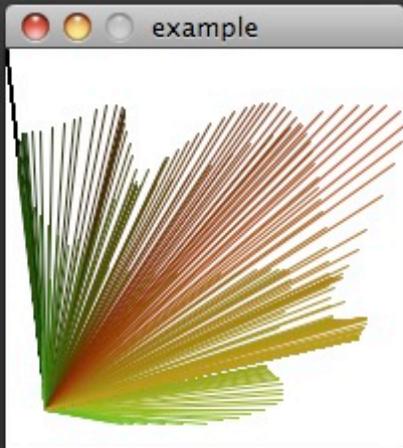


BEN FRY

Fathom



```
example | Processing 0204  
STANDARD  
example  
void setup() {  
  size(200, 200);  
  background(255);  
  smooth();  
}  
  
void draw() {  
  stroke(mouseX, mouseY, 0);  
  line(20, 180, mouseX, mouseY);  
}
```

## RENDERING

2D and 3D, OpenGL and PDF

## EXPORT

Applets for the web, or applications for Windows, Mac OS X, and Linux

## EXTERNAL INTERFACES

Video and movies, hardware devices via serial, networking

## EXTENSIONS

Expanded by many user-contributed libraries

## AVAILABILITY

Open source, and freely downloadable from [processing.org](http://processing.org)

## **Hide complexity for beginning programmers...**

- objects and inheritance
- threading
- double buffering
- etc.

## **...and address annoyances for advanced programmers**

- needlessly abstract APIs for graphics
- the two pages of code before starting every project
- treat Java more like scripting, write code to throw away later

## POWER

Computational speed between scripting and C++

## SIMPLER

More forgiving than C++, easier to develop ideas rapidly

## NOT SIMPLE ENOUGH

Ruby or Python better for teaching?

## SIMPLEST

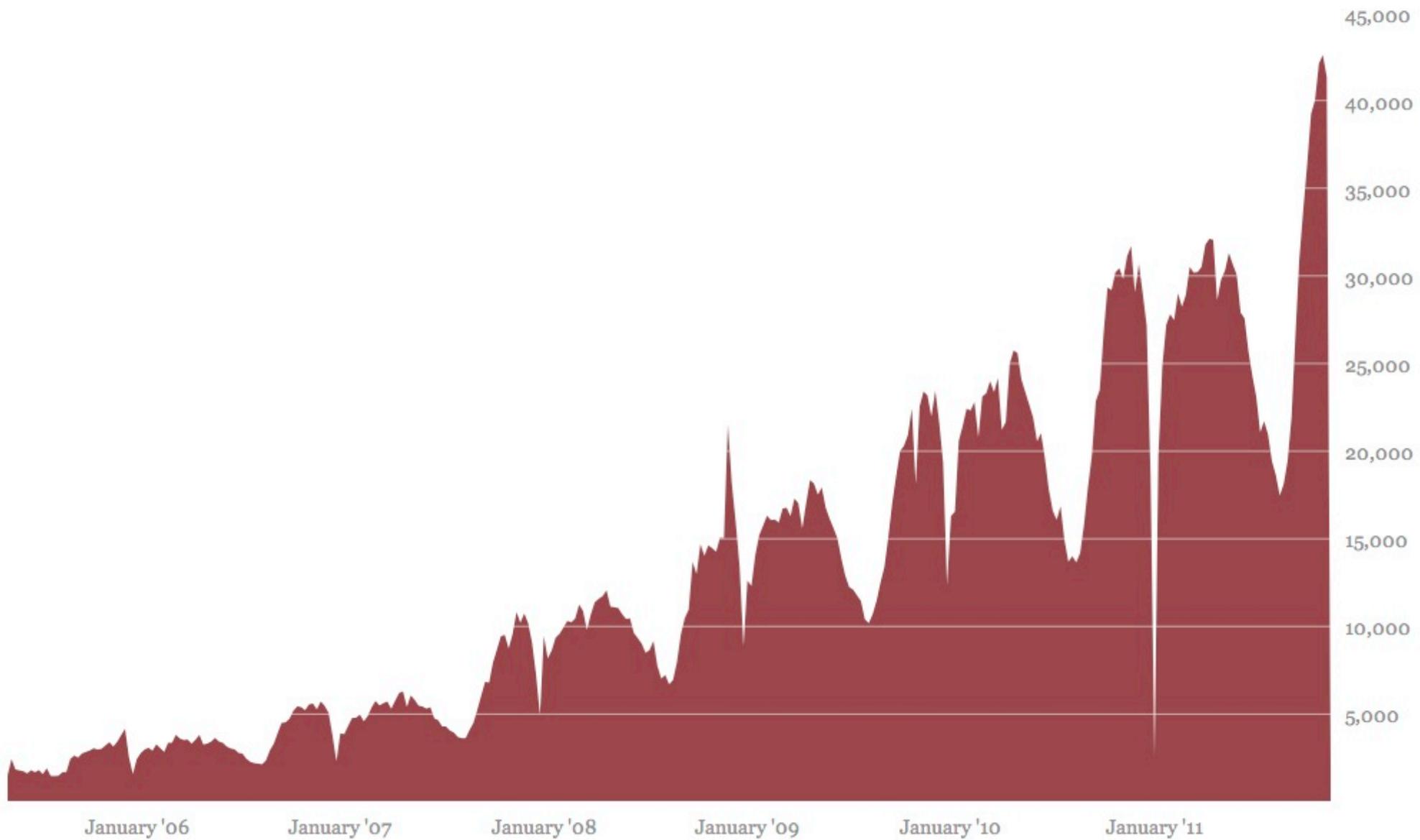
Visual languages not (yet?) great for complex problems

## DISTRIBUTION

Cross-platform Java applets and applications

## RELEVANCE

Move up to C++ or down to ActionScript/JavaScript



GENERATIVE  
GESTALTUNG

5.07 Projekte - Sammlung

5.07.1 Grundlegende Prinzipien
5.07.2 Farbe
5.07.3 Form
5.07.4 Typ
5.07.5 Bild
5.07.6 Komplexe Methoden
5.07.7 Zufall und Rauschen
5.07.8 Schwingungsfiguren
5.07.9 Formulierte Körper
5.07.10 Attraktoren
5.07.11 Sounddiagramme
5.07.12 Dynamische Datenstrukturen

GREENBERG

PROCESSING

Greenberg

THE  
ESSENTIAL  
GUIDE TO

PROCESSING FOR  
FLASH DEVELOPERS

friends of  
text



Visualizing  
Data

fr

Processing

A Programming Handbook for Visual Designers and Artists

Reas and Fry

Built with Process

INSTRUMENTAL DESIGN

REAS

FRY



Programming  
Interactivity

Noble

Shiffman

LEARNING PROCESSING

GLASSNER

Processing for Visual Artists

Terzidis

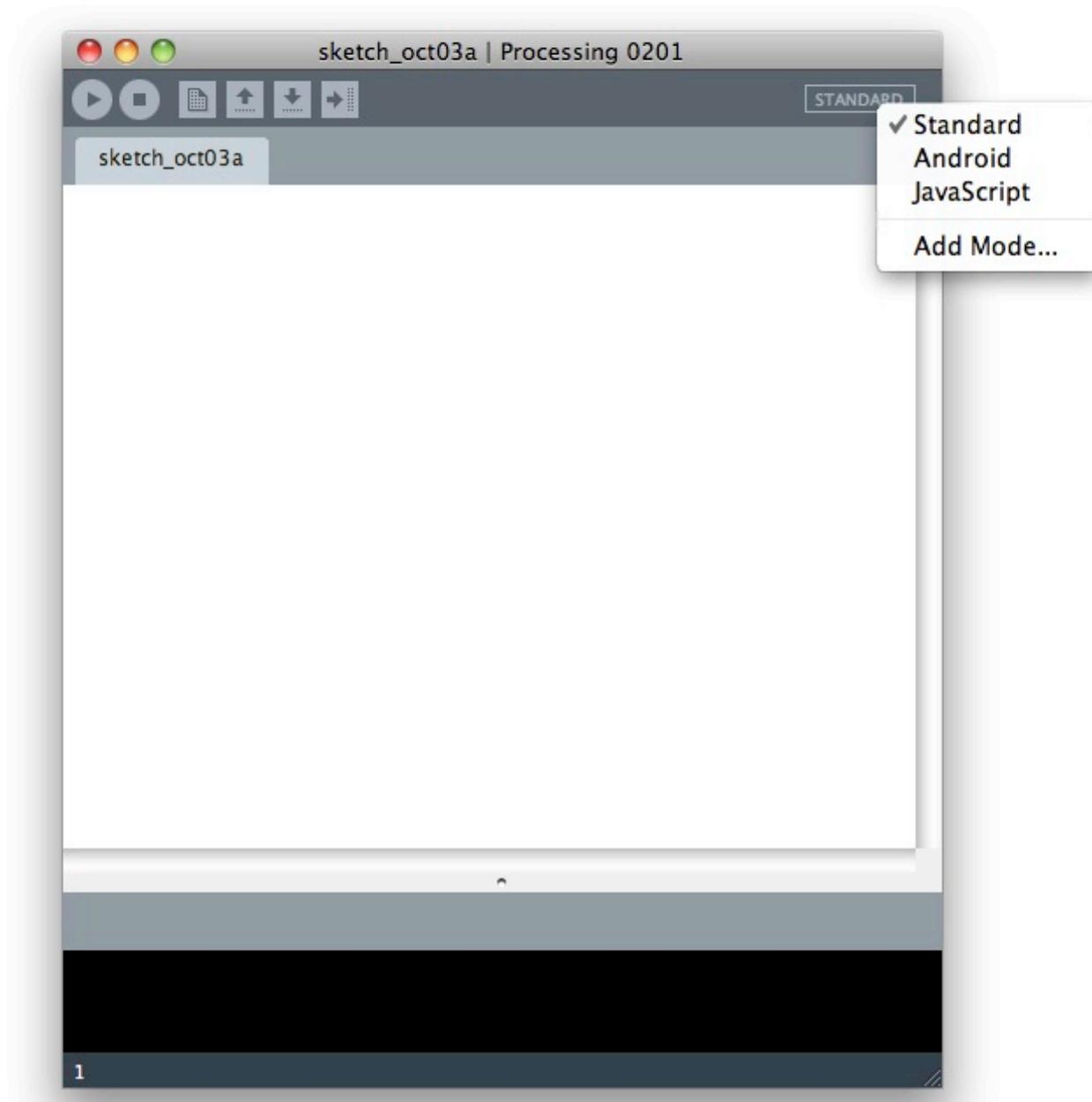
Algorithms for Visual Design  
Using the Processing Language

MARK OVERMAN

Getting Started with Processing

Reas & Fry





sketch\_oct03a | Processing 0201



STANDARD

sketch\_oct03a

- ✓ Standard
- Android
- JavaScript
- Add Mode...

1

## About Processing.js

Processing.js is an open programming language for people who want to program images, animation, and interactions for the web without using Flash or Java applets. Processing.js uses Javascript to draw shapes and manipulate images on the [HTML5 Canvas](#) element. The code is light-weight, simple to learn and makes an ideal tool for visualizing data, creating user-interfaces and developing web-based games.

Processing.js is explicitly developed for browsers that support the HTML5 <Canvas> element. Processing.js runs in Firefox, Safari, Opera and Chrome but will not be supported in Internet Explorer until Microsoft catch up with [ISSUE 15](#).

Implementing Processing.js in Flash or Silverlight is not recommended as Java already occupies the browser-plugin space for this library. For users wishing to run Processing.js in Silverlight, see [Paul Irish's Silverlight implementation](#). Using [Explorer Canvas](#) with Processing.js typically results in unusable frame-rates for moderately complex visualizations.

The Processing language was created by [Ben Fry](#) and [Casey Reas](#). It evolved from ideas explored in the Aesthetics and Computation Group at the MIT Media Lab and was originally intended to be used in a Java run-time environment. In the Summer of 2008, [John Resig](#) ( inventor of jQuery ), ported the 2D context of Processing to Javascript for use in web pages. Much like the native language, Processing.js is a community driven project, and continues to grow as browser technology advances.

## Basic Syntax

A brief look at the structure of a Processing sketch reveals how easy it is to program interactive visualizations.

As with any language, you begin by defining your global variables. Then you create a `setup()` function, where you



### Community

- Dev. Community on IRC
- Lighthouse Bug Tracking
- Processing.js GitHub Repo
- Open Source @ Seneca
- Processing.js on Twitter
- Processing.js Google Group
- Community Credits



### Updates

- removed try catch block for document.hasFocus
- typo
- OperaFix wrapped fix in closure
- OperaFix for createImageData

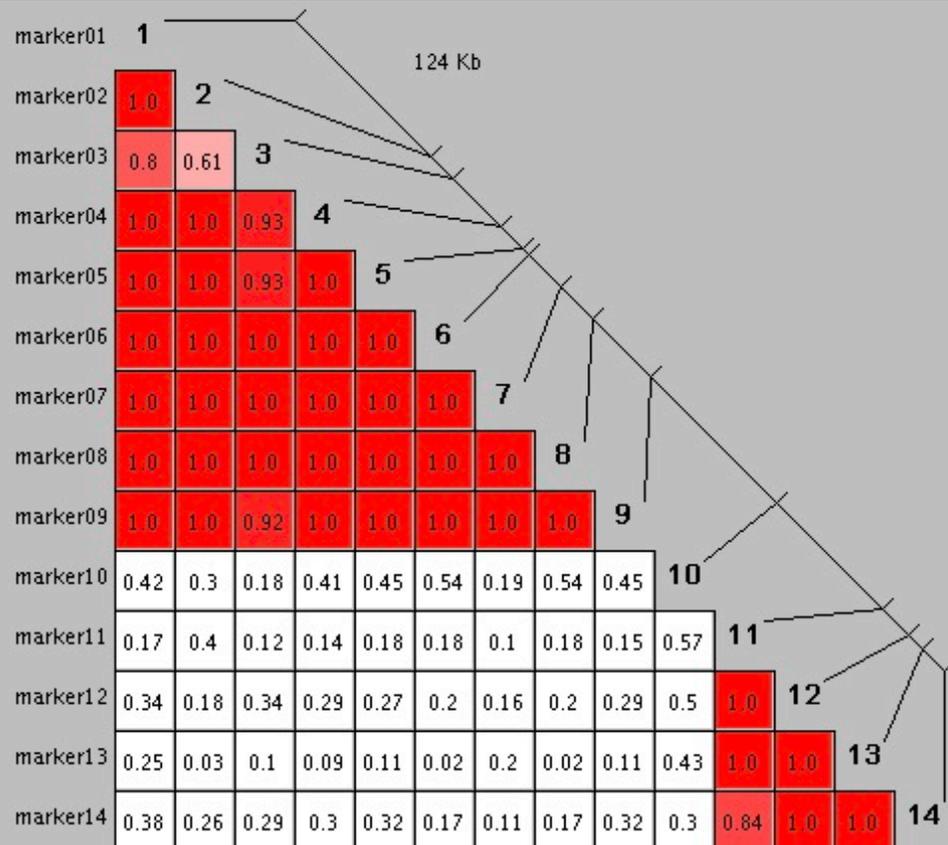


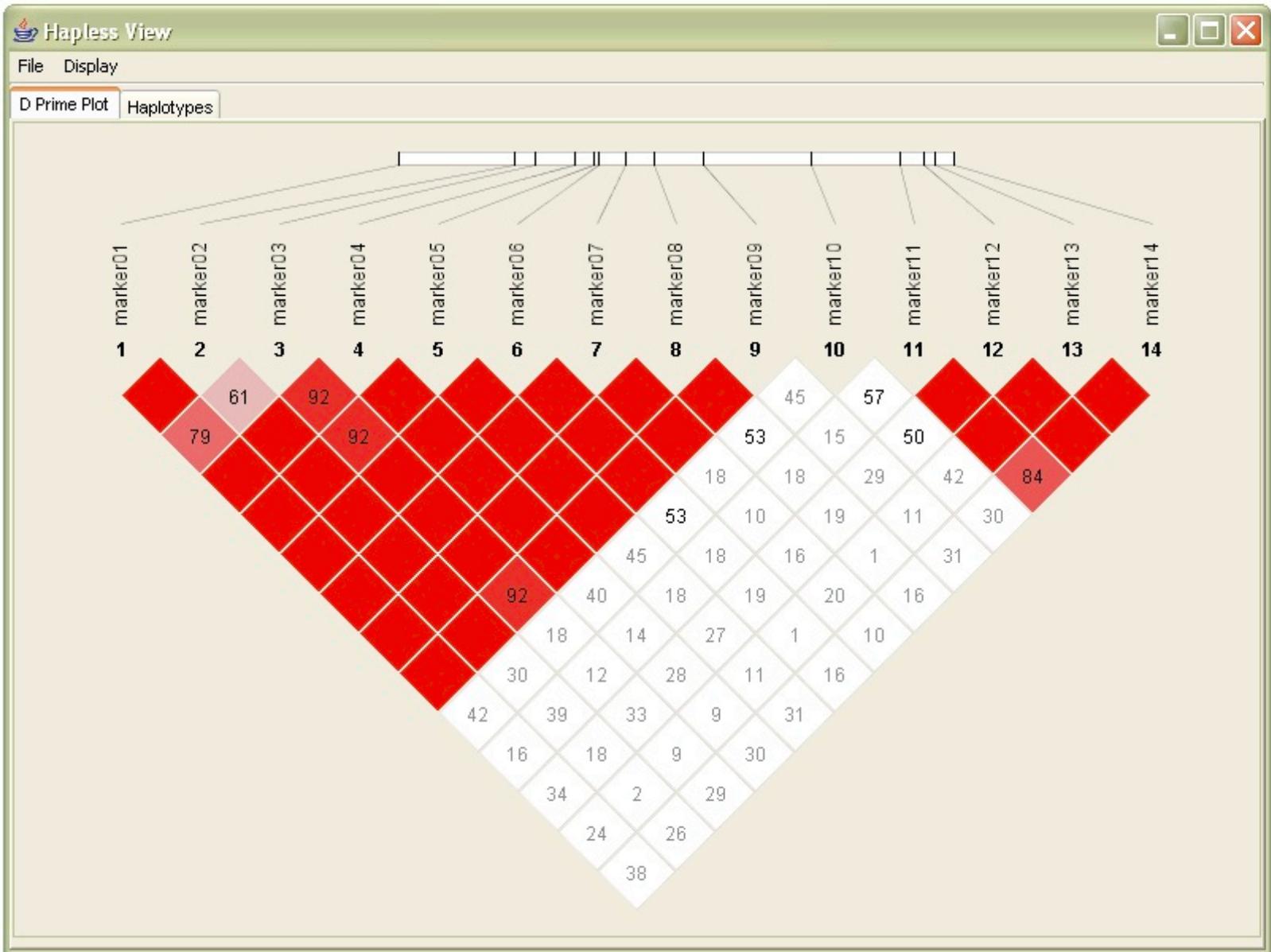


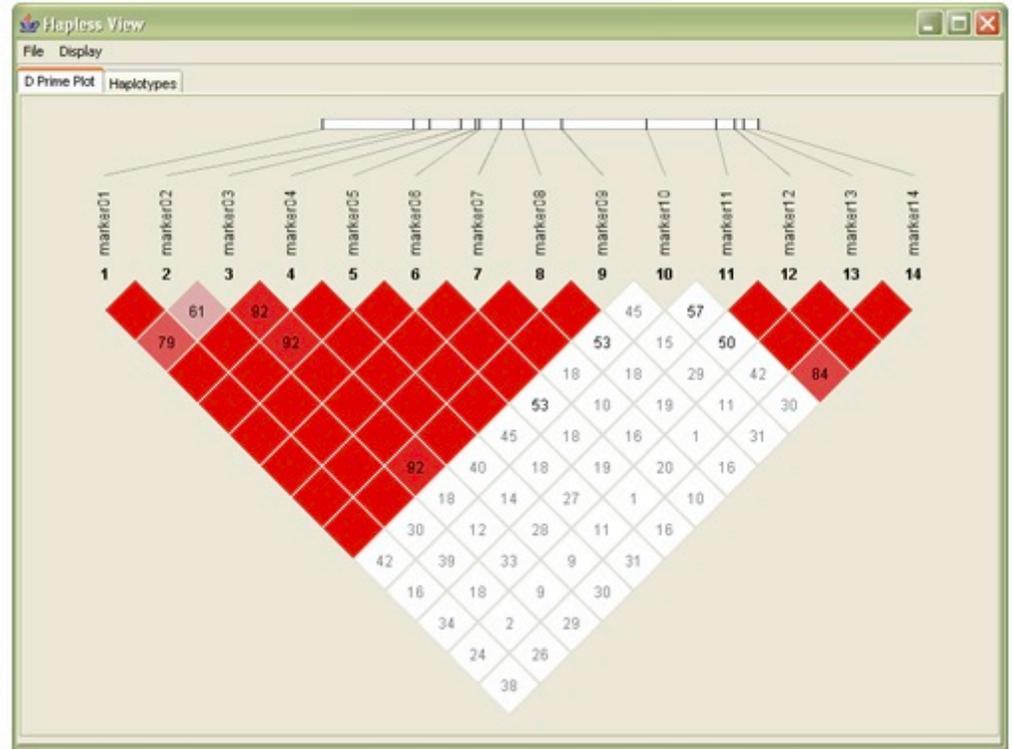
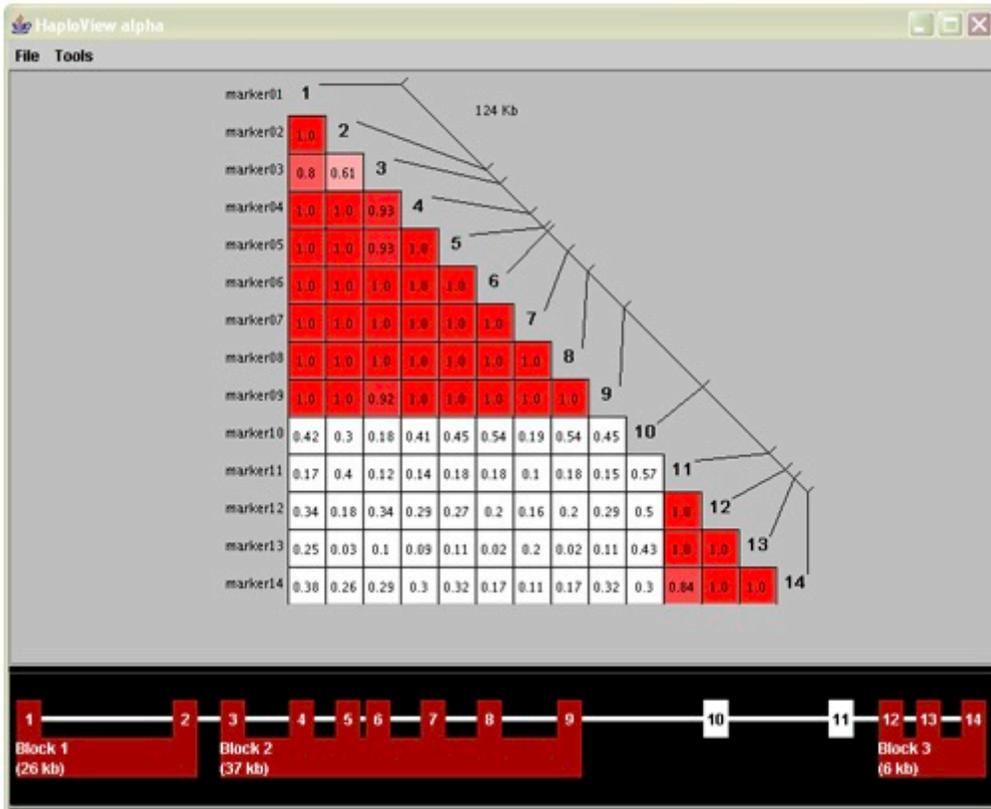
CCATCTGACATCTGACTCCCTCATGGTGCATCTGACTCCTATG	<b>G</b>	CATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCCCATCTGACTCATGG	<b>I</b>	TGCATTCCCATCTCATCTGACTCCGACTCATGGTGCATCTGAC
CCATCTGACATCTGACTCCCTCATGGTGCATCTGACTCCTATG	<b>G</b>	CATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCCCATCTGACTCATGG	<b>T</b>	TGCATTCCCATCTCATCTGACTCCGACTCATGGTGCATCTGAC
CCATCTGACATCTGACTCCCTCATGGTGCATCTGACTCCTATG	<b>C</b>	CATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCCCATCTGACTCATGG	<b>T</b>	TGCATTCCCATCTCATCTGACTCCGACTCATGGTGCATCTGAC
CCATCTGACATCTGACTCCCTCATGGTGCATCTGACTCCTATG	<b>G</b>	CATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCCCATCTGACTCATGG	<b>A</b>	TGCATTCCCATCTCATCTGACTCCGACTCATGGTGCATCTGAC
CCATCTGACATCTGACTCCCTCATGGTGCATCTGACTCCTATG	<b>G</b>	CATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCCCATCTGACTCATGG	<b>T</b>	TGCATTCCCATCTCATCTGACTCCGACTCATGGTGCATCTGAC
CCATCTGACATCTGACTCCCTCATGGTGCATCTGACTCCTATG	<b>C</b>	CATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCCCATCTGACTCATGG	<b>T</b>	TGCATTCCCATCTCATCTGACTCCGACTCATGGTGCATCTGAC
CCATCTGACATCTGACTCCCTCATGGTGCATCTGACTCCTATG	<b>G</b>	CATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCCCATCTGACTCATGG	<b>T</b>	TGCATTCCCATCTCATCTGACTCCGACTCATGGTGCATCTGAC
CCATCTGACATCTGACTCCCTCATGGTGCATCTGACTCCTATG	<b>G</b>	CATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCATGGTGCATCTGACTCCTATGGTGCATCTGACTCCCATCTGACTCATGG	<b>A</b>	TGCATTCCCATCTCATCTGACTCCGACTCATGGTGCATCTGAC

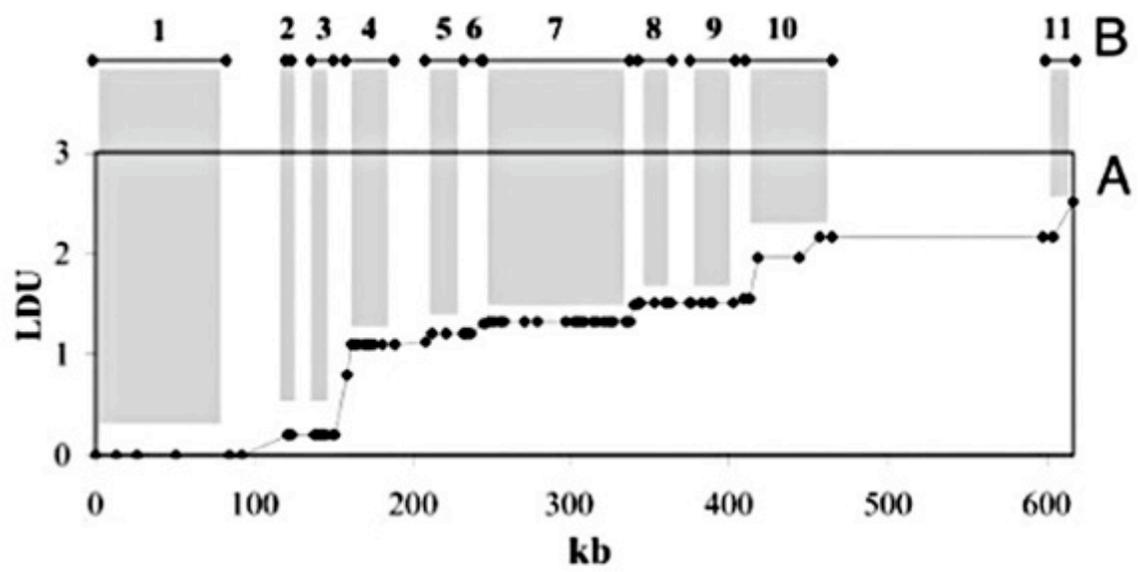

  
*~1000 base pairs (letters)*

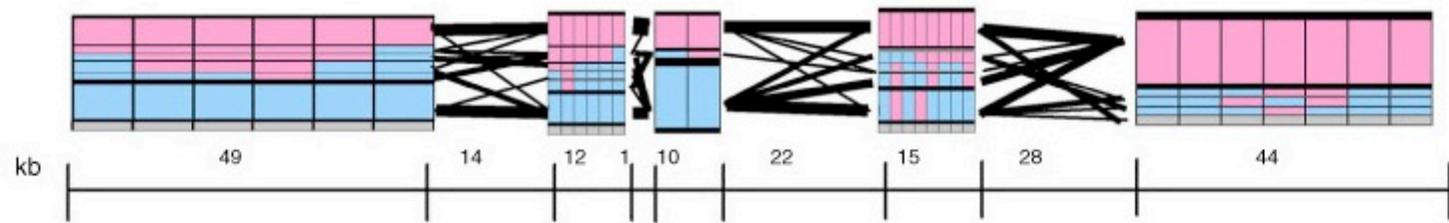


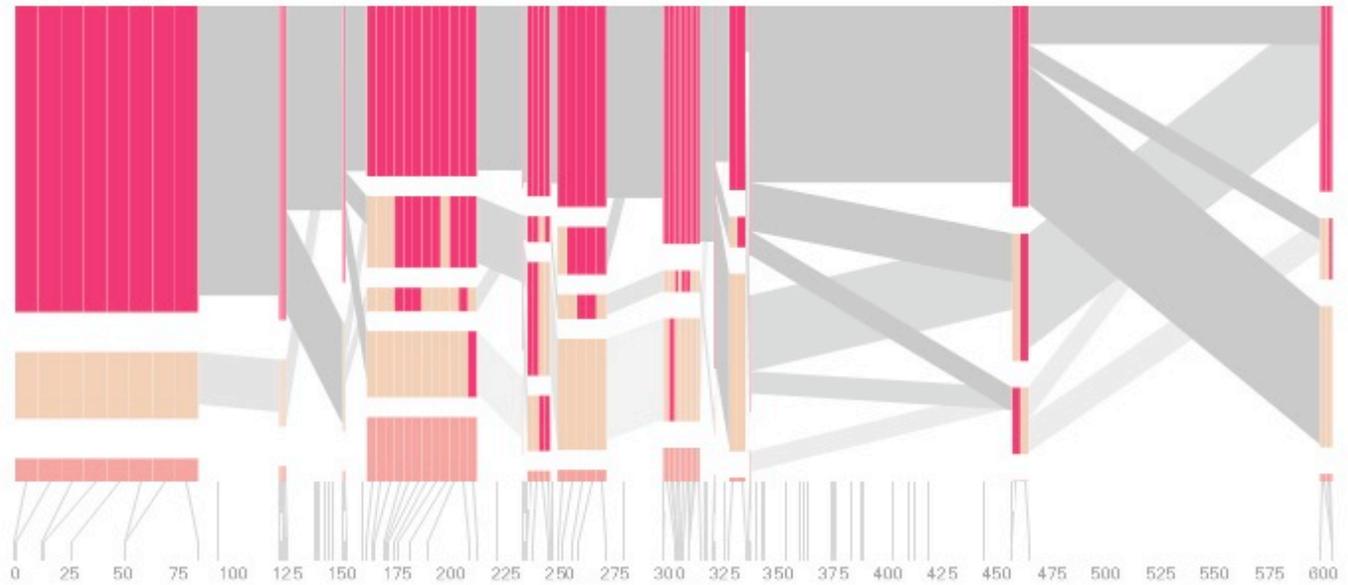
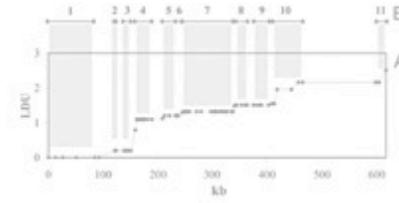
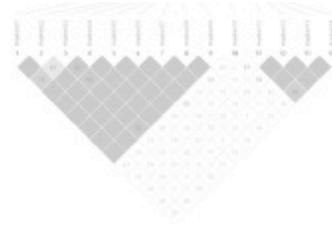
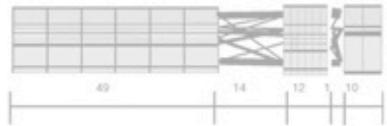












cut high ci ————— 98  
 cut low ci ————— 70  
 rec high ci ————— 90  
 min strong ld ————— 95

27 October 2005 | www.nature.com/nature

THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE

# nature



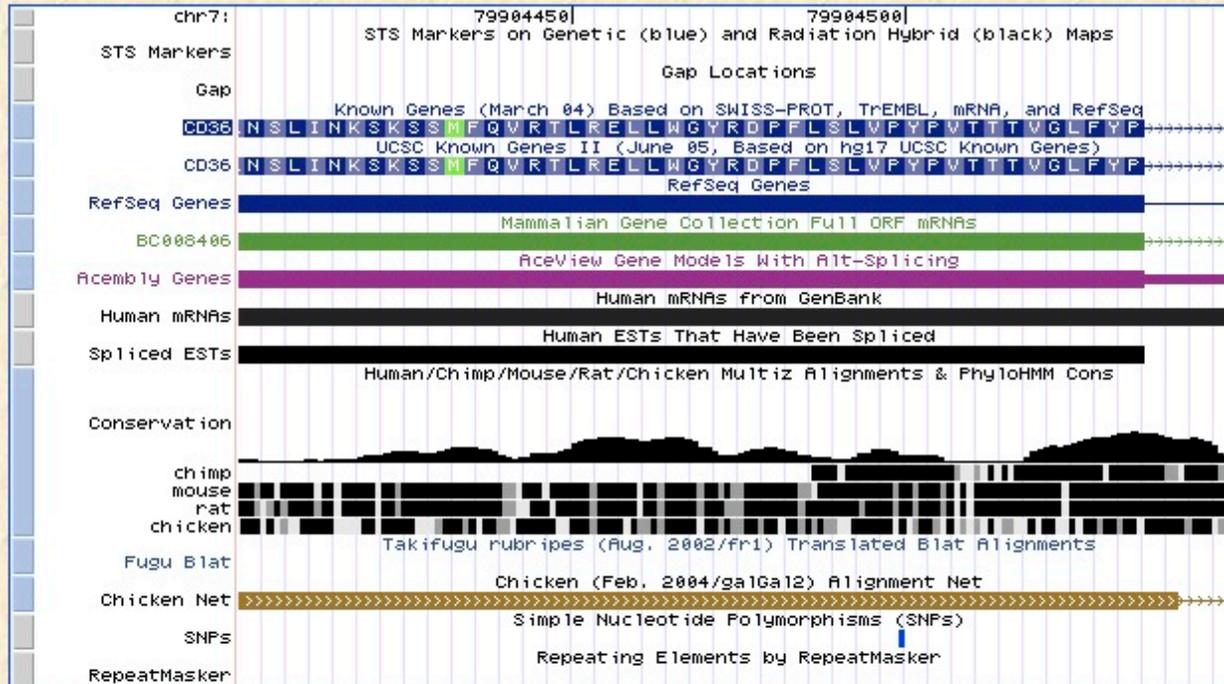
## THE HAPMAP PROJECT

Chapter and verse on  
human genetic variation

# UCSC Genome Browser on Human July 2003 Assembly

move <<< << < > >> >>> zoom in 1.5x 3x 10x base zoom out 1.5x 3x 10x

position/search chr7:79,904,401-79,904,550 jump clear size 150 bp. configure



move start < 2.0 > Click on a feature for details. Click on base position to zoom in around cursor. Click on left mini-buttons for track-specific options. move end < 2.0 >

default tracks hide all add custom tracks configure refresh

### Chromosome Color Key:



Use drop down controls below and press refresh to alter tracks displayed. Tracks with lots of items will automatically be displayed in more compact modes.

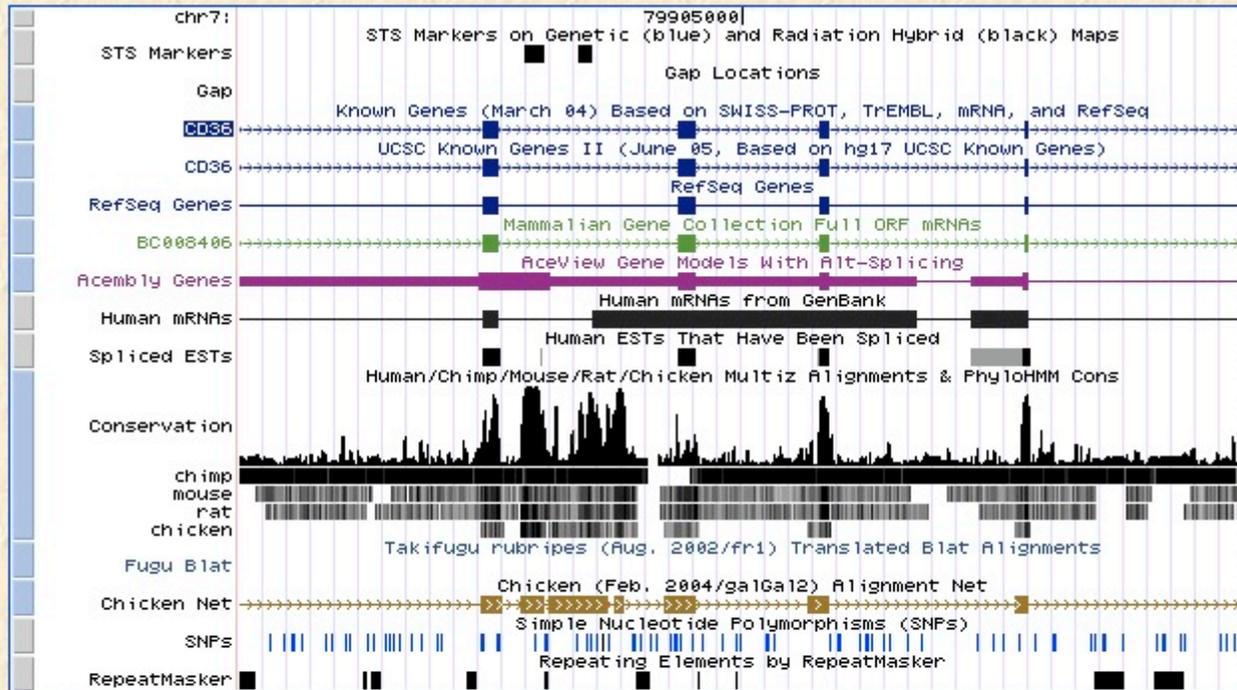
### Mapping and Sequencing Tracks

<a href="#">Base Position</a> dense ▾	<a href="#">Chromosome Band</a> hide ▾	<a href="#">STS Markers</a> dense ▾	<a href="#">FISH Clones</a> hide ▾	<a href="#">Recomb Rate</a> hide ▾
<a href="#">Map Contigs</a> hide ▾	<a href="#">Assembly</a> hide ▾	<a href="#">Gap</a> dense ▾	<a href="#">Coverage</a> hide ▾	<a href="#">BAC End Pairs</a> hide ▾

# UCSC Genome Browser on Human July 2003 Assembly

move <<< << < > >> >>> zoom in 1.5x 3x 10x base zoom out 1.5x 3x 10x

position/search chr7:79,900,001-79,910,000 jump clear size 10,000 bp. configure



move start < 2.0 > Click on a feature for details. Click on base position to zoom in around cursor. Click on left mini-buttons for track-specific options. move end < 2.0 >

default tracks hide all add custom tracks configure refresh

### Chromosome Color Key:



Use drop down controls below and press refresh to alter tracks displayed. Tracks with lots of items will automatically be displayed in more compact modes.

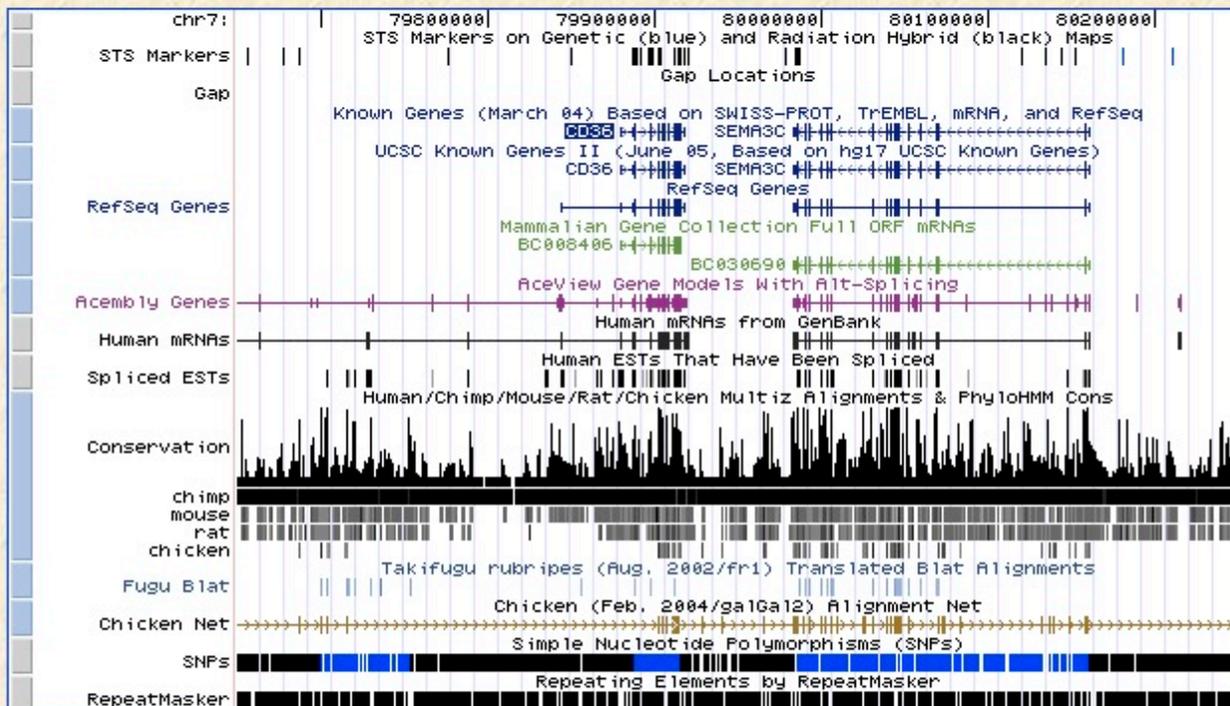
### Mapping and Sequencing Tracks

<a href="#">Base Position</a> dense ▾	<a href="#">Chromosome Band</a> hide ▾	<a href="#">STS Markers</a> dense ▾	<a href="#">FISH Clones</a> hide ▾	<a href="#">Recomb Rate</a> hide ▾
<a href="#">Map Contigs</a> hide ▾	<a href="#">Assembly</a> hide ▾	<a href="#">Gap</a> dense ▾	<a href="#">Coverage</a> hide ▾	<a href="#">BAC End Pairs</a> hide ▾

# UCSC Genome Browser on Human July 2003 Assembly

move <<< << < > >> >>> zoom in 1.5x 3x 10x base zoom out 1.5x 3x 10x

position/search chr7:79,650,001-80,250,000 jump clear size 600,000 bp. configure



move start < 2.0 > Click on a feature for details. Click on base position to zoom in around cursor. Click on left mini-buttons for track-specific options. move end < 2.0 >

default tracks hide all add custom tracks configure refresh

### Chromosome Color Key:



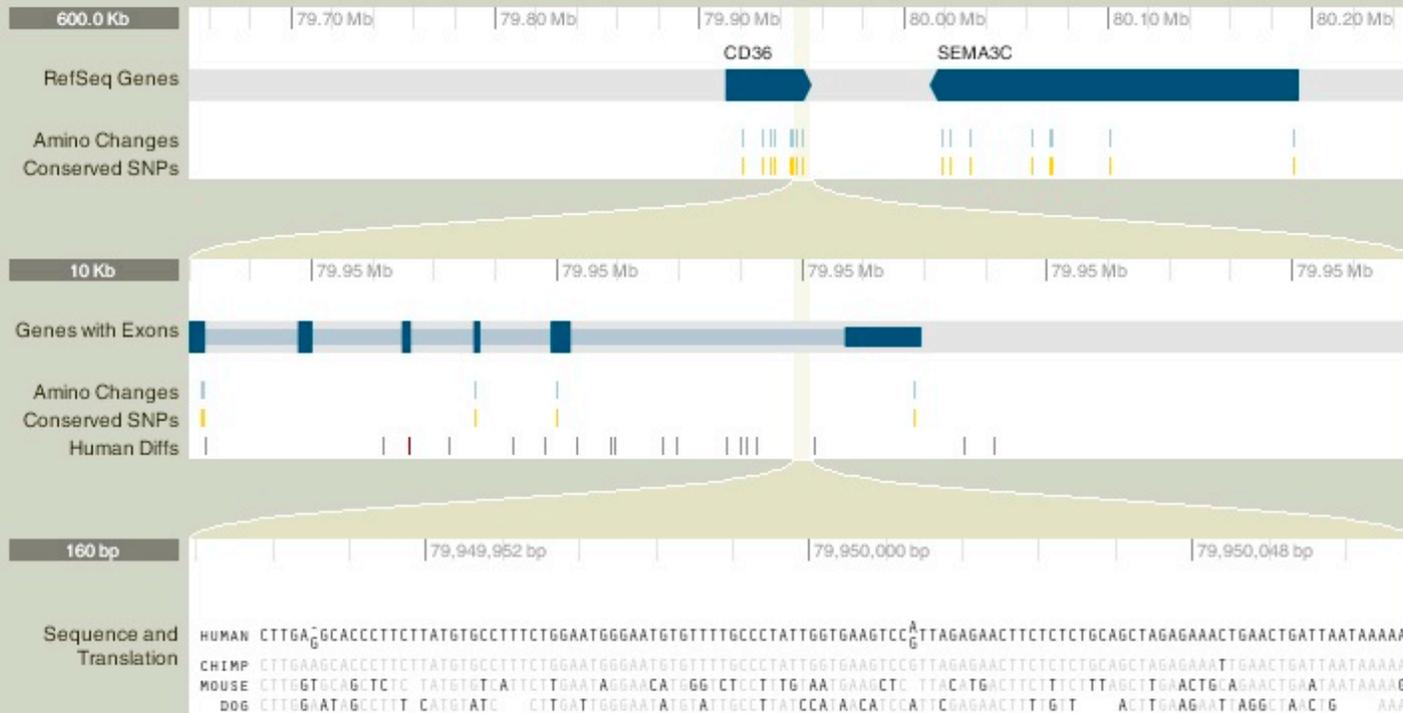
Use drop down controls below and press refresh to alter tracks displayed. Tracks with lots of items will automatically be displayed in more compact modes.

### Mapping and Sequencing Tracks

<a href="#">Base Position</a> dense ▾	<a href="#">Chromosome Band</a> hide ▾	<a href="#">STS Markers</a> dense ▾	<a href="#">FISH Clones</a> hide ▾	<a href="#">Recomb Rate</a> hide ▾
<a href="#">Map Contigs</a> hide ▾	<a href="#">Assembly</a> hide ▾	<a href="#">Gap</a> dense ▾	<a href="#">Coverage</a> hide ▾	<a href="#">BAC End Pairs</a> hide ▾

cd36

0.60 Mb from Human (hg17) Chromosome 7 Positions 79,650,001 to 80,250,000



hoxa

Load

chr7

26,730,761

27,230,760

Fetch

«

»

500.0 Kb

26.75 Mb

26.80 Mb

26.85 Mb

26.90 Mb

26.95 Mb

27.00 Mb

27.05 Mb

27.10 Mb

27.15 Mb

27.20 Mb

Similarity



5 Kb

26.98 Mb

26.98 Mb

26.98 Mb

26.98 Mb

26.98 Mb

Genes



Chimp

RheMac

Elephant

Dog

Dog2

Armadillo

Cavia

Cow

Rabbit

Mouse

Mouse7

Rat

Hedgehog

Tenrec

Shrew

Monodelphis

Monodelphisv4

Cutoff

60%

Window

50 bp

150 bp

26,979,900 bp

26,979,950 bp

26,980,000 bp

Repeats

human CCC CTGC CCC CAAT TCC TAA CAGA AAG CAGC GAC TCC TAGA ACA GGGG TAA TCAA ATT CAC GTGT GGA TACT GTG CCT GCAA CAG TGTG TTT TTC ATTA GCC CACT TCC CTG GCGG CGA GGCT GGC GGCC TCG GGC GCTT CCA TCT CTC

Chimp

RheMac

Elephant

Dog

Dog2

Armadillo

Cavia

Cow

Rabbit

Mouse

Mouse7

Rat

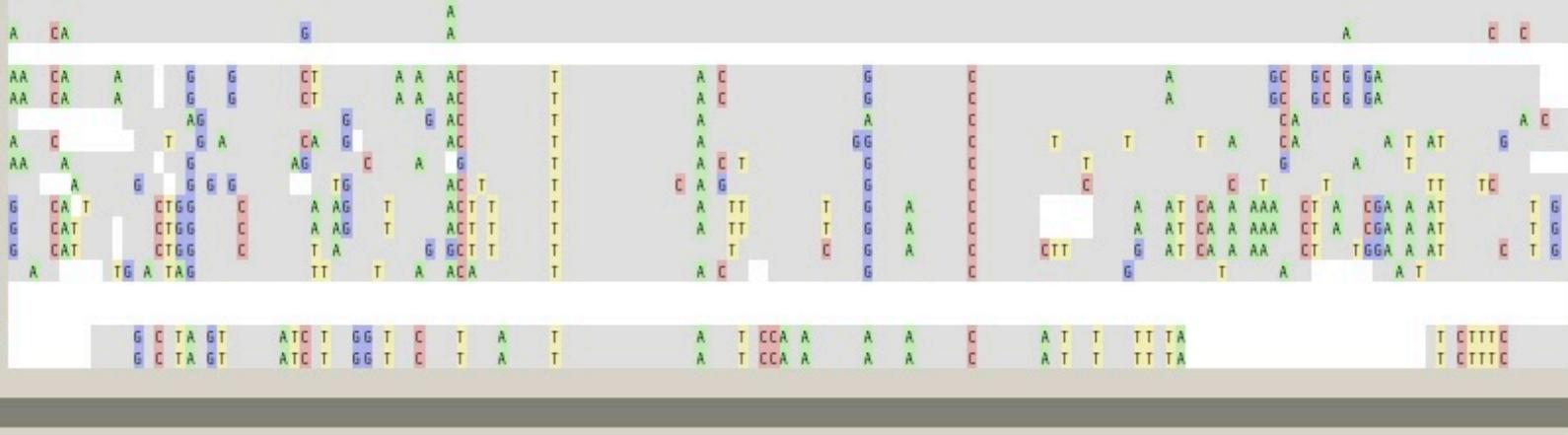
Hedgehog

Tenrec

Shrew

Monodelphis

Monodelphisv4







# The Fortune 500

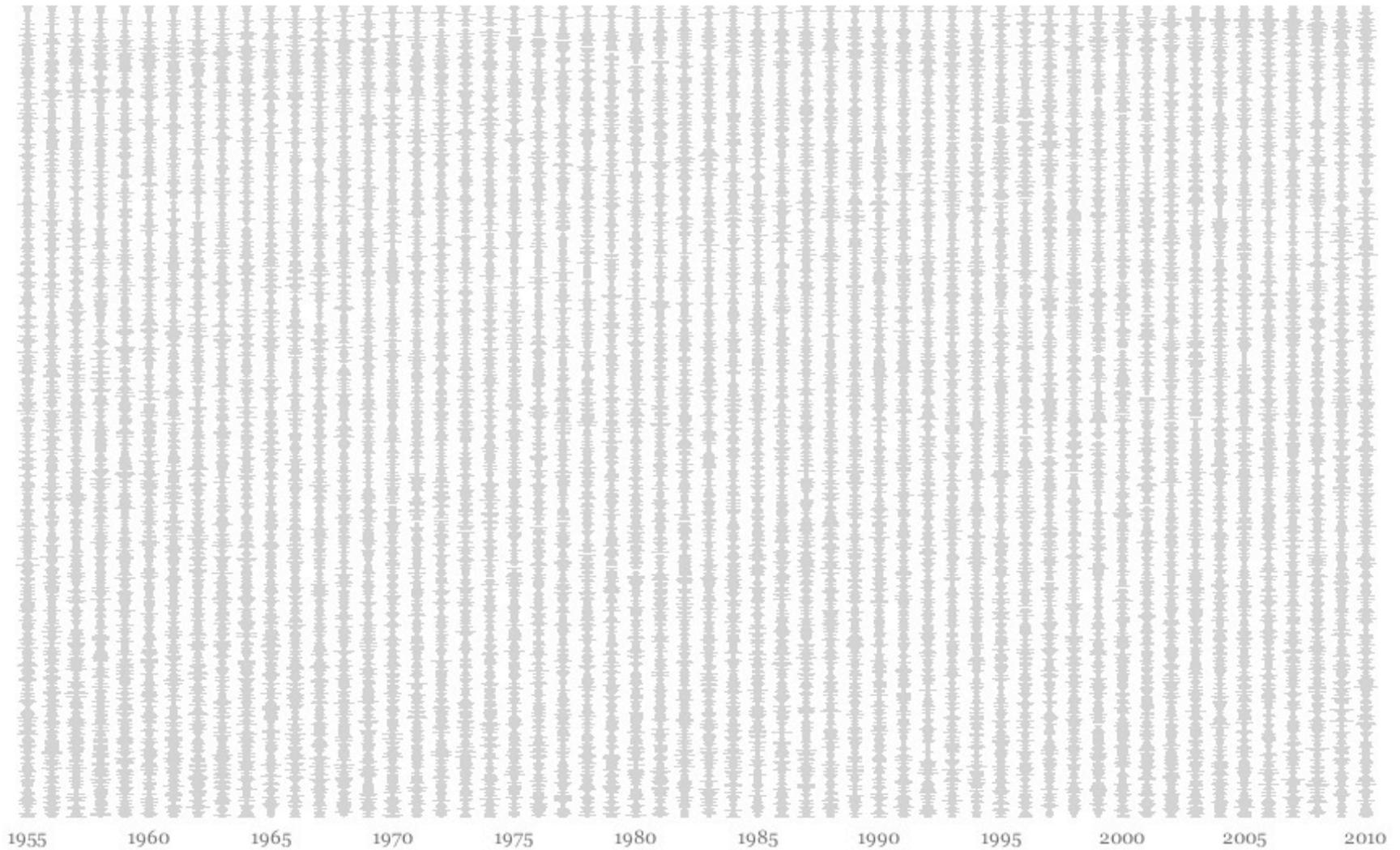
order by:

**RANK**

REVENUE

PROFIT

adjust for inflation

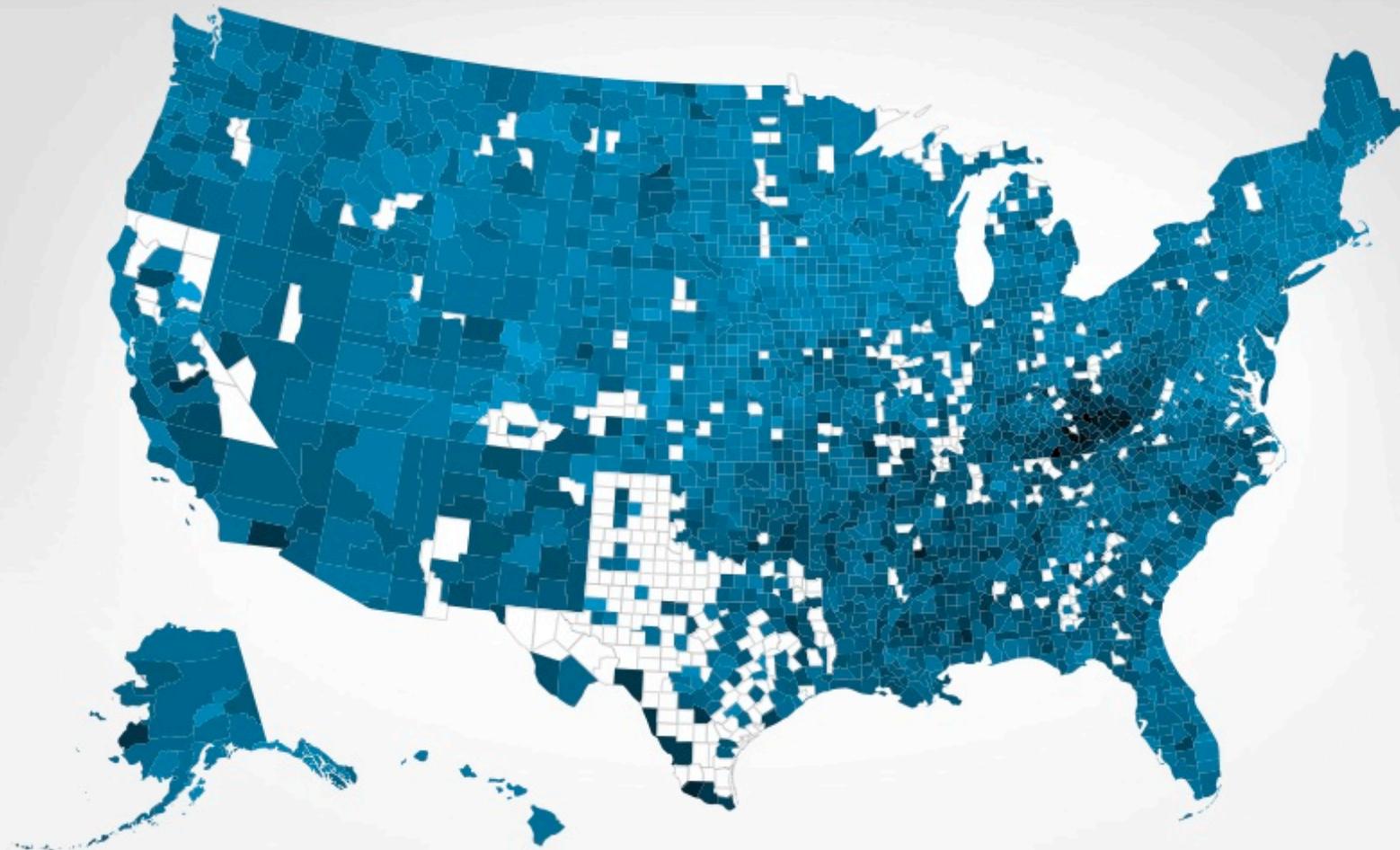




# Poor or fair health ▶

United States

Percentage: 0 46 | Show as Z-score



## Morbidity & Mortality

### Poor or fair health

- Poor physical health days
- Poor mental health days
- Low birthweight
- Premature death

## Health Behaviors

- Adult smoking
- Adult obesity
- Binge drinking
- Motor vehicle crash death rate
- Chlamydia rate
- Teen birth rate

## Clinical Care

- Uninsured adults
- Primary care provider rate
- Preventable hospital stays
- Diabetic screening
- Hospice use

## Social & Economic Factors

- High school graduation
- College degrees
- Unemployment
- Children in poverty
- Income inequality
- Inadequate social support
- Single-parent households
- Violent crime rate

## Physical Environment

- Particulate air pollution
- Ozone air pollution
- Access to healthy foods
- Liquor store density

Source: countyhealthrankings.org from the Robert Wood Johnson Foundation and University of Wisconsin



# County Health Rankings

Mobilizing Action Toward Community Health

[About This Project](#) | [Latest News](#) | [For Media](#)

Health Outcomes

Health Factors

Take Action

## Find Health Rankings

By County:

-- OR --

By State:

### Spread the Word

Share this site. Let others know how they can help.

### Find us on



### Stay Updated

Zip Code:

## Latest from County Health Rankings

December 1, 2010 | Related News

**Associated Press: Improving Americans' health takes a community**

## In the Spotlight



[CDC Journal Features Articles on Health Partnerships to Improve Population Health](#)

The November 2010 edition of *Prevention* is co



Go

[Health Outcomes](#)[Health Factors](#)[Take Action](#)[Find Health Rankings](#)[Home >](#)[Print](#) [Facebook](#) [Twitter](#) [More](#)

## Massachusetts

[Overall Rankings](#)[Health Outcomes Map](#)[Health Factors Map](#)[Health Outcomes Rankings](#)[Health Factors Rankings](#)

### Download State Summary Report

[Massachusetts Summary Report](#)

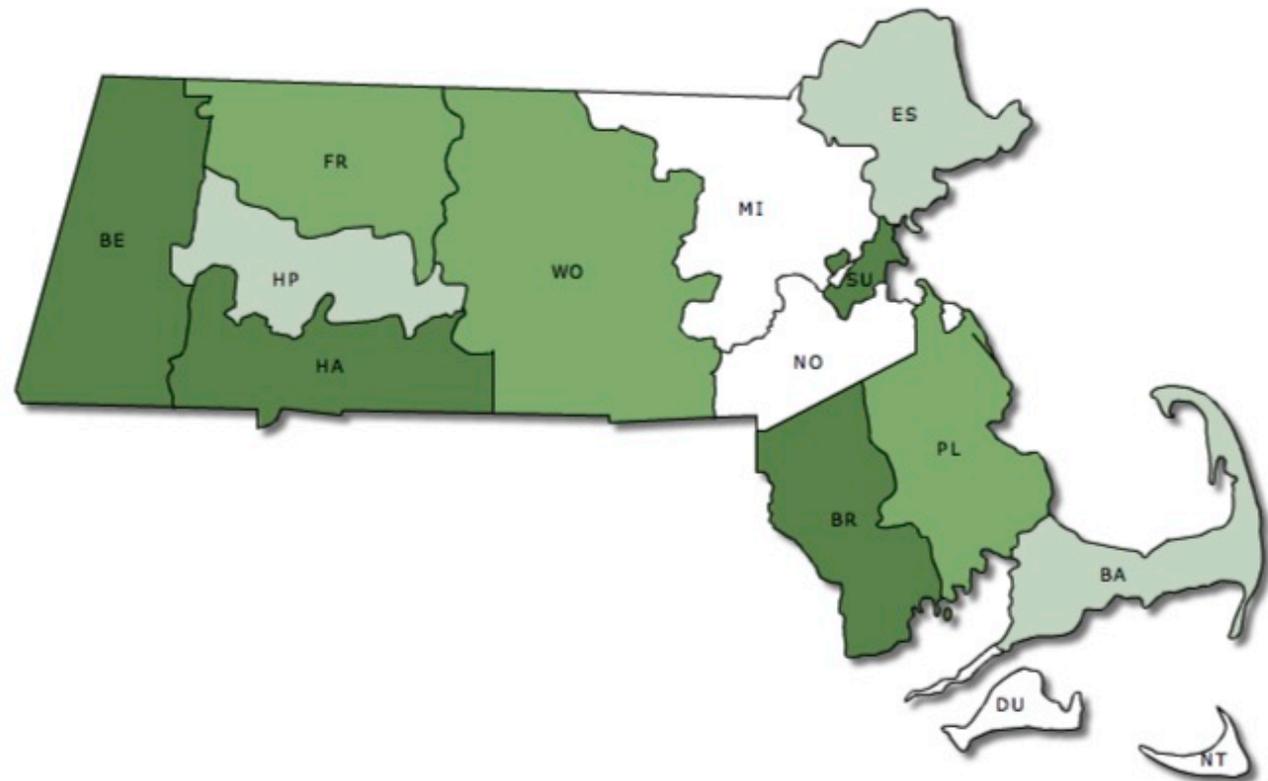
#### Related Links

- [Download State Data File](#)
- [More Information: State Contact](#)
- [Massachusetts Community Health Information Profile \(MassCHIP\)](#)
- [Massachusetts Population Health Statistics](#)
- [Massachusetts Department of Public Health](#)

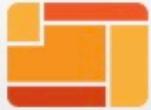
## Massachusetts

### 2010 Health Outcomes Map

Health Outcomes are the primary ranking used to rank the overall health of counties. The county ranked number 1 is considered the healthiest county in the state.



Take Action

[Health Outcomes](#)

[Health Factors](#)

[Take Action](#)

[Find Health Rankings](#) ▾

[Home](#) > [Massachusetts](#) >



## Massachusetts

[Overall Rankings](#)

[Health Outcomes Map](#)

[Health Factors Map](#)

[Health Outcomes Rankings](#)

[Health Factors Rankings](#)

## Related Links

[County Facts from US Census Bureau](#)

[County Facts from Health and Human Services \(CHSI\)](#)



## Snapshot 2010: Middlesex, MA

2009 Population: 1,505,006

	Middlesex County	Error Margin	Target Value*	Massachusetts	Rank (of 14)
Health Outcomes					<b>3</b>
Mortality					<b>3</b>
Premature death	4,629	4,510-4,748	4,573	5,681	
Morbidity					<b>5</b>
Poor or fair health	10%	10-11%	7%	12%	
Poor physical health days	2.8	2.6-2.9	2.8	3.2	
Poor mental health days	2.8	2.7-3.0	2.8	3.3	
Low birthweight	7.2%	7.1-7.4%	6.4%	7.6%	
Health Factors					<b>2</b>
Health Behaviors					<b>3</b>
Adult smoking	14%	13-15%	14%	18%	
Adult obesity	22%	21-22%	19%	22%	



# Community Health Status Indicators CHSI 2009

Our Mission: Provide Information for Improving Community Health

Select Year

Current - 2009

Select State

Massachusetts

Select County

Middlesex

Display Data

Home | About the Data | About the Project | How to Use Report | Partners | Resources

## Community Health Status Indicators Report

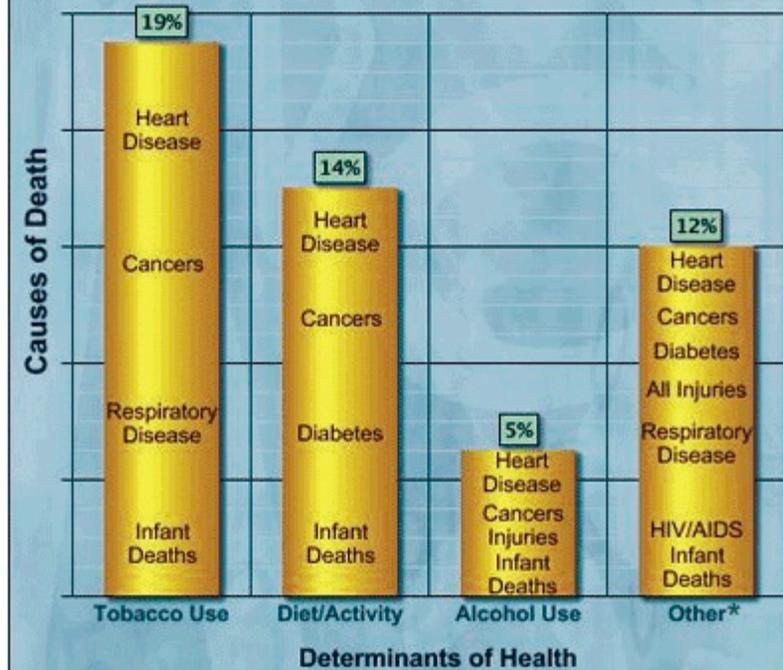


The goal of Community Health Status Indicators (CHSI) is to provide an overview of key health indicators for local communities and to encourage dialogue about actions that can be taken to improve a community's health. The CHSI report was designed not only for public health professionals but also for members of the community who are interested in the health of their community. The CHSI report contains over 200 measures for each of the 3,141 United States counties. Although CHSI presents indicators like deaths due to heart disease and cancer, it is imperative to understand that behavioral factors such as tobacco use, diet, physical activity, alcohol and drug use, sexual behavior and others substantially contribute to these deaths (see chart).

In addition to the web pages, community profiles can be displayed on maps or downloaded in a brochure format. The CHSI mapping capability allows users to visually compare similar counties (termed peer counties) as well as adjacent counties with their own county. **This feature will be**

### What's Really Killing Us?

Half of all deaths can be attributed to these factors



Source: McGinnis, J.M & Foegen, W.H. (1993). Actual causes of death in the United States. JAMA., 270(18), 2207-2212



# Community Health Status Indicators CHSI 2009

Our Mission: Provide Information for Improving Community Health

Select Year

Current - 2009

Select State

Massachusetts

Select County

Middlesex

Demographics

Summary Measures of Health

National Leading Causes of Death

Measures of Birth and Death

Relative Health Importance

Vulnerable Populations

Environmental Health

Preventive Services Use

Risk Factors for Premature Death

Access to Care

[Home](#) | [About the Data](#) | [About the Project](#) | [How to Use Report](#) | [Partners](#) | [Resources](#)

## Measures of Birth and Death:<sup>1</sup> Middlesex County, MA

Indicates a status favorable to peer county median value

Indicates that a closer look and perhaps reduction to the percent or rate may be needed. Blank indicates no comparison.

County Percent	Status	Peer County Range	Birth Measures	U.S. Percent 2005	Healthy People 2010 Target
7.4		6.4 - 9.9	Low Birth Wt. (<2500 g)	8.2	5.0
1.3		1.1 - 2.0	Very Low Birth Wt. (<1500 g)	1.5	0.9
10.8		9.8 - 14.5	Premature Births (<37 weeks)	12.7	7.6
1.0		1.5 - 4.5	Births to Women under 18	3.4	No objective
5.8		2.1 - 4.6	Births to Women age 40-54	2.7	No objective
18.3		23.2 - 44.7	Births to Unmarried Women	36.9	No objective
9.3		8.3 - 20.4	No Care in First Trimester <sup>2</sup>	16.1	10.0

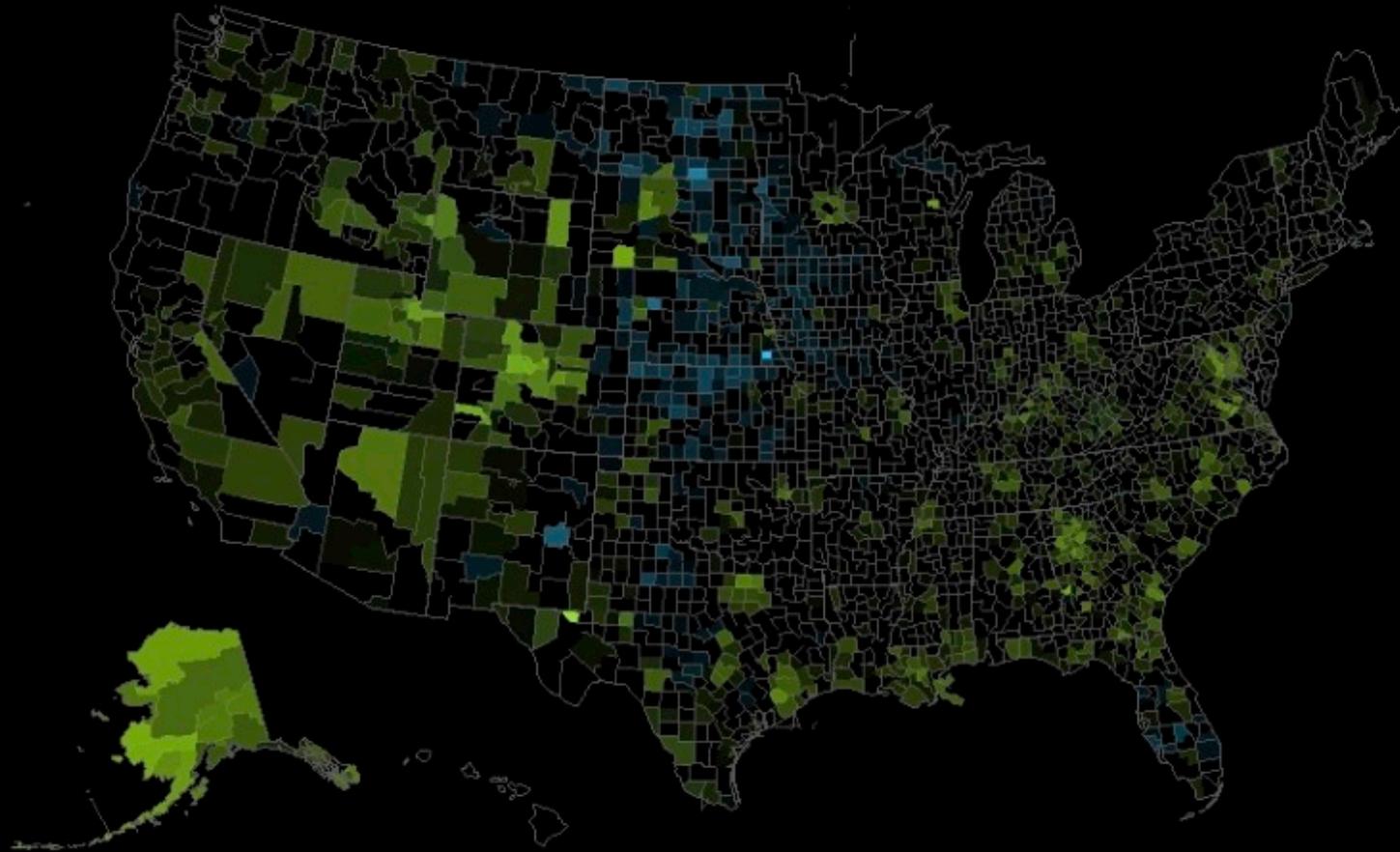
County Rate	Status	Peer County Range	Infant Mortality <sup>3</sup>	U.S. Rate 2005	Healthy People 2010 Target
4.2		4.5 - 8.3	Infant Mortality	6.9	4.5
3.7		3.2 - 6.2	White non Hispanic Infant Mortality	5.8	4.5
8.2		9.0 - 15.6	Black non Hispanic Infant Mortality	13.6	4.5
5.2		4.2 - 7.8	Hispanic Infant Mortality	5.6	4.5
3.2		3.2 - 6.2	Neonatal Infant Mortality	4.5	2.9



# Stats of the Union

[→ SNAPSHOT](#)

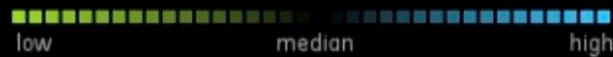
[? ABOUT](#)

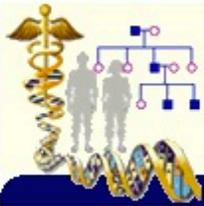


DEMOGRAPHICS

**White**  
Percentage of the population that is White

HISTORY





# Genetics Home Reference

Your Guide to Understanding Genetic Conditions

[About](#) [Site Map](#) [Contact Us](#)

A service of the U.S. National Library of Medicine®

## What's New

- MECP2 duplication syndrome
- PPM-X syndrome
- MECP2-related severe neonatal encephalopathy
- More...

## Newborn Screening

Detecting genetic disorders for early treatment

## In the Spotlight

- Learning Activities
- Information Rx
- What is direct-to-consumer genetic testing?

## Genetic Disorders A to Z

and related genes and chromosomes

### Genetic Conditions

The genetics of more than 650 health conditions, diseases, and syndromes.



### Genes

More than 900 genes, health effects of genetic differences, and gene families.



### Chromosomes

Chromosomes, mitochondrial DNA, and associated health conditions.



## Concepts & Tools

for understanding human genetics

### Handbook

Learn about mutations, inheritance, genetic counseling, genetic testing, genomic research, and more.



### Glossary

Medical and genetics definitions.



### Resources

Links to other genetics information and organizations.



Genetics Home Reference provides consumer-friendly information about the effects of genetic variations on human health.

The resources on this site should not be used as a substitute for professional medical care or advice. Users seeking information about a personal genetic disease, syndrome, or condition should consult with a qualified healthcare professional. See [How can I find a genetics professional in my area?](#) in the Handbook.

Published: November 7, 2011

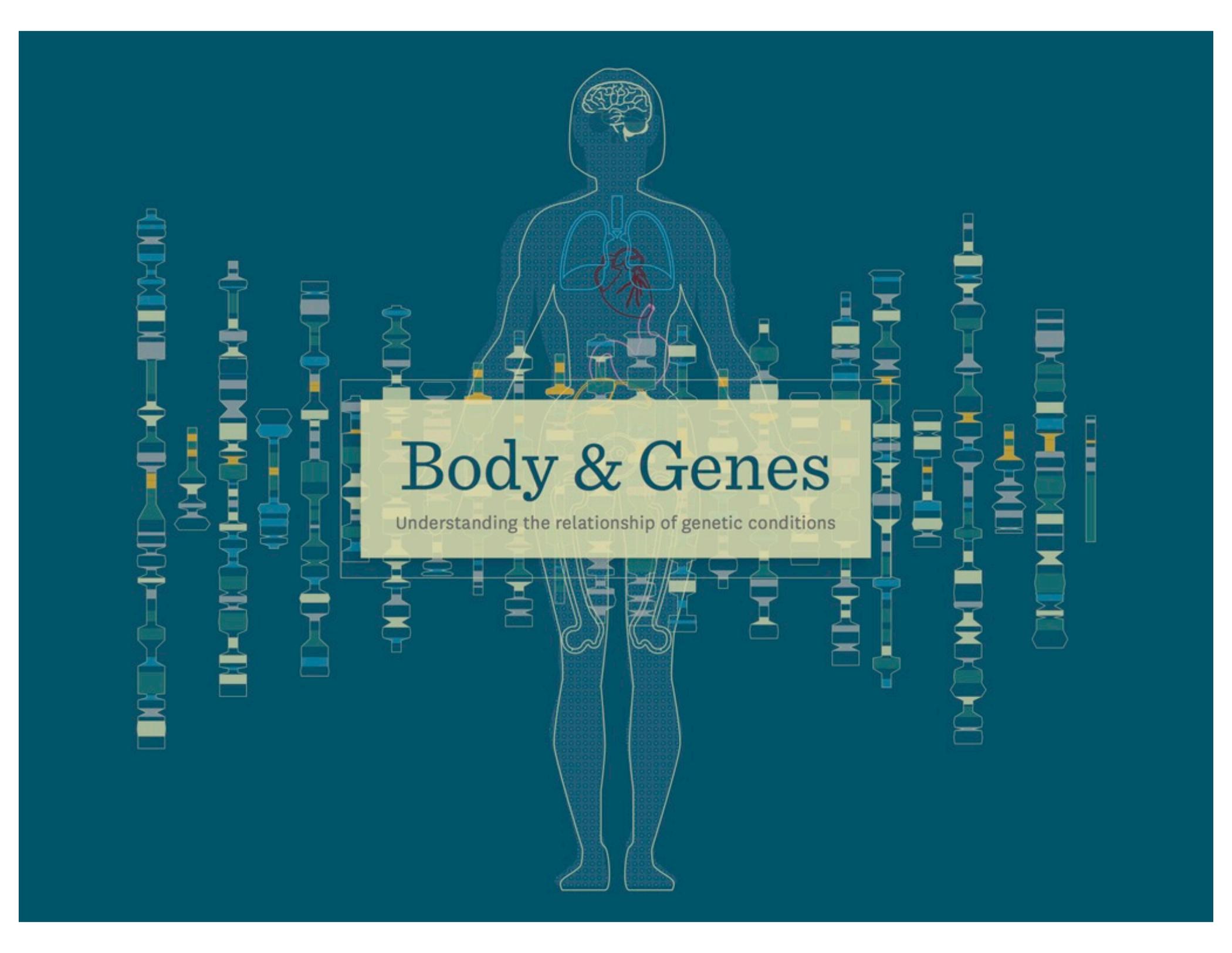
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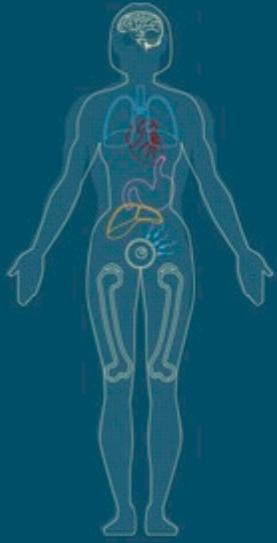


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# Body & Genes

Understanding the relationship of genetic conditions



### Genetic Categories

Blood + Circulation

Bones + Muscles

Brain + Nerves

Cancers

Digestion + Metabolism

Vision + Smell

Hormones (Endocrine)

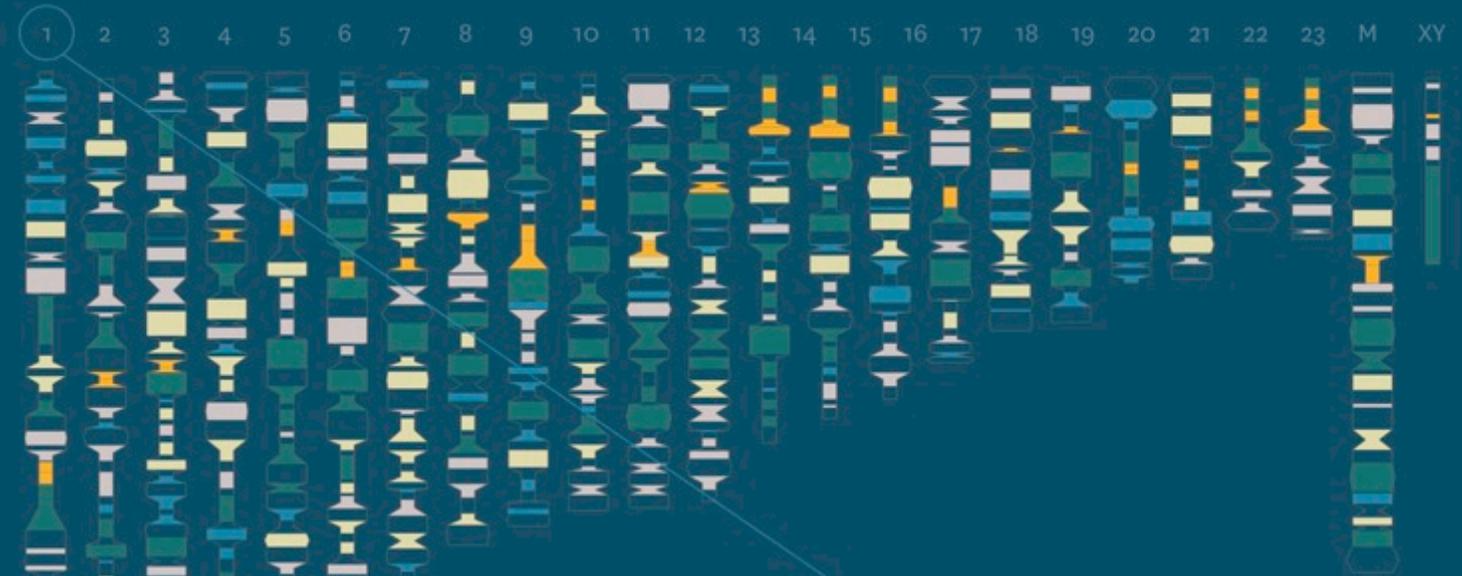
Immunity + Defense

Kidneys + Urinary

Lungs + Breathing

Reproduction

Hair + Skin

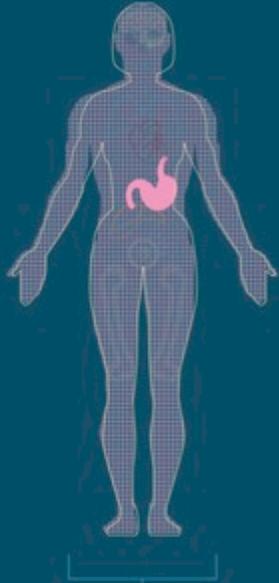


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**Chapter 1**

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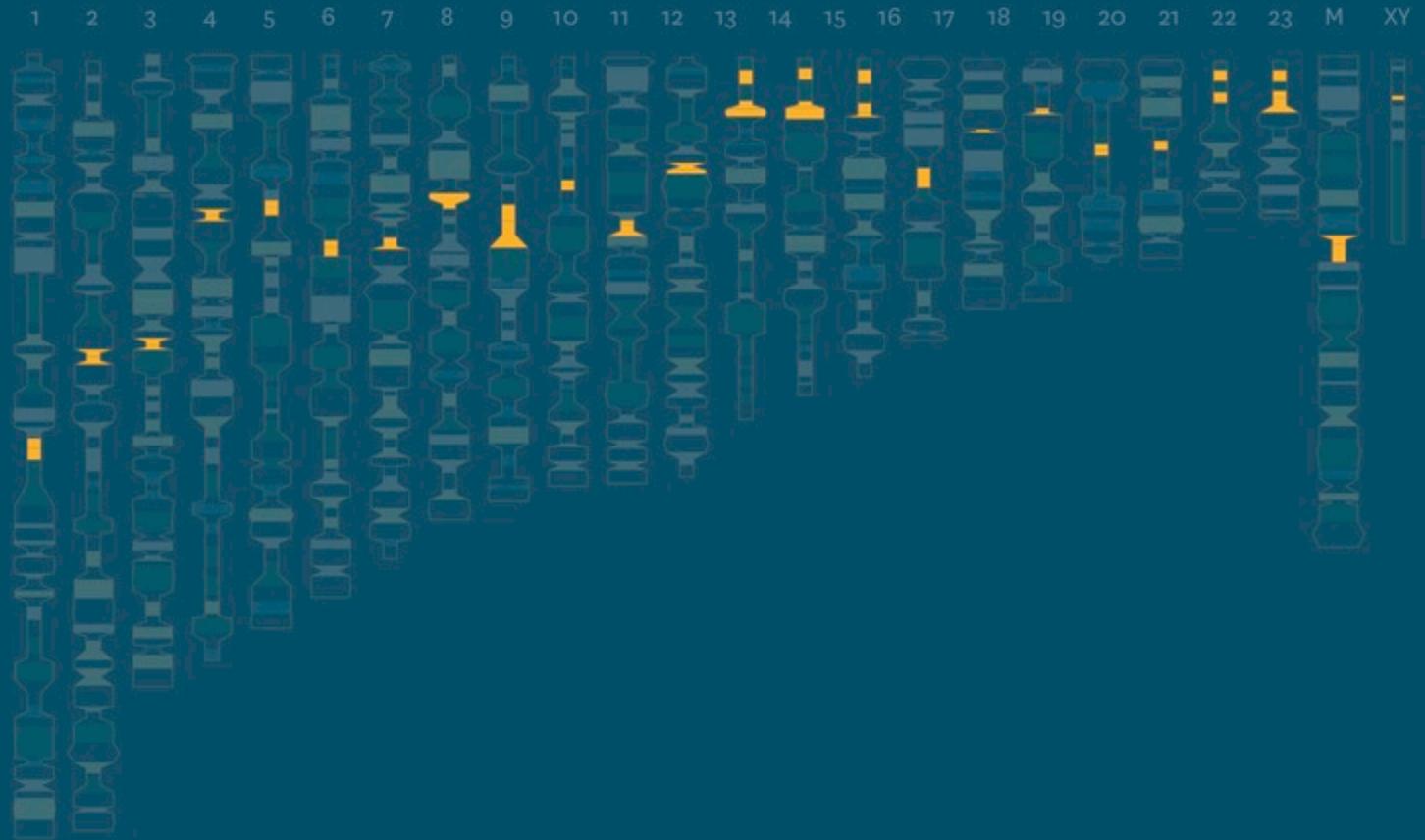
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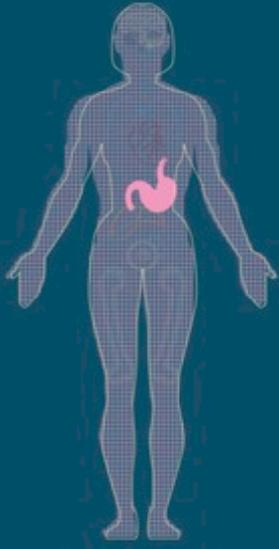
## Genetic Categories

### Digestion + Metabolism

Metabolism is the total of all chemical changes that take place in a cell or an organism. These changes produce energy and basic materials needed for important life processes. Some disorders of metabolism have a strong genetic component.

[Back](#)

## Digestion + Metabolism



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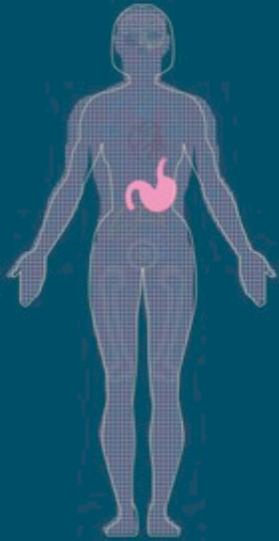
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## Genetic Categories



Back

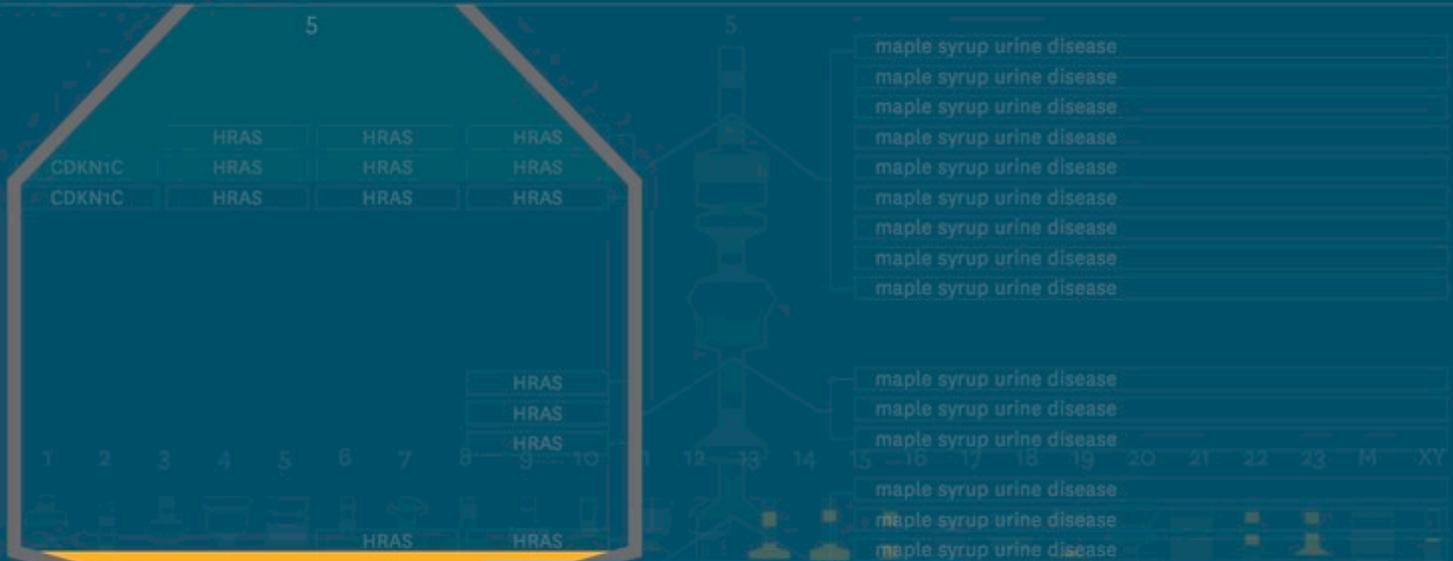
## Digestion + Metabolism



### Fact:

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## Genetic Categories



## Gene

### NAME

DBT (dihydrolipoamide branched chain transacylase E)

### FUNCTION

The DBT gene provides instructions for making part of an enzyme complex (a group of enzymes that work together)  
*read more >>*

### CONDITIONS

Maple Syrup Urine Disorder >

Other Disorders >

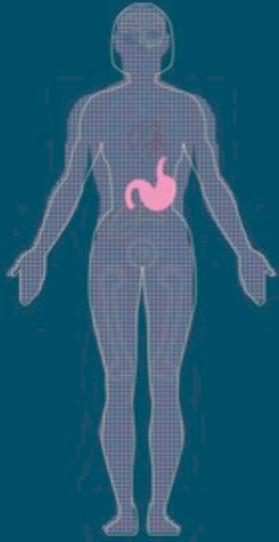
Other Disorders >

### FAMILY

to come >

Back

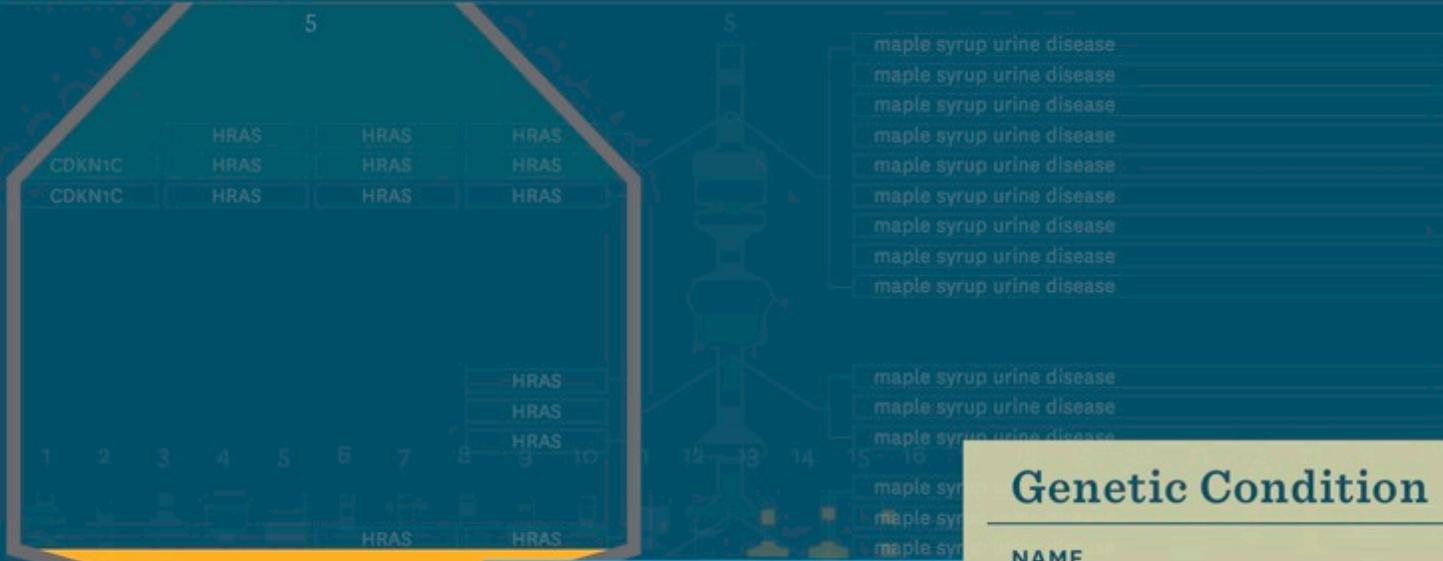
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*read more >>*

### CONDITIONS

- Maple Syrup Urine Disorder >
- Other Disorders >
- Other Disorders >

### FAMILY

to come >

## Genetic Condition

### NAME

Maple Syrup Urine Disorder

### DESCRIPTION

Maple syrup urine disease is an inherited disorder in which the body is unable to process certain protein building blocks (amino acid...*read more >>*

### INHERITANCE

autosomal recessive

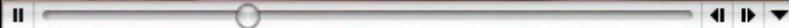
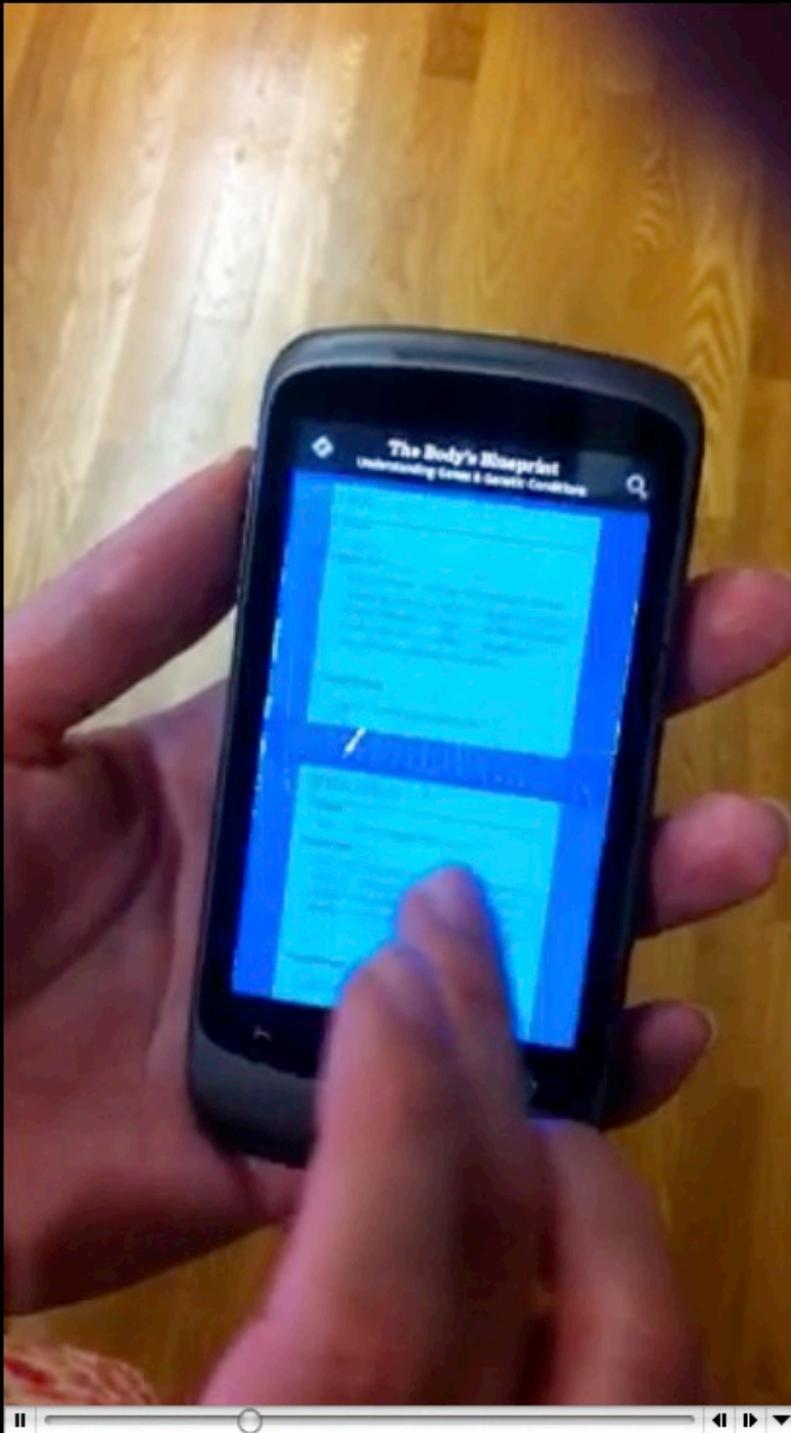
### FREQUENCY

1:185,000 infants  
1:380 Old Order Mennonite

### ASSOCIATED GENES

CDKN1C	HRAS	HRAS
CDKN1C	HRAS	HRAS

Back





## Chromosome 1

A chromosome is a thread-like structure of DNA and proteins. In most people, every cell in the body contains 46 chromosomes, divided into 23 pairs. Two copies of the chromosome — one inherited from the mother, the other from the father — form the pairs. Chromosome 1 is the largest human chromosome, representing about eight percent of the total DNA in cells.

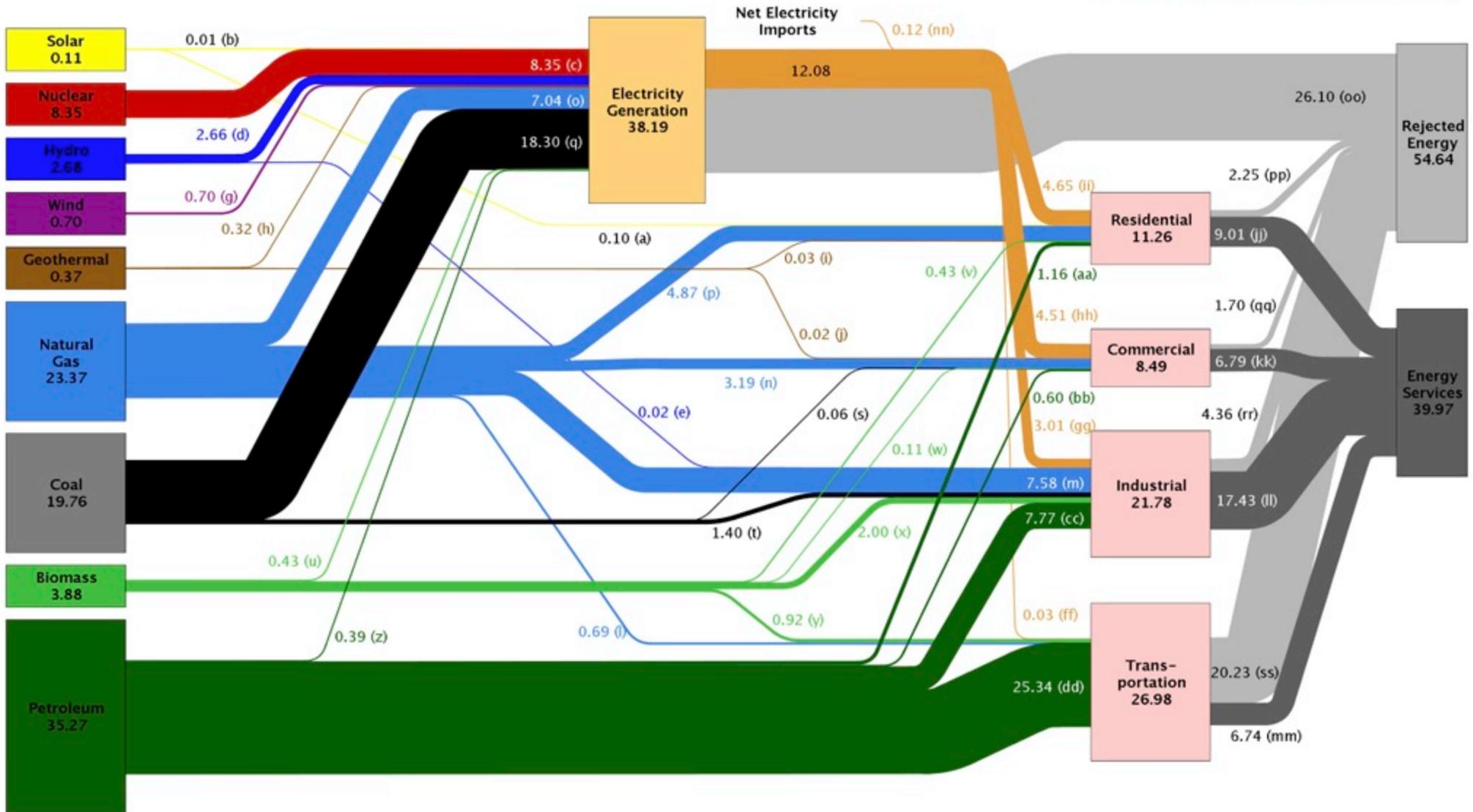
Abnormalities in chromosomes and the genes that form them can result in genetic disorders. **Porphyria** is a disease related to genes on chromosome 1.

Certain versions of the disease cause sun sensitivity and excessive hair growth—symptoms believed by some to be the origin of vampire and werewolf tales.

+

[BROWSE](#)

# Estimated U.S. Energy Use in 2009: ~94.6 Quads



Source: LLNL 2010. Data is based on DOE/EIA-0384(2009), August 2010. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports flows for non-thermal resources (i.e., hydro, wind and solar) in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 80% for the residential, commercial and industrial sectors, and as 25% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

# HOW POWER HAPPENS

Where does U.S. energy come from? Where does it go?

**PETROLEUM**

The largest energy source in the U.S. provides 94% of energy for transportation, but only 1% to generate electric power.

**NATURAL GAS**

Most of the U.S. domestic supply of natural gas (and coal) is produced in Wyoming.

**COAL**

The largest domestically produced source of energy, but also the largest emitter of carbon dioxide.

**NUCLEAR**

Generates about 20% of U.S. electricity.

**BIOMASS**

The largest renewable energy source includes firewood from trees, ethanol from corn and biodiesel from vegetable oil.

**HYDROELECTRIC**

The leading renewable source for producing electricity.

**WIND**

The fastest growing renewable source.

**GEOTHERMAL**

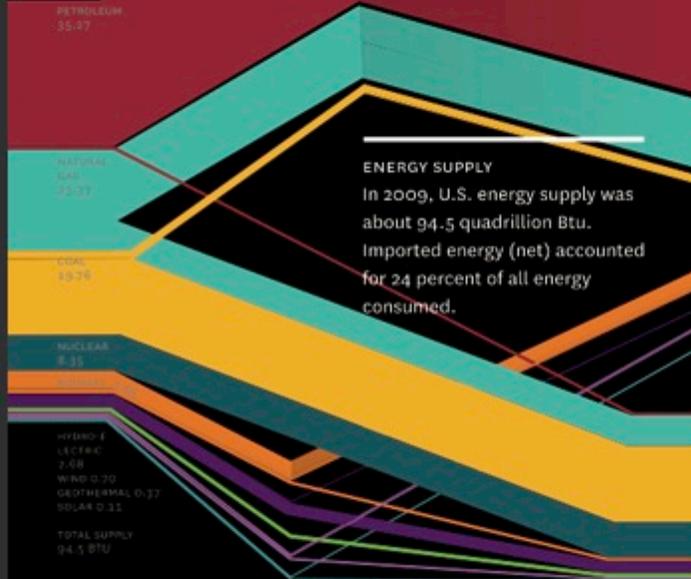
Energy contained underground in the form of steam, hot water and hot dry rocks.

**SOLAR**

Uses direct heat from the sun to create heat or steam for electricity generation.

**ENERGY SUPPLY**

In 2009, U.S. energy supply was about 94.5 quadrillion Btu. Imported energy (net) accounted for 24 percent of all energy consumed.



ENERGY LOSS 26.10

**RESIDENTIAL PETROLEUM CONSUMPTION**



**RESIDENTIAL NATURAL GAS CONSUMPTION**



**RESIDENTIAL ELECTRICITY CONSUMPTION**



TRANSPORTATION 26.08

INDUSTRIAL 23.70

RESIDENTIAL 21.16

COMMERCIAL 8.49

**ENERGY CONSUMPTION**

Transportation (freight, cars and planes) consumes the most energy (mostly petroleum). This sector also loses the most energy.

TRANSPORTATION LOSS 20.23

4.16

2.25

1.70

TOTAL LOSS 54.64

**HOW DO ENERGY PRODUCTION AND CONSUMPTION COMPARE WORLDWIDE?**



**ELECTRICITY PRODUCTION**

Fossil fuels are used to produce 69% of the net electricity in the country, nuclear provides 20% and renewable energy resources about 10%.

## Where It's From



## Where It Goes

### Power Plants

### Residential

### Commercial

### Industrial

### Transportation

## What's Wasted

Lost Energy 54.46 Quads

Used Energy 39.97 Quads

Estimated U.S. Energy Use, 2009

# 94.6 Quads

A "quad" is one quadrillion [British thermal units](#). One Btu is roughly the amount of energy released by burning a match. One quad is equal to about 8 billion gallons of gasoline. The U.S. accounts for about 4.5 percent of the world's population. It used about 20 percent of global energy, or 94.6 quads in 2009.

Notes: Graphic does not depict the United States' 0.12 Quad net electricity imports. Totals may not equal sum due to independent rounding.  
Data: Lawrence Livermore National Laboratory, Energy Information Administration

### ENERGY GENERATION



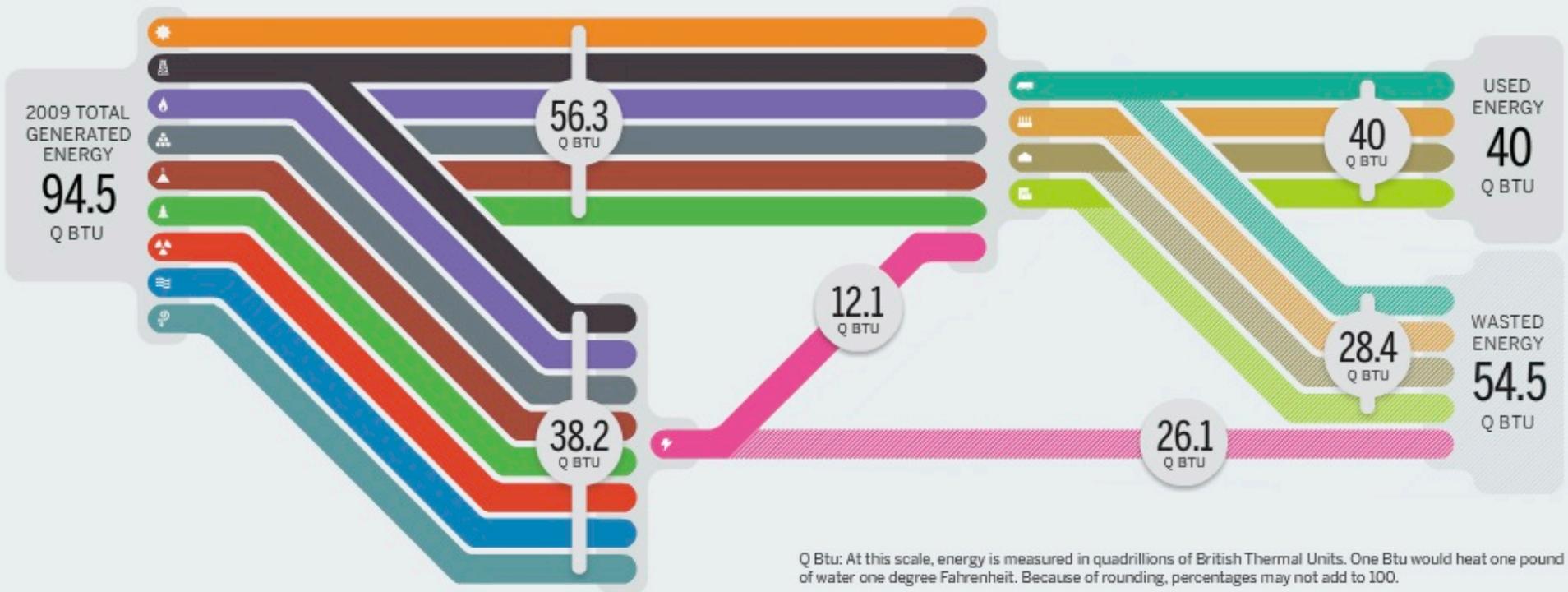
### ENERGY CONSUMPTION



# THE AMERICAN ENERGY SPECTRUM

SOURCE: Lawrence Livermore National Laboratory. A collaboration between GOOD and Hyperakt.

To fully understand the energy issue, we have to understand where America gets its energy, and how it uses it. When you see the full picture, the problems (we waste a lot of energy) and the potential solutions (we have just barely cracked into renewable energy) become more clear. Here, from solar to coal, is how much of our energy comes from each potential source, and where those sources go.



Q Btu: At this scale, energy is measured in quadrillions of British Thermal Units. One Btu would heat one pound of water one degree Fahrenheit. Because of rounding, percentages may not add to 100.

THE FUTURE OF ENERGY  
BY THE NUMBERS

TOTAL SUPPLY

The U.S. consumed 94.6 quadrillion BTUs of energy in 2007, more than any other nation. It also produced more energy than any nation but China, some 73 quadrillion BTUs.



\*All amounts are in quads, one quad is equal to one quadrillion BTUs (the amount of energy in eight billion gallons of gasoline).

ENERGY PRODUCTION AND CONSUMPTION WORLDWIDE



**PETROLEUM**  
Provides more power than any other source, nearly all of it for transportation.

**NATURAL GAS**  
Produces a quarter less carbon as oil for the same amount of energy output.

HOW POWER HAPPENS

Where does U.S. energy come from? Where does it go?

**COAL** The largest domestic source of energy, it's mostly used to produce electricity.

**NUCLEAR** It generates about 70 percent of the emissions-free electricity in the U.S.

**RENEWABLES** As farmed, it was the largest energy source 100 years ago. Now it's back at 10th.

**HYDROELECTRIC** Forget dams: U.S. rivers, tides and currents could power 47 million homes.

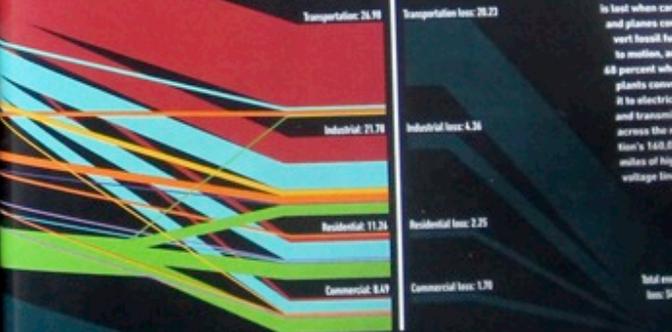
**WIND** The U.S. consumes 24 times as much wind power as it did just 20 years ago.

**GEOTHERMAL** The six-mile layer of land beneath the U.S. contains about 34 million quads.

**SOLAR** California produces nearly 70 percent of all the solar power consumed in the U.S.

TOTAL DEMAND

Those 94.6 quads break down into 300 million BTUs per capita—the equivalent of about 50 barrels of oil for every American.



HEAT LOSS

Transforming and moving energy is an inefficient process. About 75 percent is lost when cars and planes convert fossil fuel to motion, and 48 percent when plants convert it to electricity and transmit it across the nation's 140,000 miles of high-voltage lines.

POWER PLANTS

Fossil fuels (mostly coal) generate nearly 70 percent of the electricity we use. The rest comes from nuclear power (20 percent) and renewable resources (10 percent).

RESIDENTIAL PETROLEUM CONSUMPTION

Petroleum is used in every region, mostly for transportation. But the older housing stock that predominates the Northeast also uses considerable fuel all for home heating.

RESIDENTIAL NATURAL GAS CONSUMPTION

Most domestic natural gas is produced in Wyoming. But one of the biggest consumers in California, in part because environmental regulations there make gas more attractive.

RESIDENTIAL ELECTRICITY CONSUMPTION

New homes built with electric heat and central air conditioning, as in fast-growing California and throughout Texas and Florida, tend to draw for more electricity.

Sources: U.S. Energy Information Administration (August 2010), Lawrence Livermore National Laboratory, "North American Global Energy Status," Proceedings of the 7th European Energy and Total Energy Conference, March 2007, Roger Bechtold et al.

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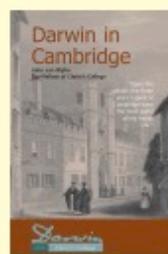
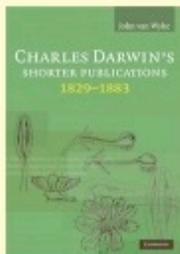
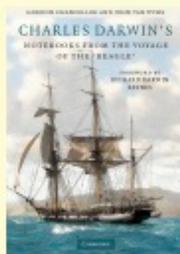
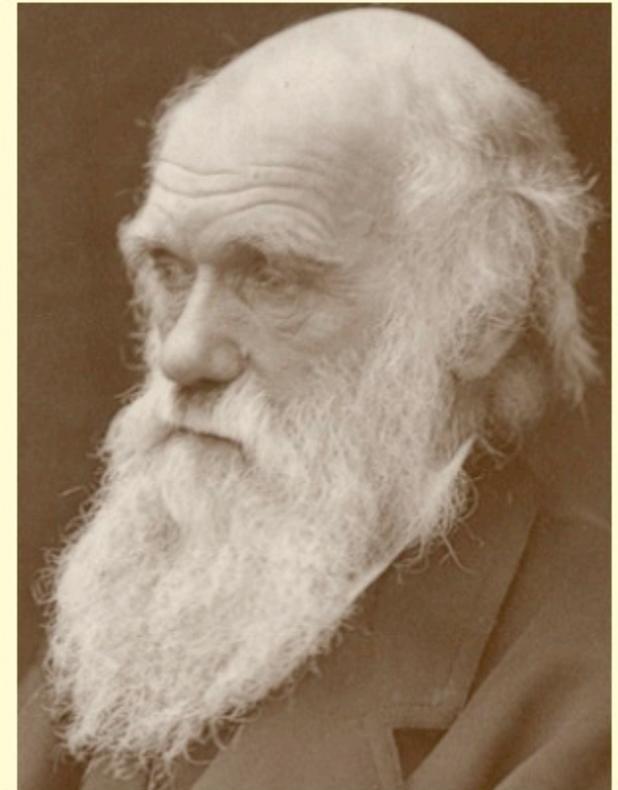
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## ON THE ORIGIN OF SPECIES.

### INTRODUCTION.

WHEN on board H.M.S. 'Beagle,' as naturalist, I was much struck with certain facts in the distribution of the inhabitants of South America, and in the geological relations of the present to the past inhabitants of that continent. These facts seemed to me to throw some light on the origin of species—that mystery of mysteries, as it has been called by one of our greatest philosophers. On my return home, it occurred to me, in 1837, that something might perhaps be made out on this question by patiently accumulating and reflecting on all sorts of facts which could possibly have any bearing on it. After five years' work I allowed myself to speculate on the subject, and drew up some short notes; these I enlarged in 1844 into a [sketch](#) of the conclusions, which then seemed to me probable: from that period to the present day I have steadily pursued the same object. I hope that I may be excused for entering on these personal details, as I give them to show that I have not been hasty in coming to a decision.

My work is now nearly finished; but as it will

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On the other hand, I do believe that natural selection always acts very slowly, **often only** generally at **only** long intervals of time, and generally on only a very few of the inhabitants of the same region at the same time. I further believe, that this slow, intermittent action of natural selection accords perfectly **well** with what geology tells us of the rate and manner at which the inhabitants of the world have changed.

Slow though the process of selection may be, if feeble man can do much by his powers of artificial selection, I can see no limit to the amount of change, to the beauty and infinite complexity of the coadaptations between all organic beings, one with another and with their physical conditions of life, which may be effected in the long course of time by nature's power of selection.

Extinction caused by Natural Selection.—This subject will be more fully discussed in our chapter on Geology; but it must be here alluded to from being intimately connected with natural selection.

Natural selection acts solely through the preservation of variations in some way advantageous, which consequently endure. From the high geometrical ratio of increase of all organic beings, each area is already stocked with the full number of its existing inhabitants, and as most areas are already stocked with a great diversity of forms, it follows that, as each selected and favoured form increases in number, so generally will the less favoured forms decrease and become rare. Rarity, as geology tells us, is the precursor to extinction. We can, also, see that any form represented by few individuals will, during fluctuations in the seasons or in the number of its enemies, run a good chance of utter extinction. But we may go further than this; for as new forms are continually and slowly being produced, unless we believe that the number of specific forms goes on perpetually and almost indefinitely increasing, **numbers many** inevitably must become extinct. That the number of specific forms has not indefinitely increased, geology tells us plainly; and we shall presently attempt to show why it is that the number of species throughout the world has not become immeasurably great.

We have seen that the species which are most numerous in individuals have the best chance of producing within any given period favourable variations. We have evidence of this, in the facts stated in the second chapter, showing that it is the common species which offer the

better adapted to the then existing conditions, may not soon occur. **and variation itself is apparently always a slow process.** The **process results** will often be greatly retarded by free inter-crossing. Many will exclaim that these several causes are amply sufficient **wholly to stop neutralise the action power** of natural selection. I do not believe so. **On the other hand,** But I do believe that natural selection **always generally** acts very slowly **generally in effecting changes,** at **only** long intervals of time, and **generally on only on a very few** of the inhabitants of the same region. **at the same time.** I further believe that **this these** slow, intermittent **action results** of natural selection **accords accord** perfectly with what geology tells us of the rate and manner at which the inhabitants of the world have changed.

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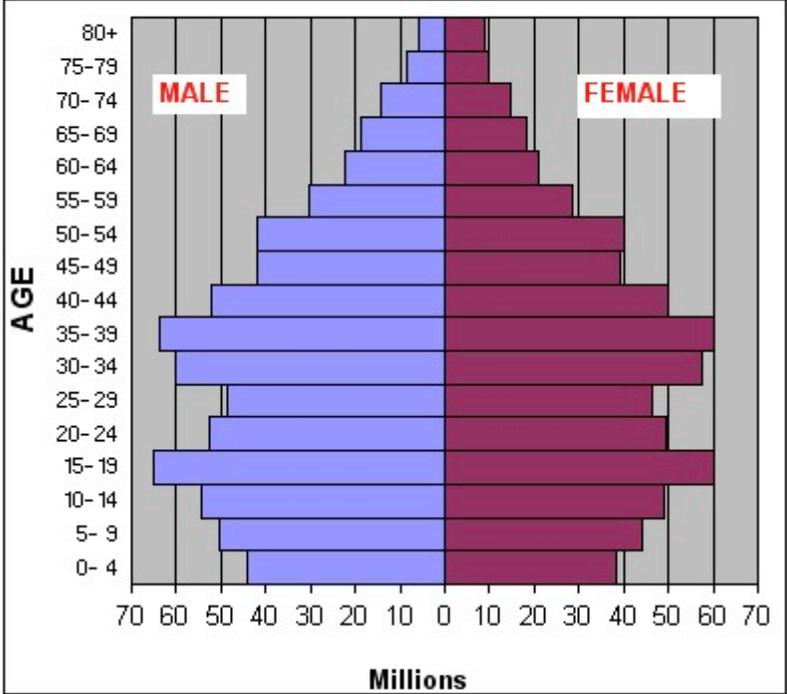


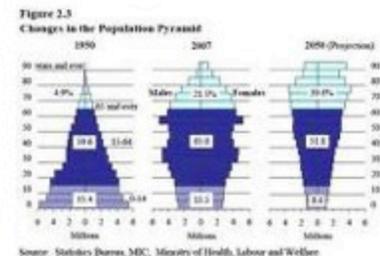
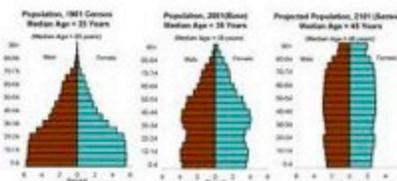
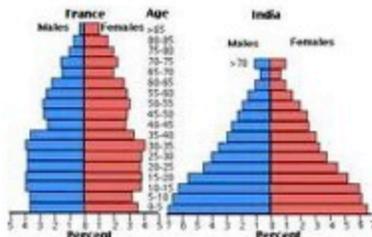
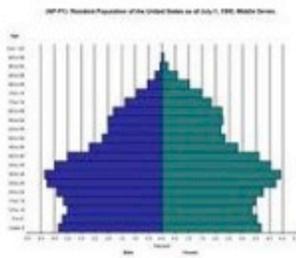
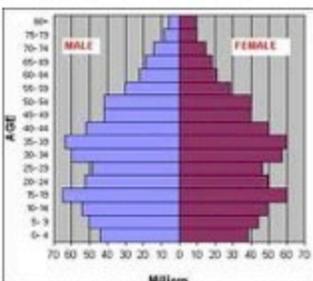
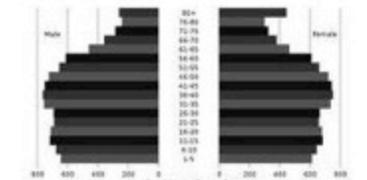
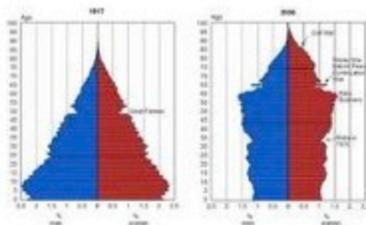
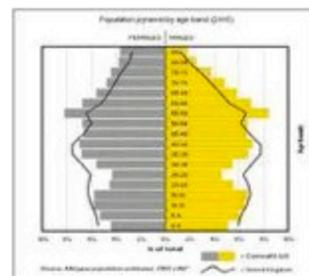
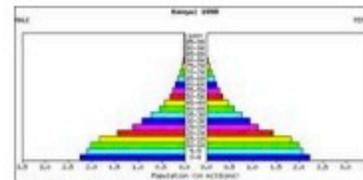
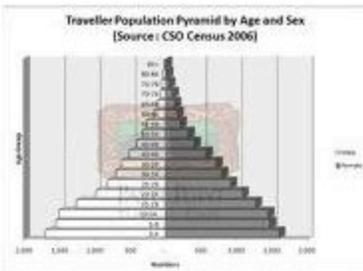
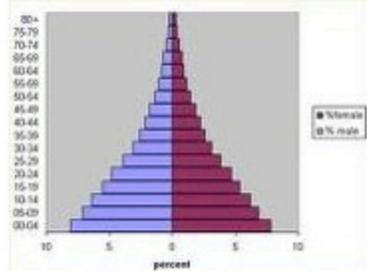
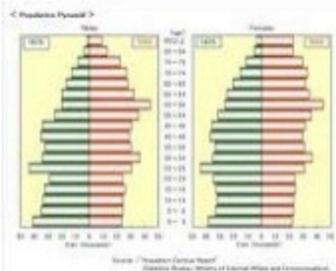
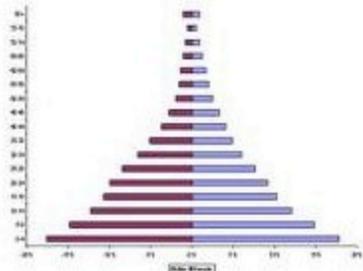
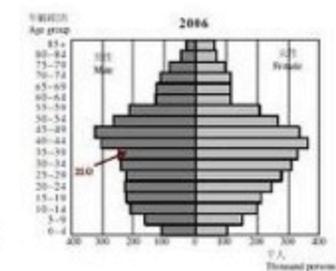
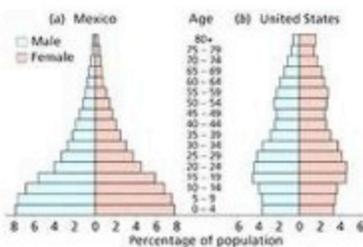
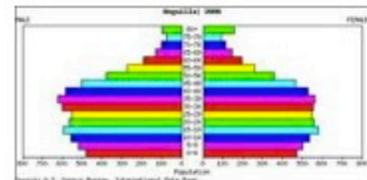
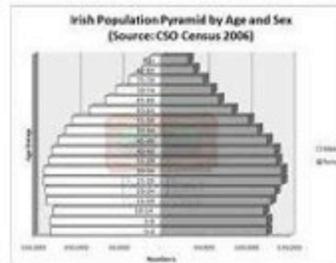
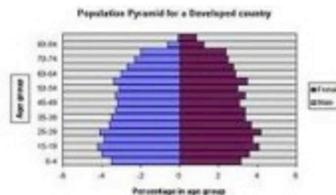
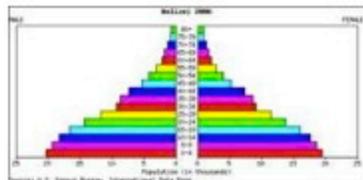
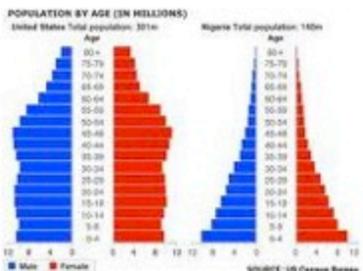
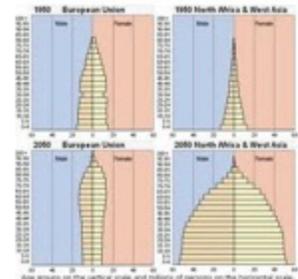
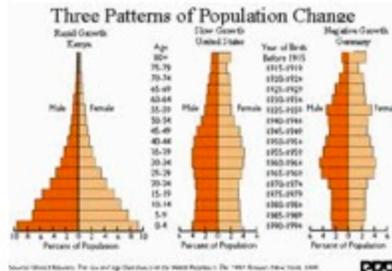
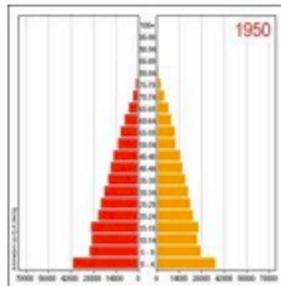
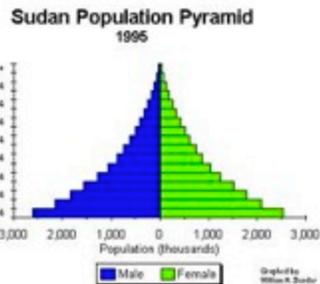
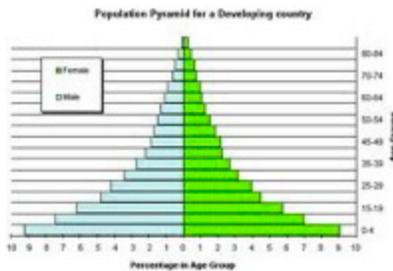
ON THE ORIGIN OF SPECIES *The Preservation of Favoured Races*

Reset Pause Slow Fast

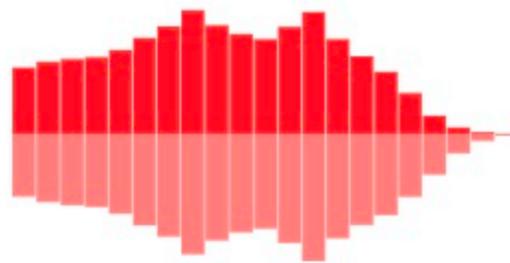


■ First Edition (1859) ■ Second Edition (1860) ■ Third Edition (1861) ■ Fourth Edition (1866) ■ Fifth Edition (1869) ■ Sixth Edition (1872)



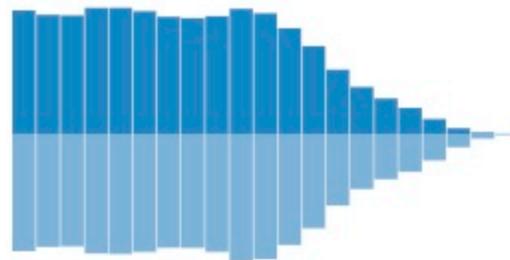


- France
- Germany
- Italy
-  **Japan**
- United Kingdom
- USA
- South Korea
- China



2010 Population: 127 million

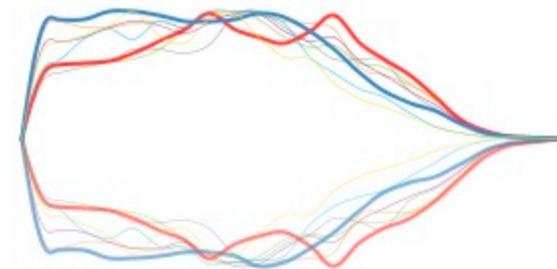
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- Germany
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- United Kingdom
-  **USA**
- South Korea
- China



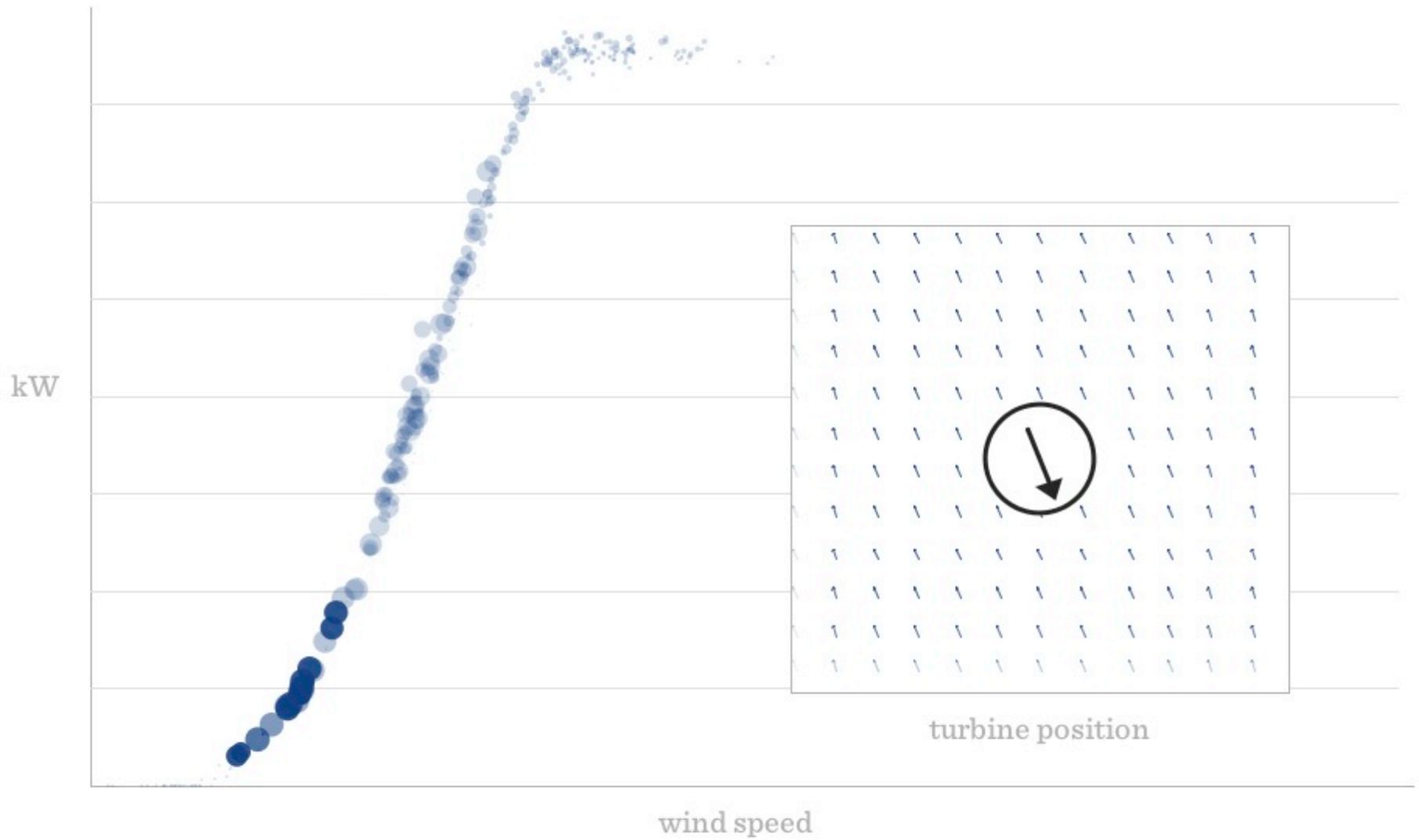
2010 Population: 318 million

### An Aging Population

This visualization depicts shifts in population by age group from eight industrialized nations. On the left, select two countries for comparison, or see all eight as a composite below. Use the slider at the bottom of the screen to cycle through population growth from 1950 to 2050.







January 26 at 7:50 AM





# Feedback from Feber.se

*“Det här måste vara det bästa som har hänt universum sedan vatten med köttsmak.”*

# Feedback from Feber.se

*“This must be the best thing to happen  
to the universe since meat flavored water.”*