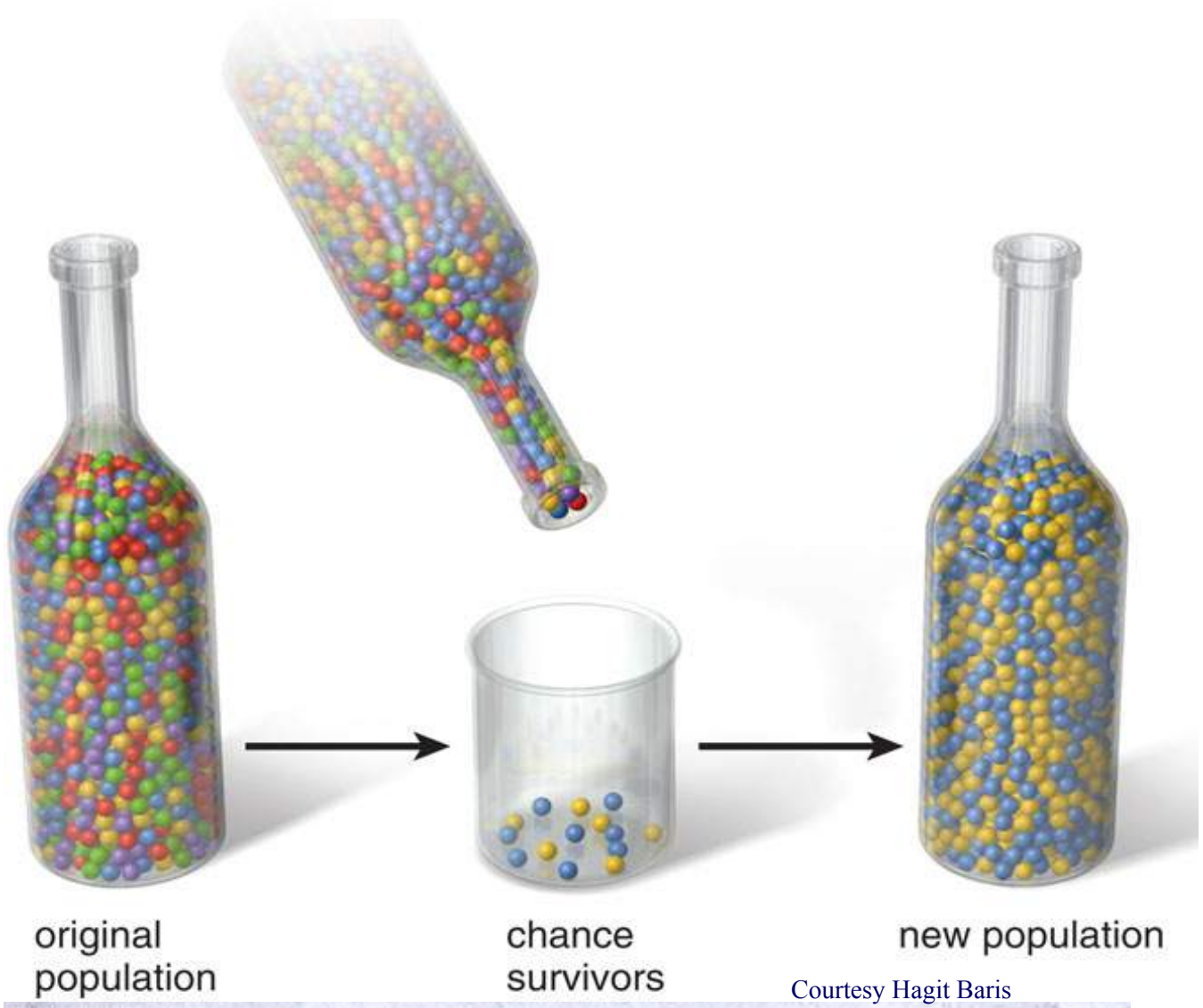
David Goldstein, now of Duke University, reported in 2002 that the mitochondrial DNA of women in Jewish communities around the world did not seem to be Middle Eastern, and indeed each community had its own genetic pattern. But in some cases the mitochondrial DNA was closely related to that of the host community.

Dr. Goldstein and his colleagues suggested that the genesis of each Jewish community, including the

Connected by Amy Harmon January 22, 2006

Love You, K2a2a, Whoever You Are

Y and mtDNA both favour bottleneck explanation for "Ashkenazi" disease alleles

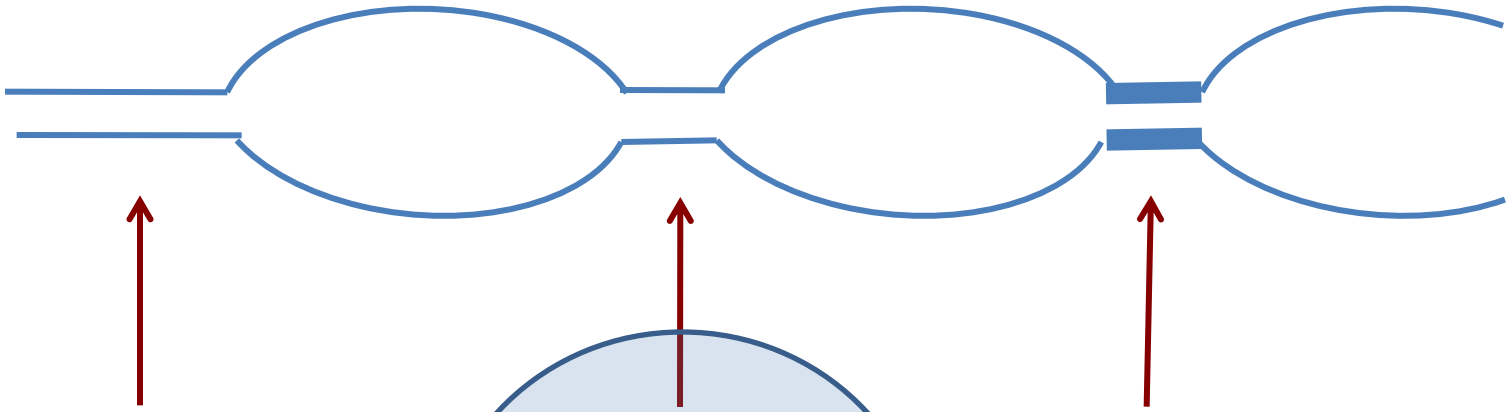


Courtesy Hagit Baris

Cystic Fibrosis

- >1300 mutations worldwide
- Only 6 account for >95% of CF in Ashkenazi Jews

Bottlenecks



3,000ybp

Shared with Near East

LRRK2 in Parkinson's

2,000ybp

Shared with non-Ashkenazi Jews

Factor XI Deficiency

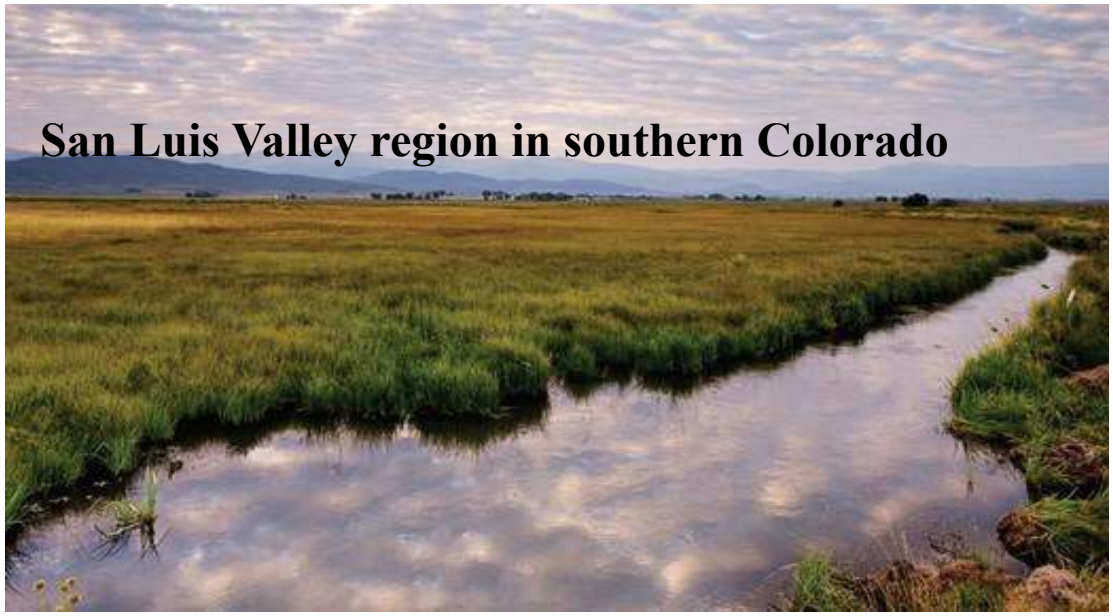
<1,000ybp

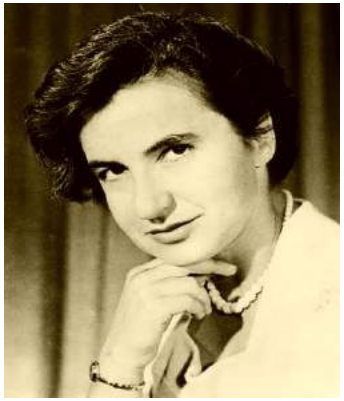
Private Ashkenazi

Idiopathic Torsion Dystonia

The 185delAG *BRCA1* mutation originated before the dispersion of Jews in the Diaspora and is not limited to Ashkenazim

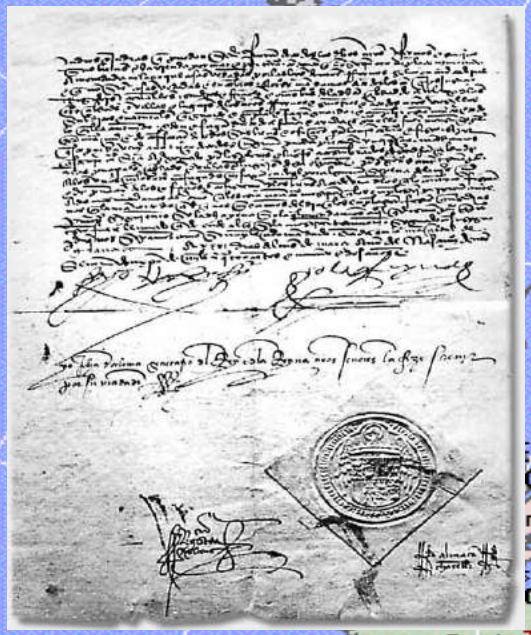
Revital Bruchim Bar-Sade[1], Anna Kruglikova[1], Baruch Modan[4], Eva Gak[2], Galit Hirsh-Yechezkel[4], Livia Theodor[1], Ilya Novikov[4], Ruth Gershoni-Baruch[7], Shulamit Risel[3], Moshe Z. Papa[5], Gilad Ben-Baruch[6] and Eitan Friedman[1,*]





Friedman, Ostrer et al. Ashkenazi BRCA1 Mutation 185delAG mutation for breast cancer in New Mexican and southern Colorado and other Hispanic communities

Jewish Migration to Europe



1492 A.C.

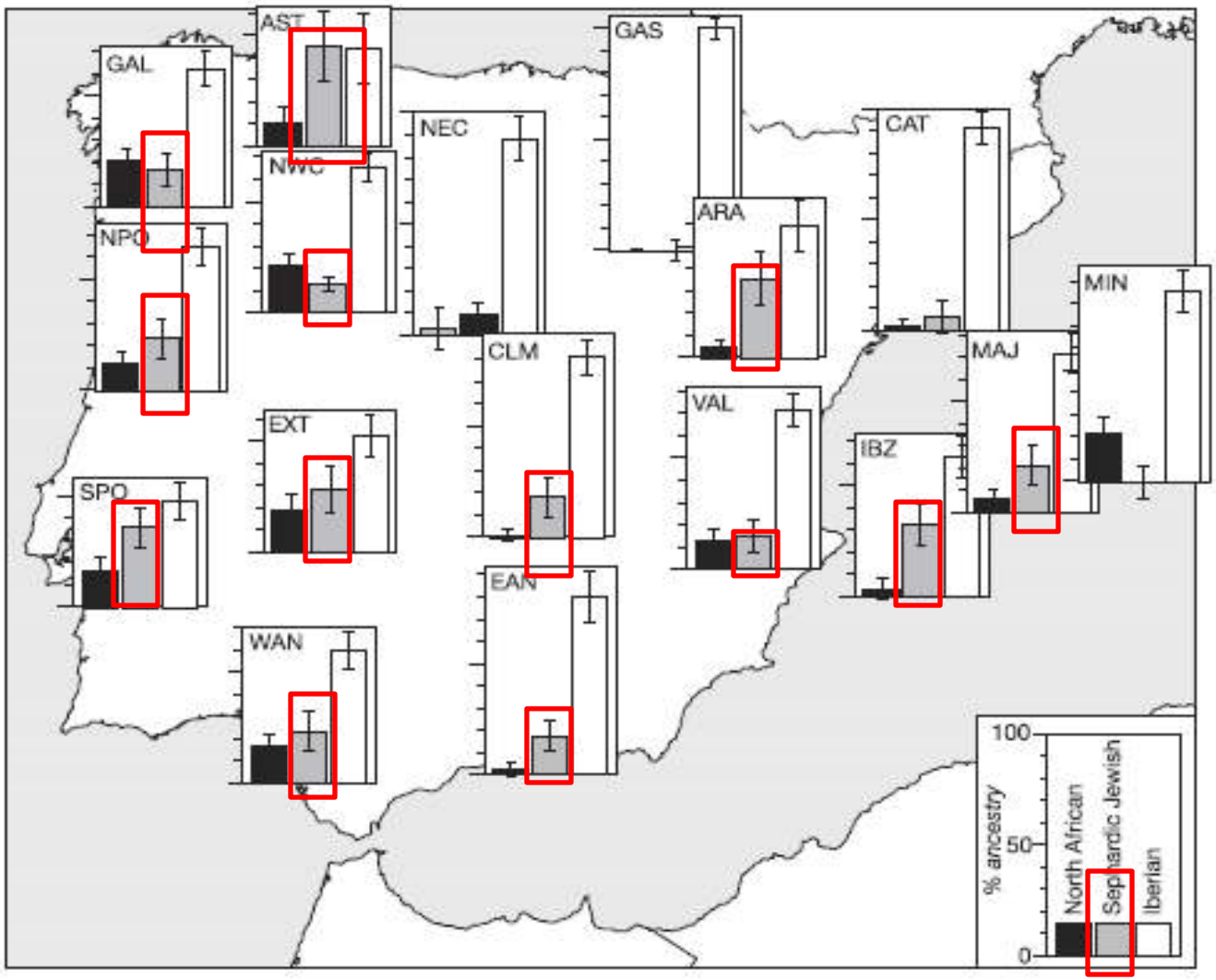
13 th century

7 th century

1 st-2 nd century

1 LUXEMBOURG
2 LIECHTENSTEIN
3 SLOVENIA
4 CROATIA
5 BOSNIA-HERZEGOVINA
6 MACEDONIA
7 VATICAN CITY

Iberian Peninsula and Balearic Islands

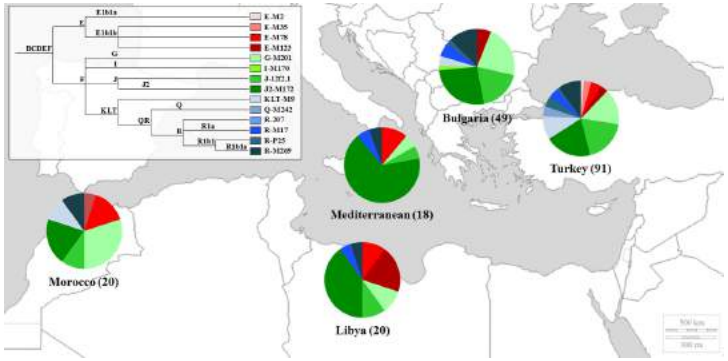


20%~
מתושבי חצי
האי האיברי
כיום הנם
ממוצא יהודי

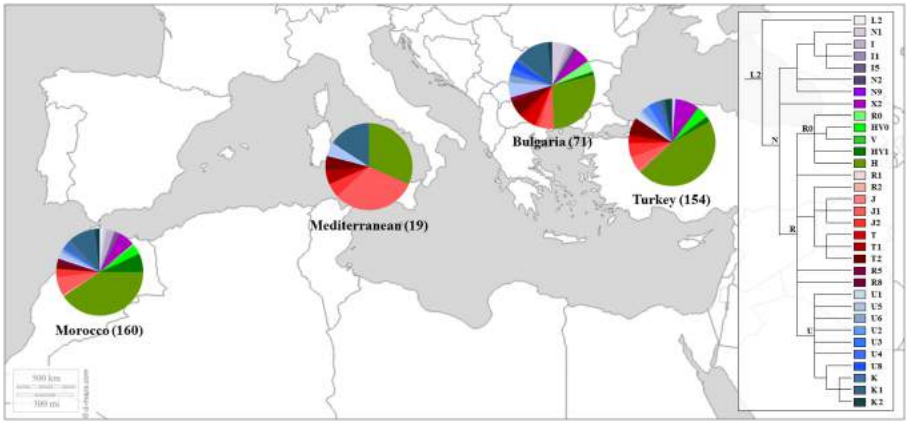
Adams et al. AJHG, 2008

Descendants of the Conversos

Y and mtDNA Haplotypes in Jewish Communities Descendant from Iberian Exile



Y-Chromosome



mtDNA

Noguiero et al. 2015 based on Behar 2008 and Picornell 2006

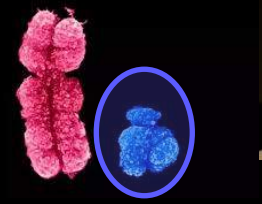
Chueta of Mallorca were designated as Jewish in 2011 after more than 500 years

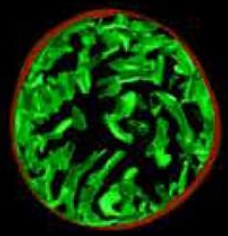
“Lost Tribes and Hidden Jews”

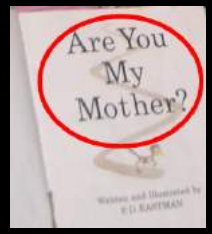
Are we there yet?

Reconstructing Ancestry

Individuals who share the same set of markers for a given DNA region share a common ancestry at that genomic region

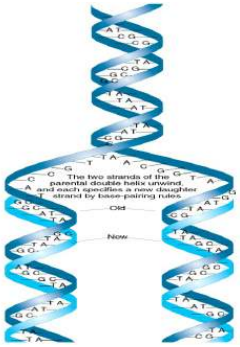






If the markers are on the Y-chromosome – shared paternal ancestry

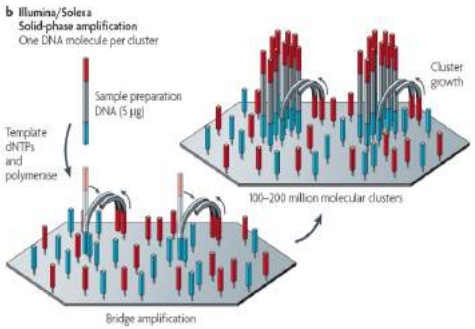
If the markers are on mitochondrial DNA – shared maternal ancestry



Each individual is a beautiful COMPOSITE of many Ancestors and each Genomic Region has its own evolutionary history

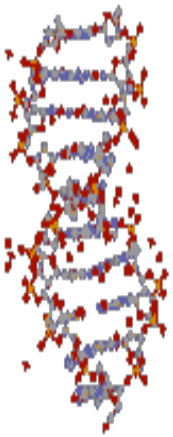
Easily evident in the Whole Genome

Now technologically, computationally, and economically practical to also study the whole genome



Genome Wide View of World Wide Jewish Diaspora Communities

Genome Wide



14 Diaspora Jewish and more than 60 non-Jewish Communities

- **Western and Eastern Europe: Ashkenazi and Sephardi**
- **North Africa**
- **Near and Middle East**
- **India and Far East**
- **Hidden Communities**

doi:10.1038/nature09103 nature

The genome-wide structure of the Jewish people

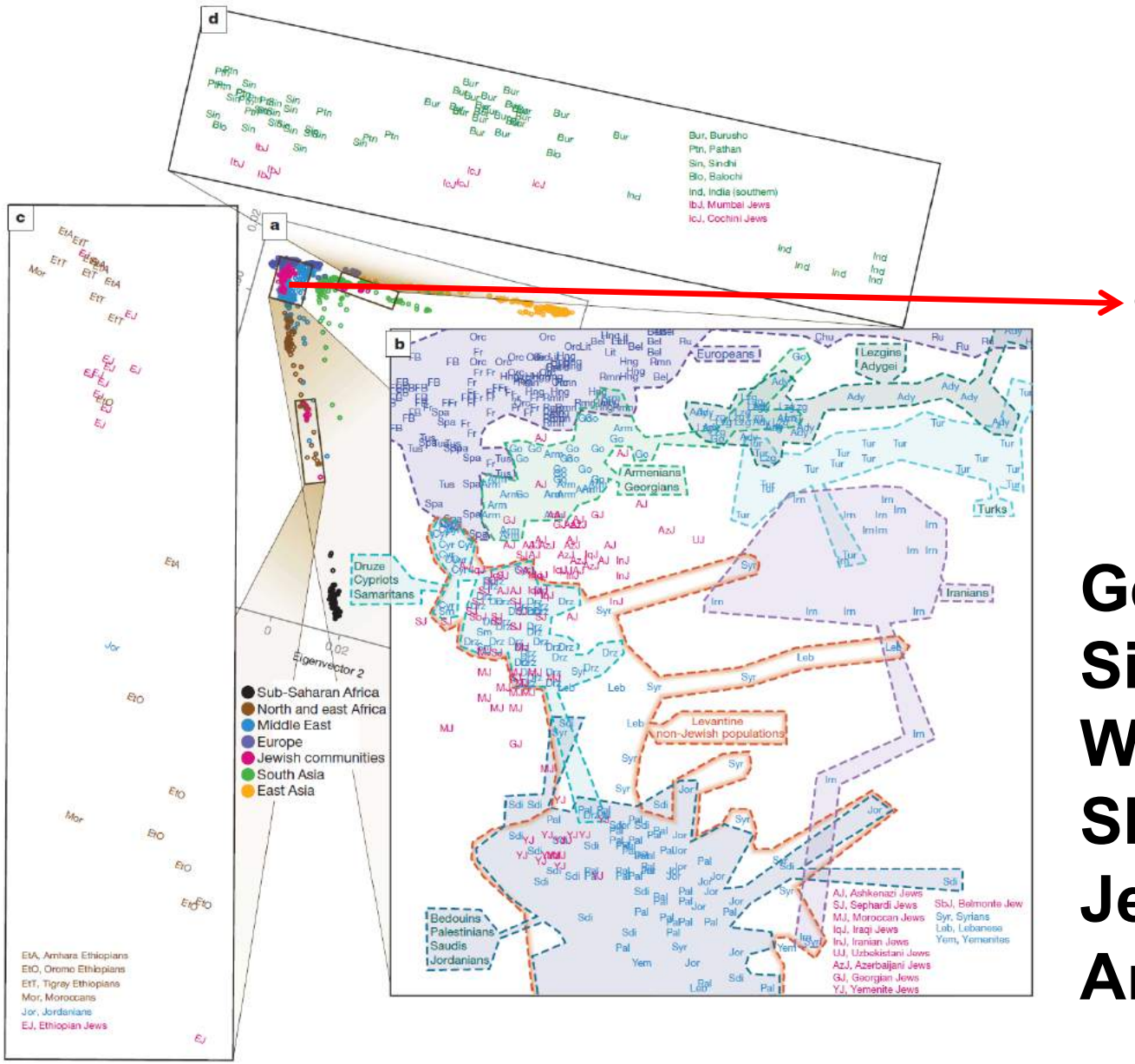
Doron Behar

Richard Villems
Estonian BioCenter

Shay Tzur
Guennady Yudkovsky

Researchers from Eight Countries

Analysis of 500,000 Genome Wide Markers: 14 Jewish and 69 non- Jewish Populations

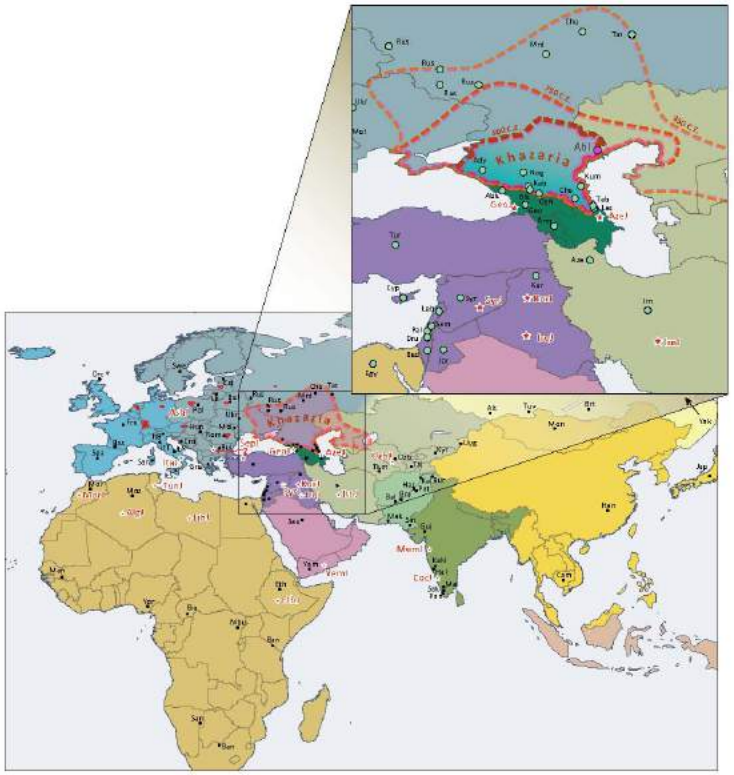


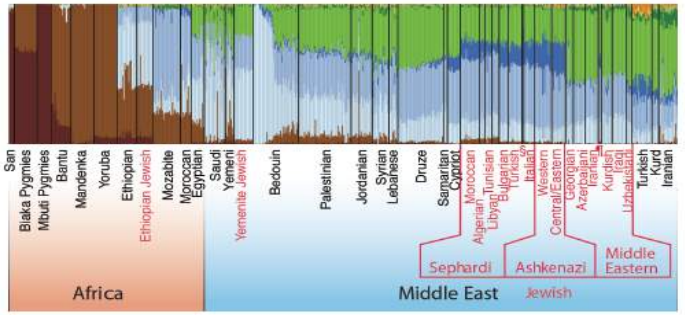
Jews from communities covering > 90% contemporary population cluster with current Levant populations

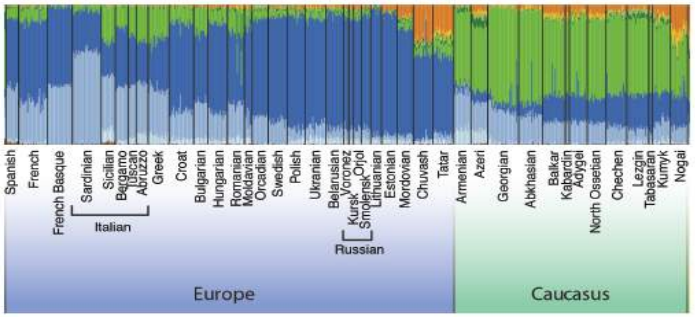
Genome Wide Signature of World-Wide Shared Jewish Ancestry

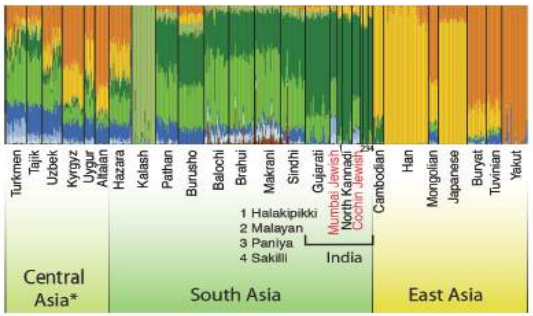
8-1-2013

No Evidence from Genome-Wide Data of a Khazar Origin for the Ashkenazi Jews









Ultimate Resolution → Whole Genome Sequence

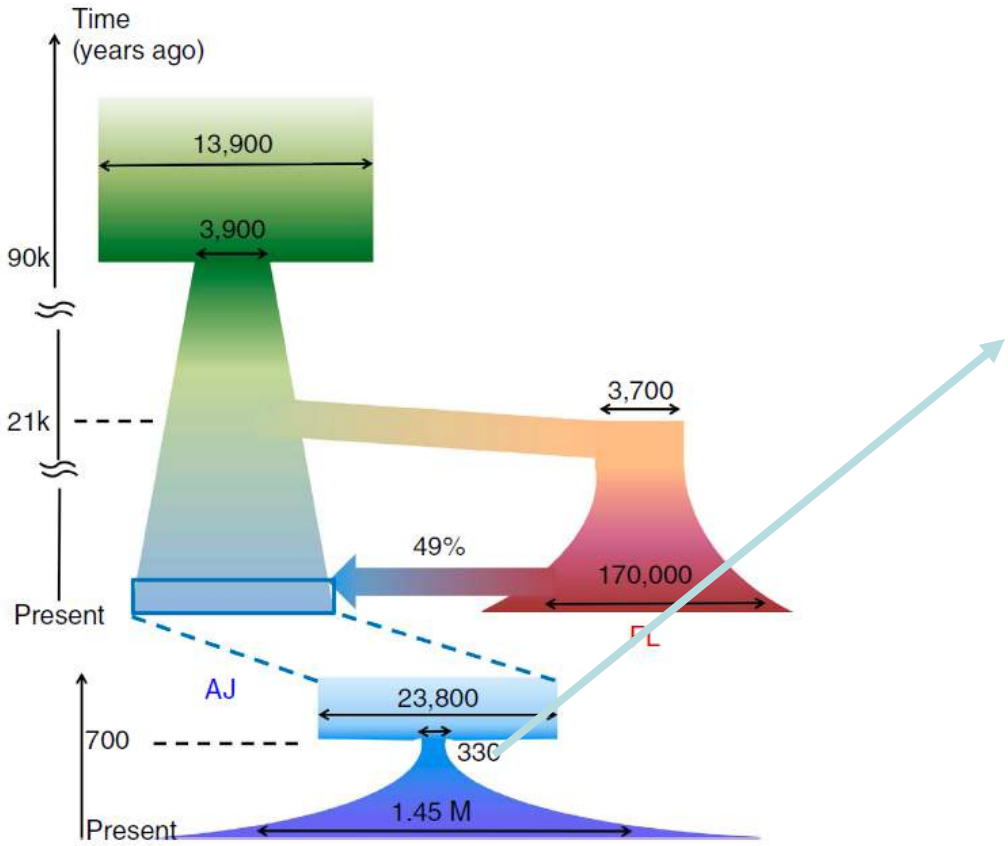
ARTICLE

Received 24 Jun 2014 | Accepted 28 Jul 2014 | Published 9 Sep 2014

DOI: 10.1038/ncomms5835 OPEN

Sequencing an Ashkenazi reference panel supports population-targeted personal genomics and illuminates Jewish and European origins

Carmi et al 2014



- Contemporary Ashkenazi Jewish Genomes descend from 330 founders ~400 years ago
- ~50% Near East and 50% SouthernEuropean

Past History of the Jewi People

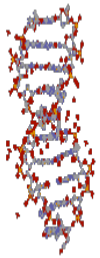
Levant Origin with Global Genomic and Cultural Influence

- Introgression
- Conversion
- Admixture
- Evolutionary Adaptation to environment

Mosaic or Tapestry?

Autumn 2009 – Haaretz supplement

FINDING "LOST JEWS"



- **Genetics tells us that there is shared Jewish ancestry throughout the globe**
- **However – finding lost Jews extends beyond genetics**

Indian Jewish Diaspora

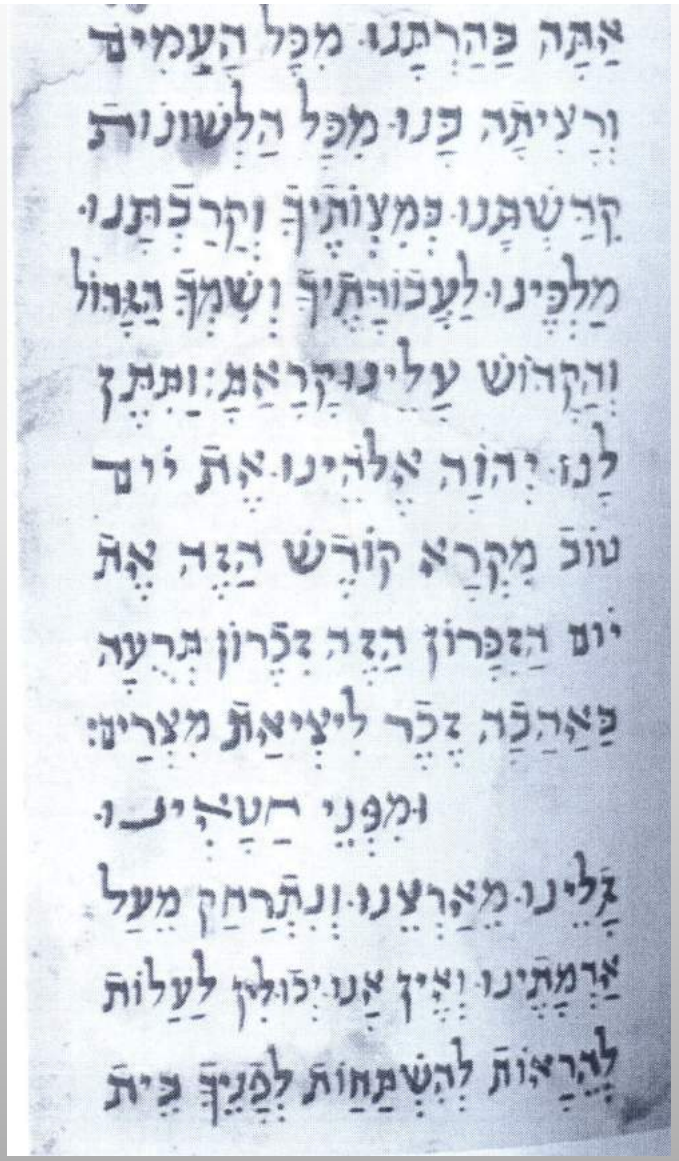
Bene-Menashe

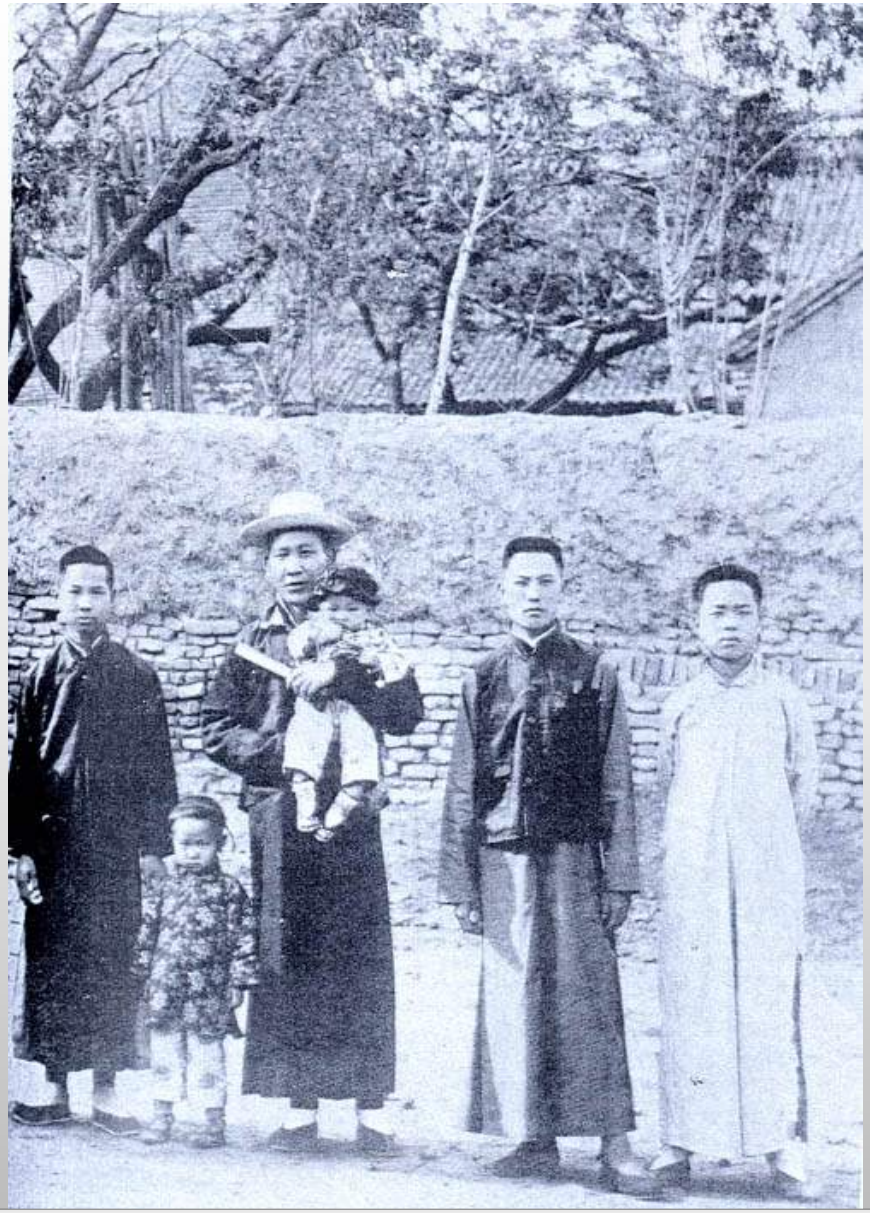
Bene-Israel

Cochin

Ancient Cochin Torah Scrolls

Bene Menashe children in a village in northeastern India


אַתָּה בְחַרְתָּנוּ מִכָּל הָעַמִּים
וְרוֹמַמְתָּנוּ מִכָּל הַלְּשׁוֹנוֹת
וְקִדַּשְׁתָּנוּ בְּמִצְוֹתֶיךָ וְקֵרַבְתָּנוּ
מַלְכֵּנוּ לַעֲבוֹדָתֶךָ וְשִׁמְךָ הַגָּדוֹל
וְהַקָּדוֹשׁ עָלֵינוּ קָרָאתָ: וַתִּתֶּן
לָנוּ יְהוָה אֱלֹהֵינוּ אֶת יוֹם
טוֹב מִקְרָא קֹדֶשׁ הַזֶּה אֶת
יוֹם הַזִּכָּרוֹן הַזֶּה זִכְרוֹן תְּרוּעָה
בְּאַהֲבָה זֵכֶר לִיצִיאַת מִצְרָיִם:
וּמִפָּנֵי חֲטָאֵינוּ
גָּלִינוּ מֵאַרְצֵנוּ וְנִתְרַחַקְנוּ מֵעַל
אַדְמָתֵנוּ וְאֵין אֲנוּ יְכוֹלִין לַעֲלוֹת
לְרָאוֹת וְלְהִשְׁתַּחֲוֹת לְפָנֶיךָ בֵּית

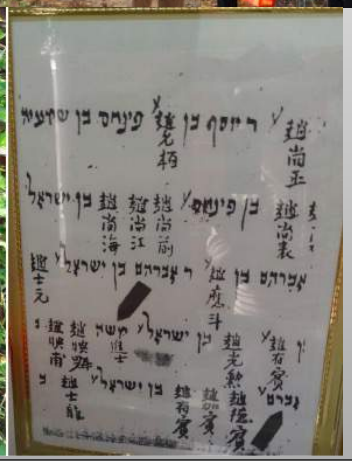


Jews from the Clans of Chao (*left*), Ai, Li, and Shih; K'aifeng Conference, 1919


Kaifeng synagogue site 2014.11
Zhao's Family in South Jiaojing Hutong


BRAZIL
10

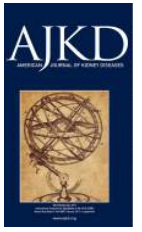

赵宅
开封犹太会堂旧址



Ethiopian Jews (Beta Israel)
Low Risk for Kidney Failure

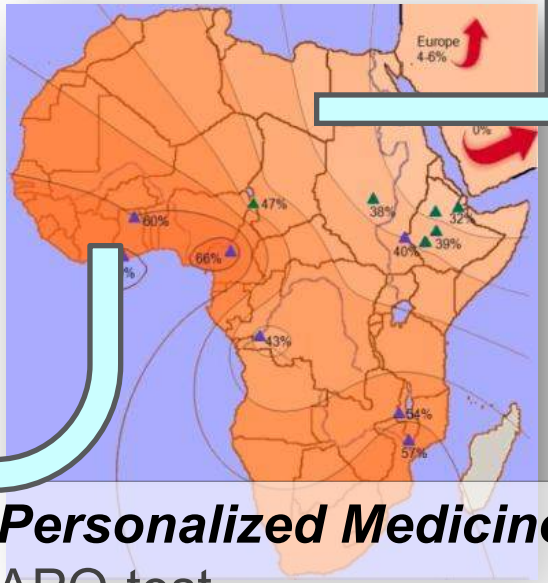
What protects Ethiopian Jews from Kidney Failure?

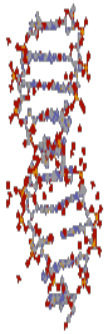
Population Based Health and Disease Gene Discovery



POPULATION BASED GENE MAPPING

Identification of Major Kidney Disease Causative Gene → APOL1





Personalized Medicine

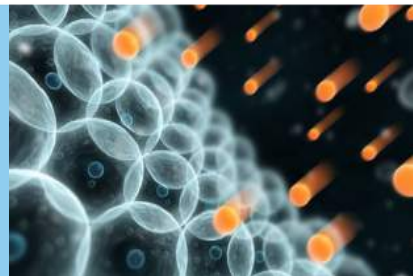
APO-test

1. Kidney transplantation
2. Nephrotoxins
3. Antihypertensives

Research progress with industry to target this gene product in preventing and treating the worldwide challenge of kidney and cardiovascular disease

RAMBAMHCC
75 years of healing

Technion
Haifa
THE BRUCE RAPPAPORT FACULTY OF MEDICINE



Genetics as a "Mirror" of Demographic Future

- **Changing Genomic Structure in Israeli Jewish Community**
- **Changing Genomic Structure in U.S. Jewish Community**
- **Recovery of "Lost Jews" from remote communities**

Genetics as a “Mirror” of Demographic Future

- **Changing Genomic Structure in Israeli Jewish Community**

קבוץ גלויות ⟸ מיזוג גלויות

Genetics as a "Mirror" of Demographic Future

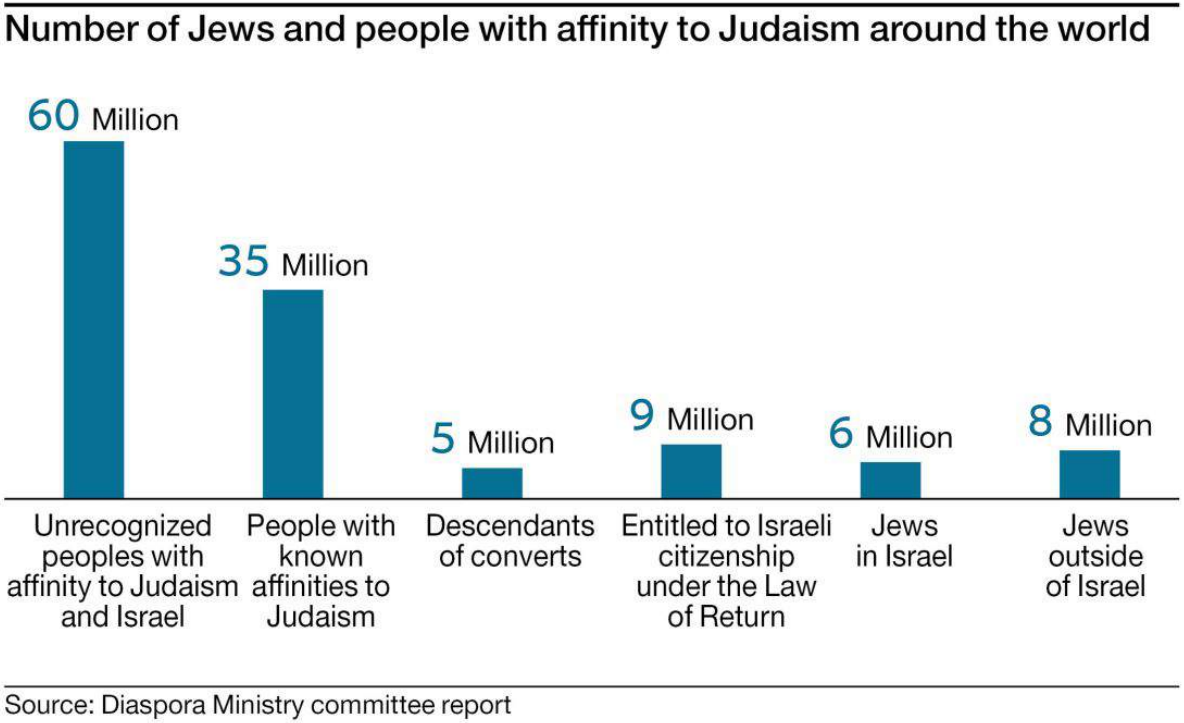
- **Changing Genomic Structure in U.S. Jewish Community**

- Egress of Jewish ancestry into general population
- Growth of a few communities with high levels of endogamy

NOT NEW!

Genetics as a "Mirror" of Demographic Future

- **Recovery of "Lost Jews" from remote communities**



Michael Freund – Shavei Israel

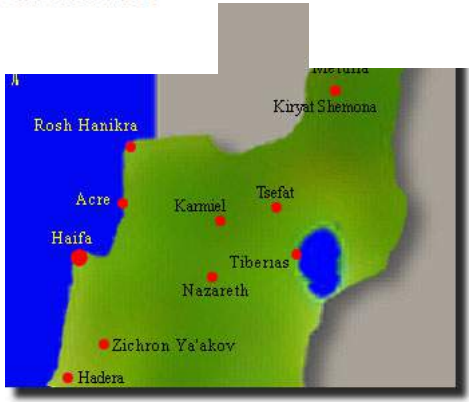
Genetics as a "Mirror" of Demographic Future

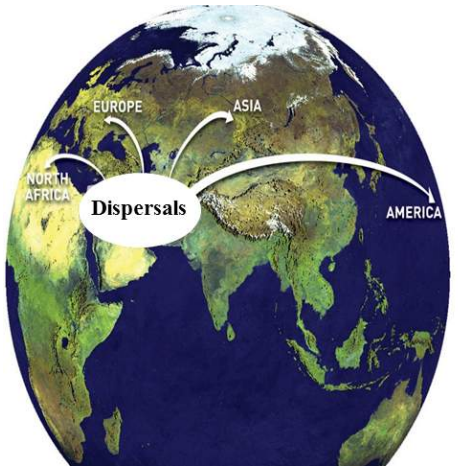
- **Changing Genomic Structure in Israeli Jewish Community**
- **Changing Genomic Structure in U.S. Jewish Community**
- **Recovery of "Lost Jews" from remote communities**
- **Future of humankind**

Context: Genetic Future of Humankind

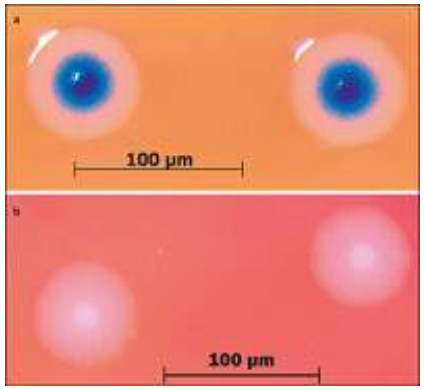
Hershkovitz et al.
Science 2018

The earliest modern humans outside Africa





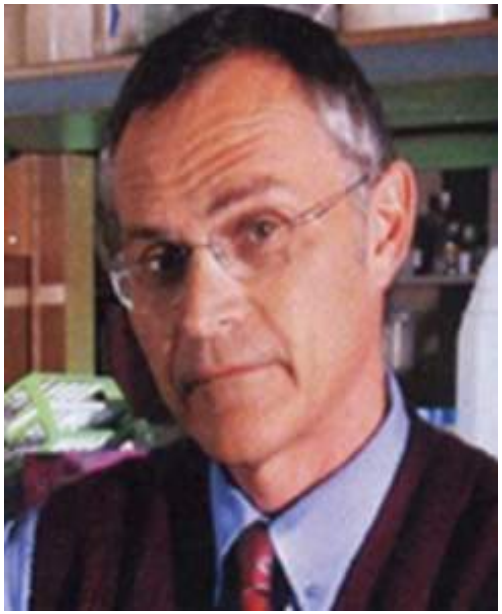
Synthetic Genome



Venter, Glass, and Smith

New Life Form

Romesberg



Societal and Legal Considerations: e.g. Jewish Identity

Saw You at Sinai

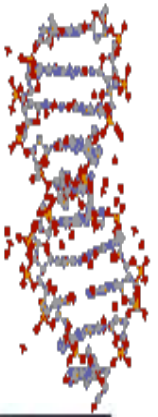
Biology and Jewish Identity

Paul Newman and Peter Lawford

Scholarly Discussion and Experimental Testing of

“Biological Phenotype Hypothesis”

Beyond the Jewish Genome:



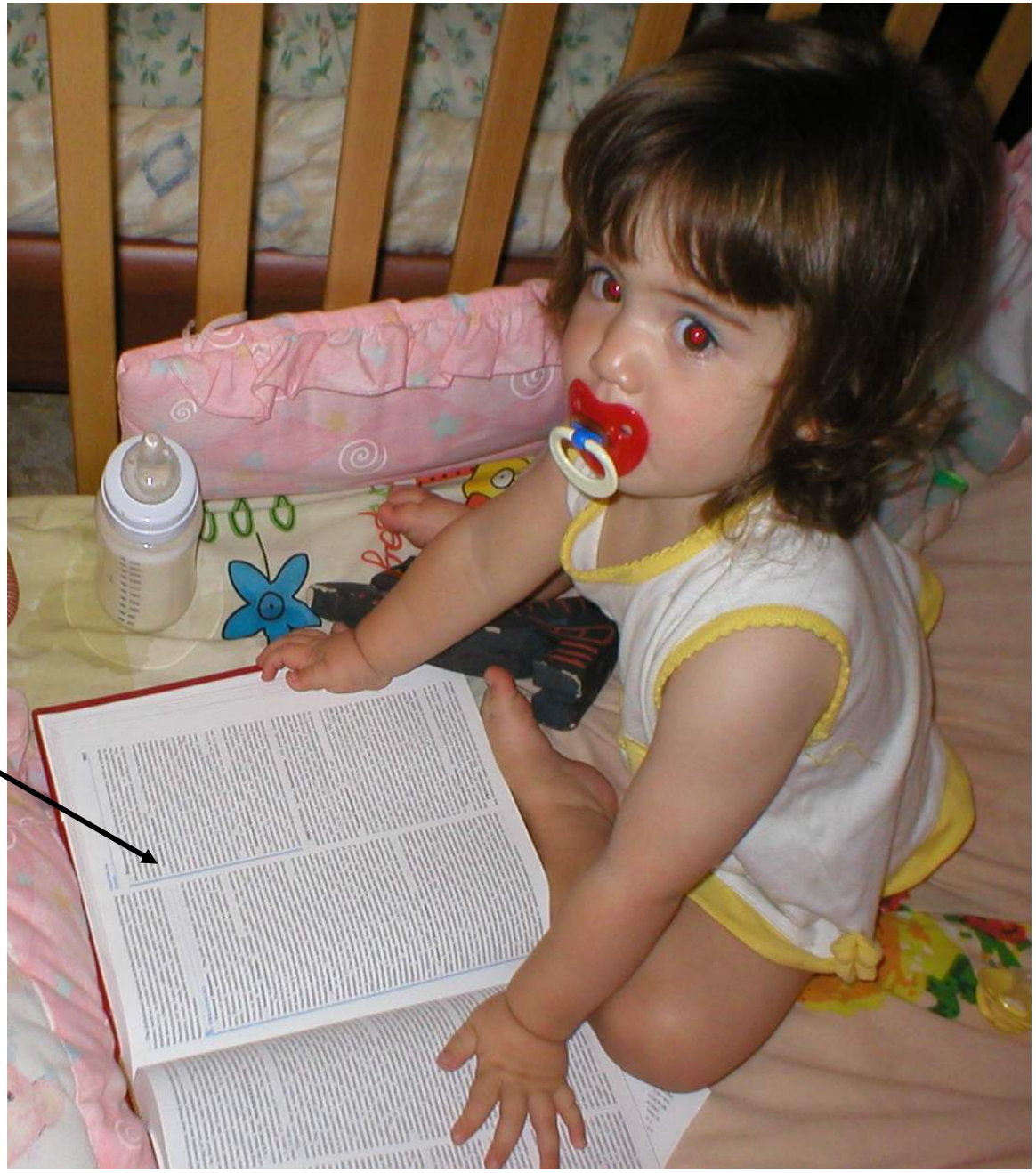
Jewish Epigenomics

Harrison's 19th edition

Chapter 335

Chronic Kidney Disease

Nature
or
Nurture
or
Epigenome



A Cultural Epigenome

Talmudic view of

"genetic predeterminism"

"Strive to be a student* of Aaron:
love peace and pursue peace".

*** student rather than descendant**

Hillel: Ethics of the Fathers

Molecular Medicine Laboratory: Looking for Answers


Many students
colleagues and
collaborators

謝謝

Case 1

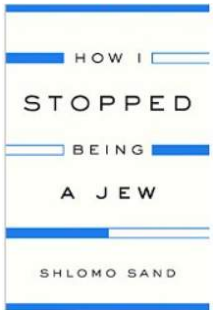
30 year old Israeli woman is to marry an Israeli Jewish man in Israel. The woman immigrated at the age 12 from the Ukraine under the "Law of Return". There is documentation for Jewish identity of her paternal grandfather, but no comparable record as her maternal side.

The Rabbinical Courts in Israel refuse to grant a marriage permit. She carries out private DNA testing which shows that her mitochondrial (maternally transmitted) DNA is of the K1a1b1a sublineage shared with 1.5 millions of established Jews, while was found only in one non-Jew(?) subject from west Ukraine in a 13500 non-Jewish European sample set .

- **Does the woman need conversion?**

Am I (Born) Jewish?

- Transcendental feeling
- Tay–Sachs mutation carrier on an incidental screen
- Told by mother on her deathbed that she was born Jewish
- Wanting to be **not** Jewish



Should I sequence my mitochondrial DNA to help me achieve a greater level of certainty about myself ?

My four Jewish mothers

INTERVIEW

First he traced most Cohanim to one male ancestor. Now he has linked many Ashkenazi Jews to four women. Eminent scientist Karl Skorecki talks to Brenda Maddox

KARL SKORECKI IN BRIEF

'There is no such thing as a gene for Jews, no genetic identity for any race. Modern genetics has deconstructed the idea of race. We all trace to common ancestry'

Mitochondrial DNA – Was I Born Jewish?

Natalia (arrived from former Soviet Union during 90's)

Maayan (combat IDF, granddaughter of Palmach fighter frmom Kibbutz Mishmar HaEmek)

Shaindel (married to Rosh Yehshiva in Bene Beraq)

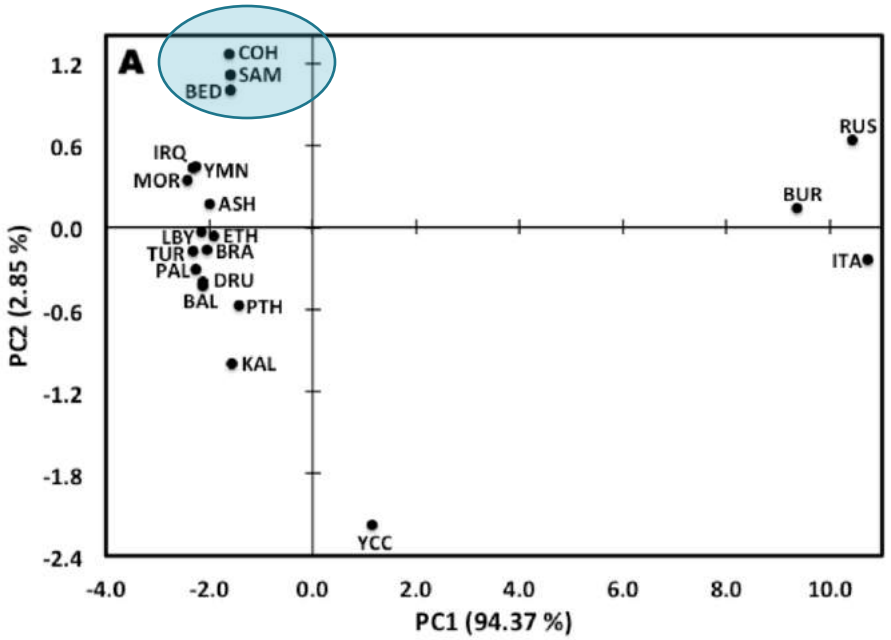
Anna
Svetlana
Natalia

Shoshana
Noa
Maayan

Rachele
Braindel
Shaindel


בירורי יהדות


בירורי יהדות
לאור מחקרים גנטיים
הצעה וניתוח של היסודות המדעיים וההלכתיים בסוגיית בירורי יהדות על בסיס סימנים גנטיים הייחודיים באוכלוסיות יהודיות
כל הזכויות שמורות:



	Y chromosome marker (DYS prefix)													
Family	19	388	389-I	389-II	390	391	392	393	426	438	439	YCAIIa	YCAIIb	Haplogroup[3]
Cohen-1	14	12	13	18	24	10	11	13	11	10	19	19	22	E3b (M78)
Cohen-2	14	12	13	18	24	11	11	13	11	10	19	19	22	E3b (M78)
Danfi-1	**14**	15	14	16	24	**10**	**11**	**12**	11	9	18	19	22	J2f (M172, M67)
Danfi-2	**14**	15	14	16	**23**	**10**	**11**	**12**	11	9	18	19	22	J2f (M172, M67)
Joshua-Marhiv-1	**14**	**16**	13	17	**23**	11	**11**	**12**	11	10	17	22	22	J1 (M267)
Joshua-Marhiv-2	**14**	**16**	13	17	**23**	11	**11**	**12**	11	10	17	22	22	J1 (M267)
Joshua-Marhiv-3	**14**	**16**	13	17	**23**	11	**11**	**12**	11	10	17	22	22	J1 (M267)
Joshua-Marhiv-4	**14**	**16**	13	17	**23**	11	**11**	**12**	11	10	17	22	22	J1 (M267)
Tsedaka-1	**14**	15	13	16	**23**	**10**	**11**	**12**	12	8	20	19	22	J2* (M172)
Tsedaka-2	**14**	15	13	16	**23**	**10**	**11**	**12**	12	8	20	19	22	J2* (M172)
Tsedaka-3	**14**	15	13	16	**23**	**10**	**11**	**12**	12	8	20	19	22	J2* (M172)
Tsedaka-4	**14**	15	13	16	**23**	**10**	**11**	**12**	12	8	20	19	22	J2* (M172)
CMH[1]	**14**	**16**	13	16	**23**	**10**	**11**	**12**	11	10	19	22	22	J1 (M267)
CMH[2]	14/15	15/16	14	16	**23**	**10**	**11**	**12**	11	9	19	19	22/23	J2* (M172)

Oefner et al. 2013

העדה הדרוזית היא "שמורת טבע" של המבנה הגנטי של אוכלוסית המזרח התיכון בימים קדומים

Clustered Genome-Wide Ancestry with Ashkenazi and non-Ashkenazi Jews

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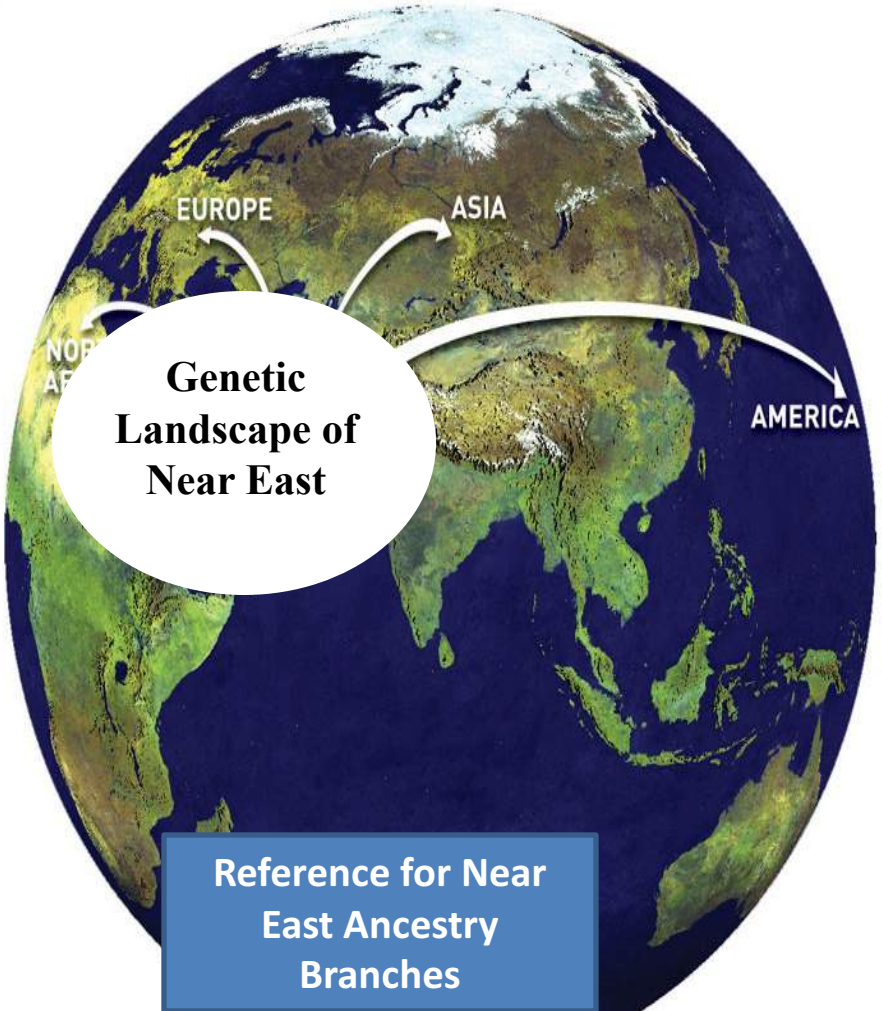
But the Druze have not wandered the face of the globe



Numerous Disease Genes have been mapped in both the Druze and Jewish populations