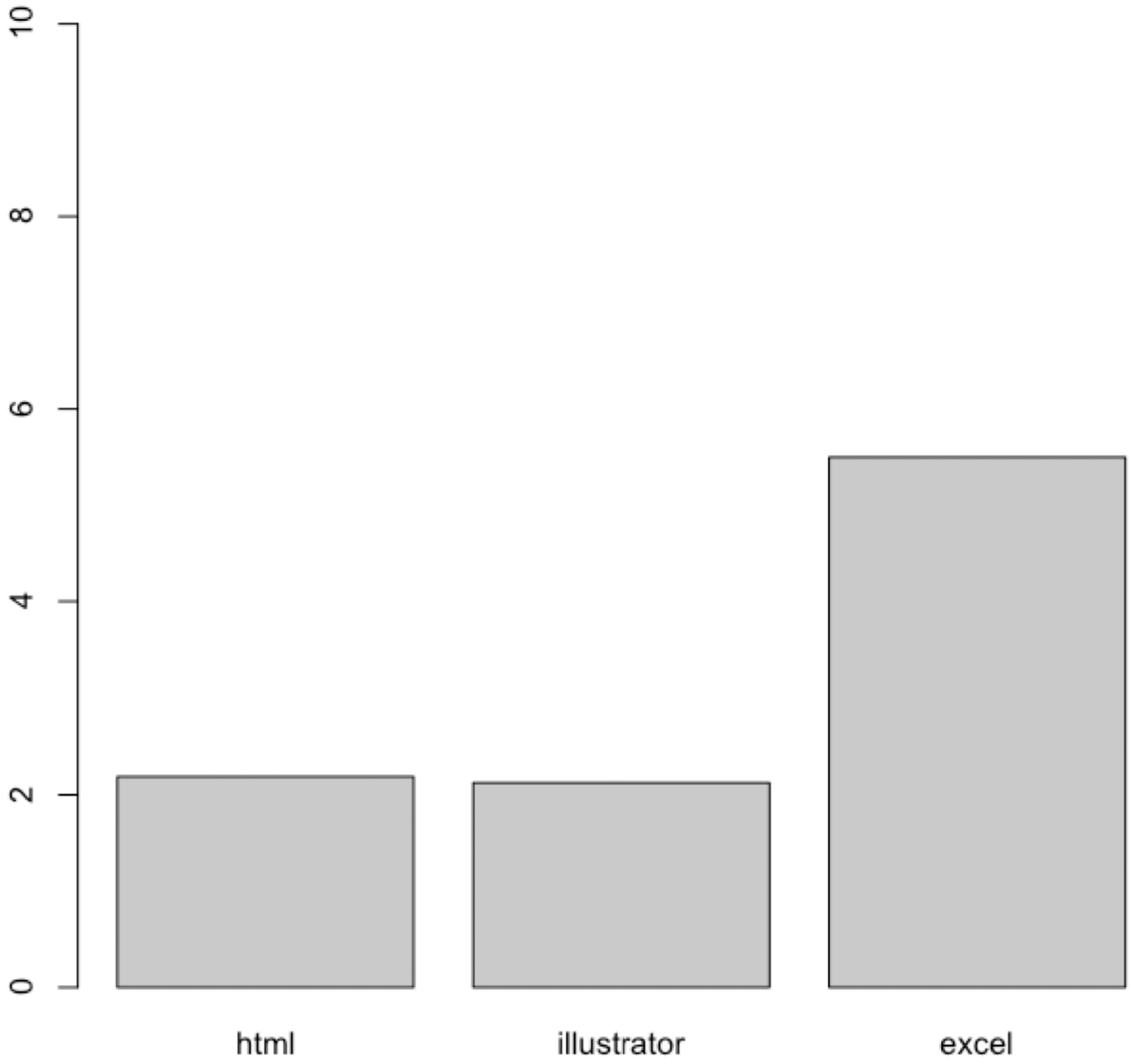
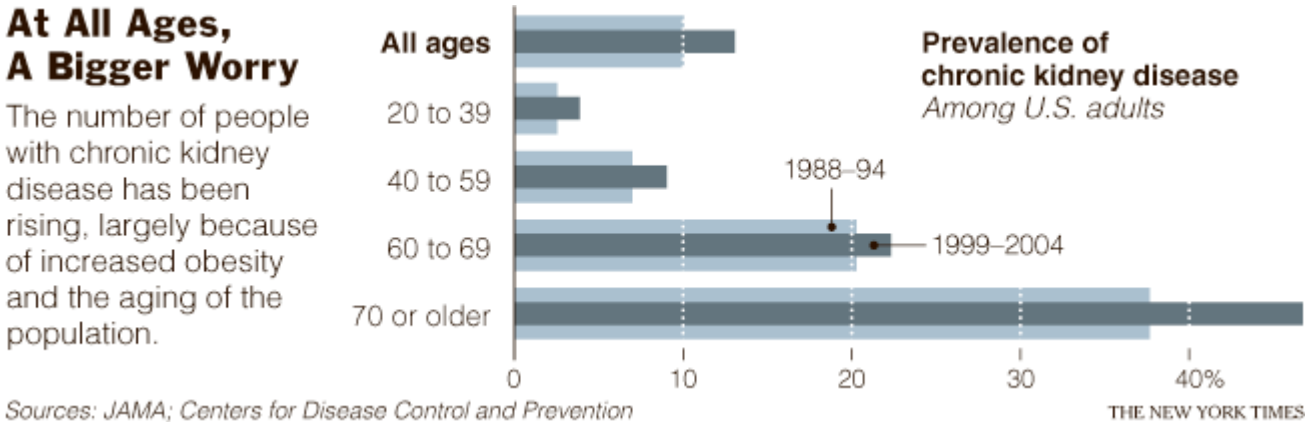
Bar Charts

- Workhorse
- Many variants
- Good for comparing a few items
- Good for revealing patterns in what are essentially tables
- Common mistakes involve:
  - Zero-basing
  - Thoughtful ordering of items

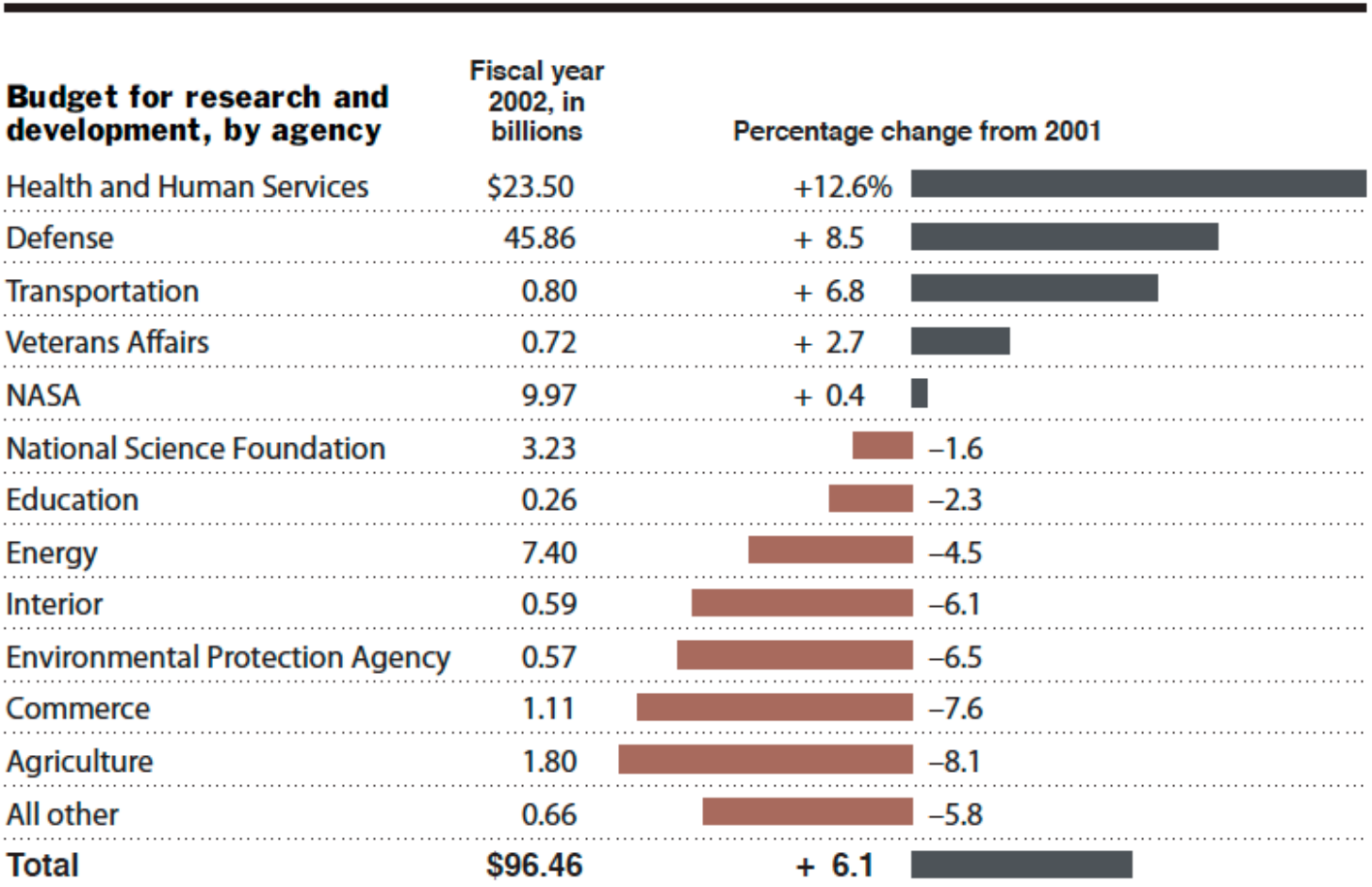
Bar Charts



Bar Charts


At All Ages, A Bigger Worry
The number of people with chronic kidney disease has been rising, largely because of increased obesity and the aging of the population.
All ages
20 to 39
40 to 59
60 to 69
70 or older
1988–94
1999–2004
Prevalence of chronic kidney disease
Among U.S. adults
0
10
20
30
40%
Sources: JAMA; Centers for Disease Control and Prevention
THE NEW YORK TIMES

Bar Charts

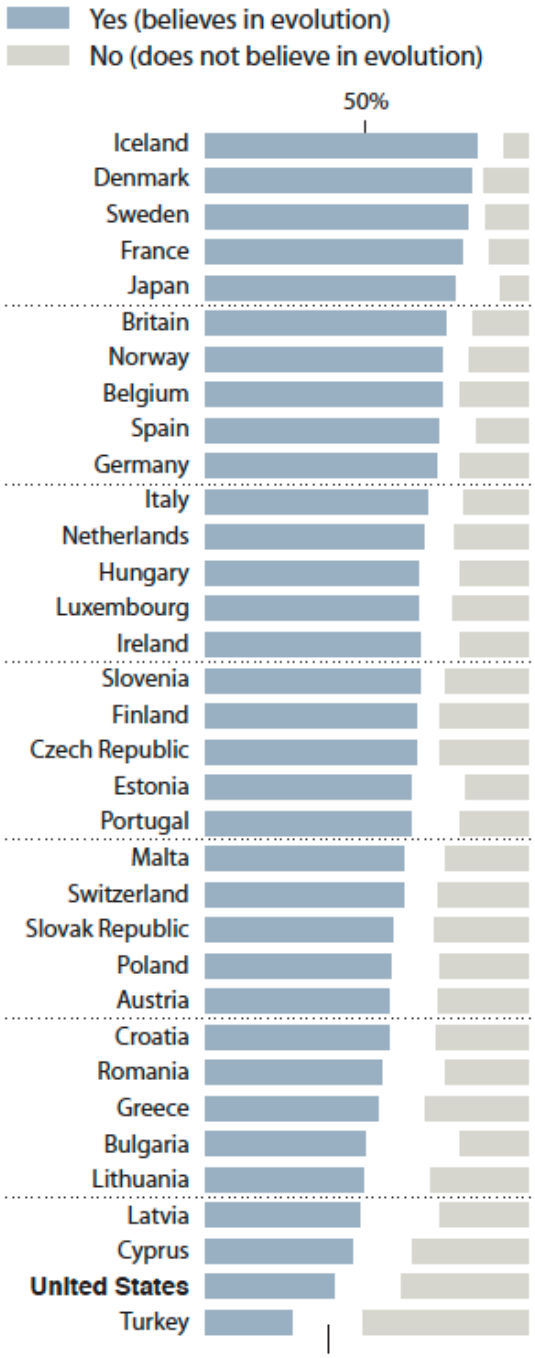


Budget for research and development, by agency	Fiscal year 2002, in billions	Percentage change from 2001
Health and Human Services	$23.50	+12.6%
Defense	45.86	+ 8.5
Transportation	0.80	+ 6.8
Veterans Affairs	0.72	+ 2.7
NASA	9.97	+ 0.4
National Science Foundation	3.23	–1.6
Education	0.26	–2.3
Energy	7.40	–4.5
Interior	0.59	–6.1
Environmental Protection Agency	0.57	–6.5
Commerce	1.11	–7.6
Agriculture	1.80	–8.1
All other	0.66	–5.8
Total	**$96.46**	**+ 6.1**

Source: American Association for the Advancement of Science

The New York Times

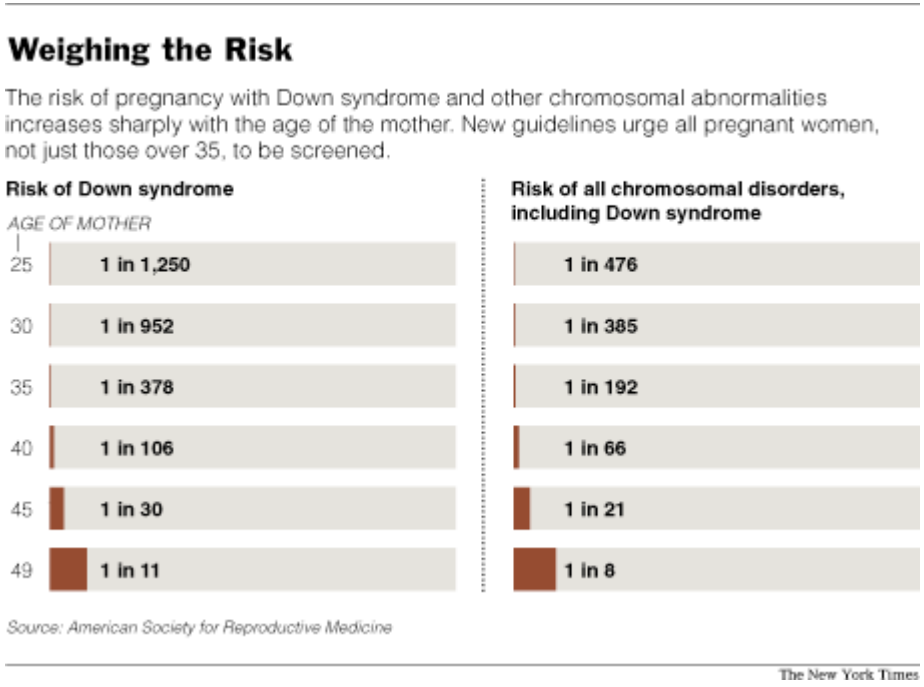
Did human beings, as we know them, develop from earlier species of animals?



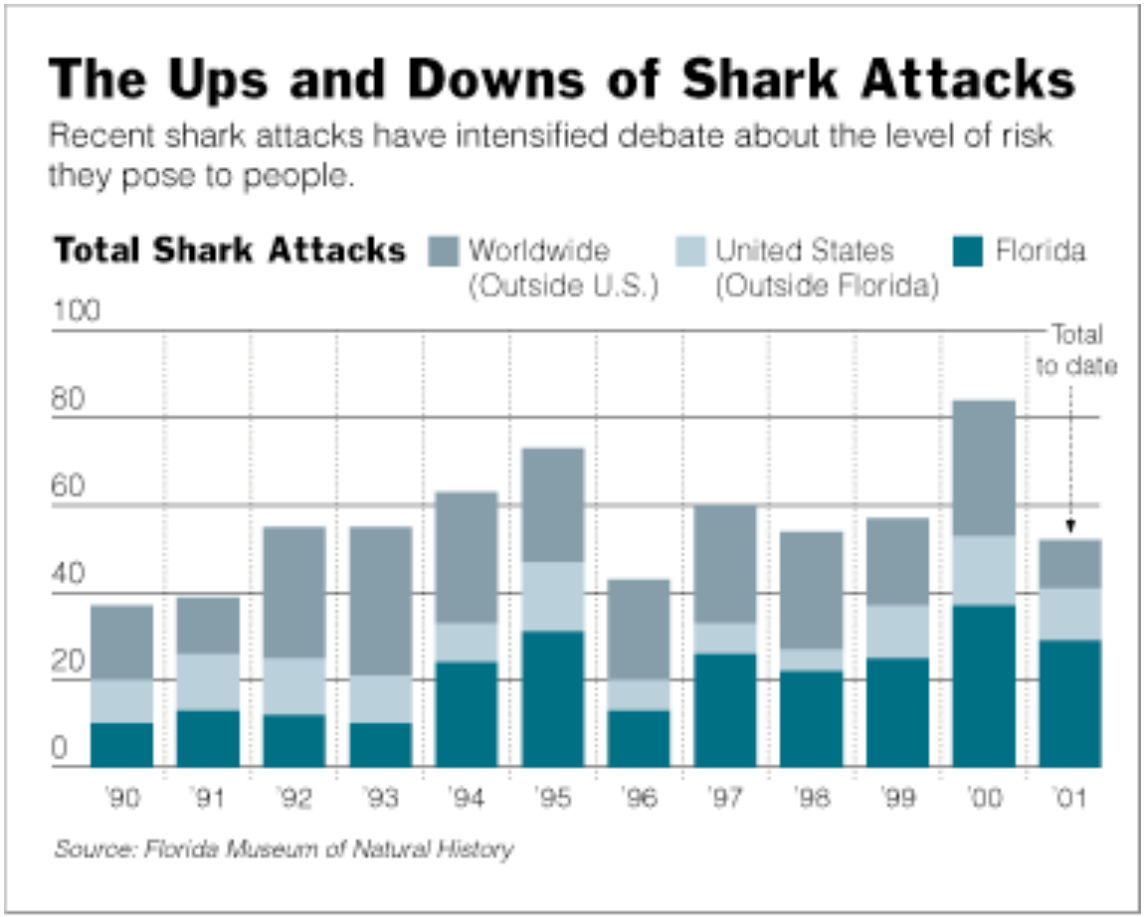
White areas represent an answer of not sure.

Source: Jon D. Miller, Michigan State University

Bar Charts


Weighing the Risk
The risk of pregnancy with Down syndrome and other chromosomal abnormalities increases sharply with the age of the mother. New guidelines urge all pregnant women, not just those over 35, to be screened.
Risk of Down syndrome
AGE OF MOTHER
25
1 in 1,250
30
1 in 952
35
1 in 378
40
1 in 106
45
1 in 30
49
1 in 11
Risk of all chromosomal disorders, including Down syndrome
1 in 476
1 in 385
1 in 192
1 in 66
1 in 21
1 in 8
Source: American Society for Reproductive Medicine
The New York Times

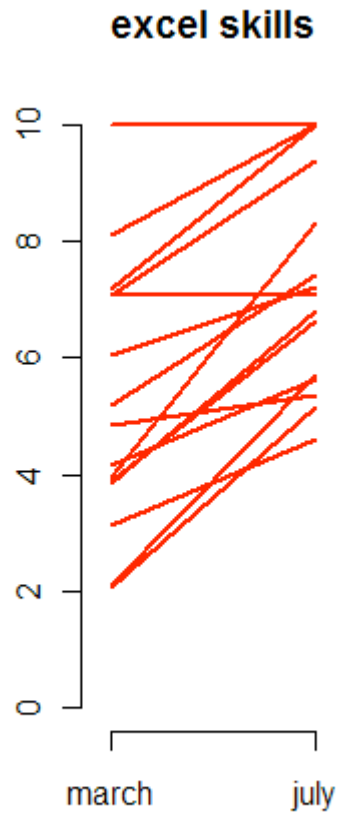
Bar Charts


The Ups and Downs of Shark Attacks
Recent shark attacks have intensified debate about the level of risk they pose to people.
Total Shark Attacks
Worldwide (Outside U.S.)
United States (Outside Florida)
Florida
100
80
60
40
20
0
Total to date
'90
'91
'92
'93
'94
'95
'96
'97
'98
'99
'00
'01
Source: Florida Museum of Natural History
The New York Times

Line Charts

- Workhorse
- Good for comparing over time
- Generally better than bar charts if you are trying to show more than two series.
- Common mistakes include:
  - Legends when they aren't necessary
  - Dual axes when they don't make sense
  - 3D

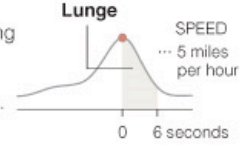
Line Charts



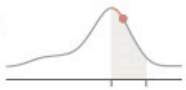
Lunge Feeding

Scientists tracking fin whales have created the first detailed model of how they feed. After gliding to depths of more than 600 feet in search of krill, a fin whale will repeatedly accelerate and open its mouth wide, engulfing about 20 pounds of krill and more than its own weight in water as it grinds to a halt.

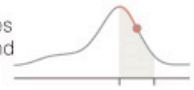
START OF LUNGE
After accelerating into a school of krill, the whale opens its mouth.



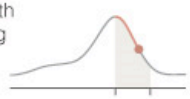
2 SECONDS
Grooves in the blubber between the lower jaws begin to expand.



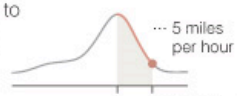
3 SECONDS
Now fully open, the mouth causes massive drag and deceleration.

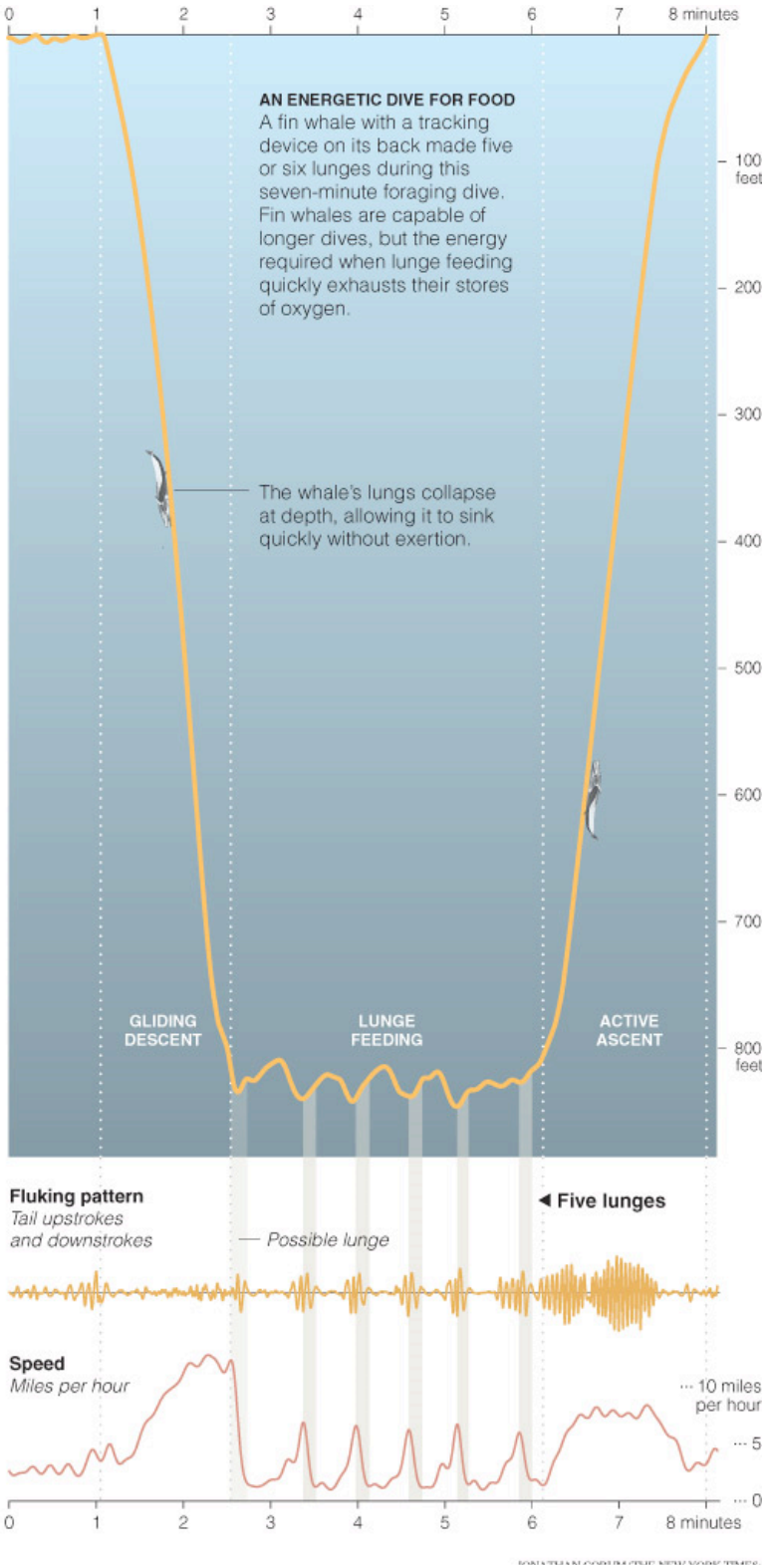


4 SECONDS
The closing mouth continues to drag as the whale pushes forward.



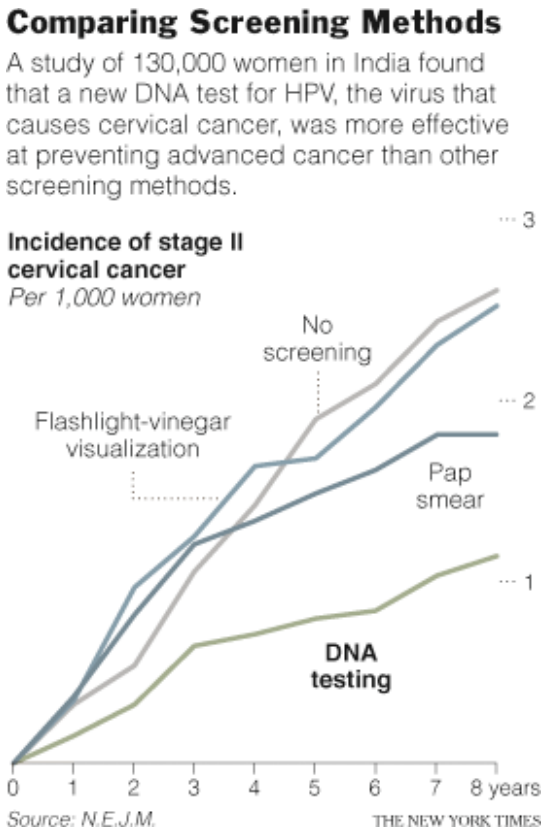
6 SECONDS
The whale starts to filter out the krill and prepare for another lunge.



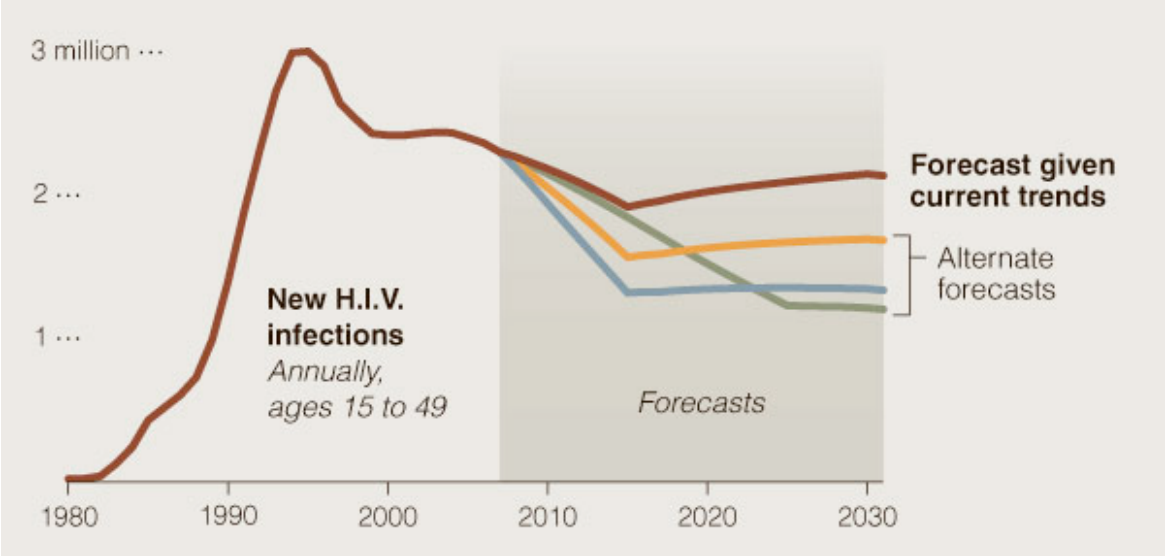


Sources: Jeremy A. Goldbogen; Nicholas D. Pyenson;

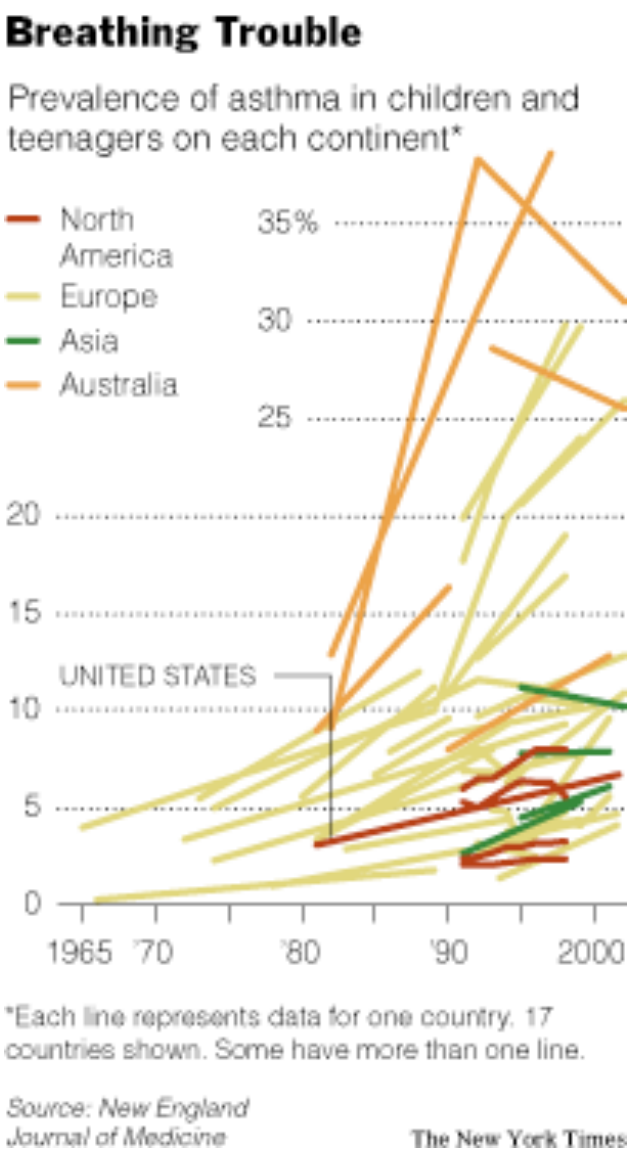
Line Charts


Comparing Screening Methods
A study of 130,000 women in India found that a new DNA test for HPV, the virus that causes cervical cancer, was more effective at preventing advanced cancer than other screening methods.
Incidence of stage II cervical cancer
Per 1,000 women
3
2
1
No screening
Flashlight-vinegar visualization
Pap smear
DNA testing
0 1 2 3 4 5 6 7 8 years
Source: N.E.J.M.
THE NEW YORK TIMES

Line Charts


3 million
2
1
New H.I.V. infections
Annually, ages 15 to 49
Forecasts
Forecast given current trends
Alternate forecasts
1980
1990
2000
2010
2020
2030

Line Charts

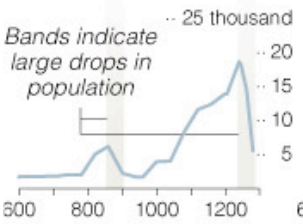

Breathing Trouble
Prevalence of asthma in children and teenagers on each continent*
North America
Europe
Asia
Australia
35%
30
25
20
15
UNITED STATES
10
5
0
1965
'70
'80
'90
2000
*Each line represents data for one country. 17 countries shown. Some have more than one line.
Source: New England Journal of Medicine
The New York Times

Piecing Together an Ancient Migration

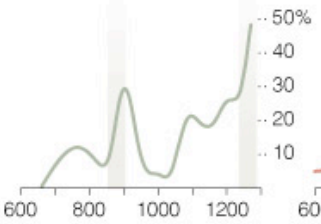
The Village Ecodynamics Project is a detailed study of a large tract of land near Mesa Verde. Using new research and computer simulations, the project points to a combination of causes for the mass migrations of Anasazi in the late 13th century, including climate, population growth, societal changes, warfare and crop failure.

POPULATION CYCLES The study area shows evidence of two major cycles of population growth and decline. Both cycles appear linked to an increase in the percentage of people living in villages, and an increase in violence and conflict.

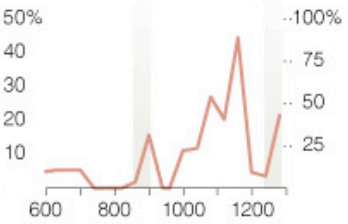
Estimated population



Percentage in villages

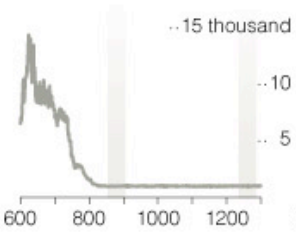


Incidence of warfare

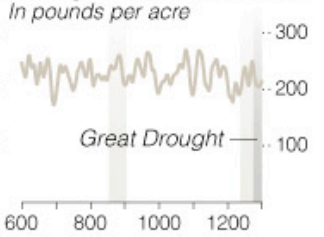


FOOD RESOURCES
With wild deer largely depleted by 1100, the Anasazi had to rely on corn-fed domesticated turkeys for protein, making the population even more dependent on the corn harvest.

Number of deer



Average potential corn yield
In pounds per acre



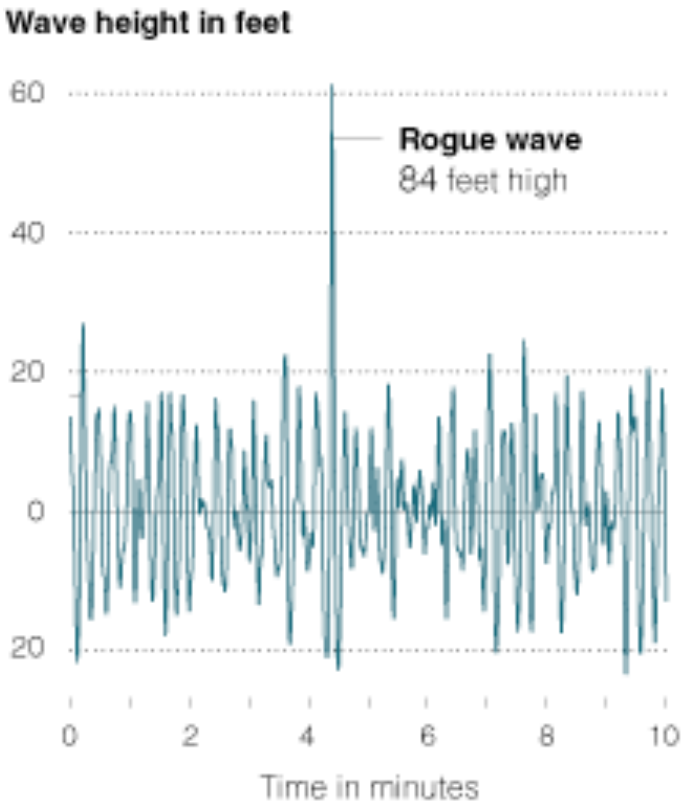
Sources: Timothy A. Kohler, Washington State University; "Themes in Southwest Prehistory," edited by George J. Gumerman

THE NEW YORK TIMES

Line Charts

A Real Phenomenon

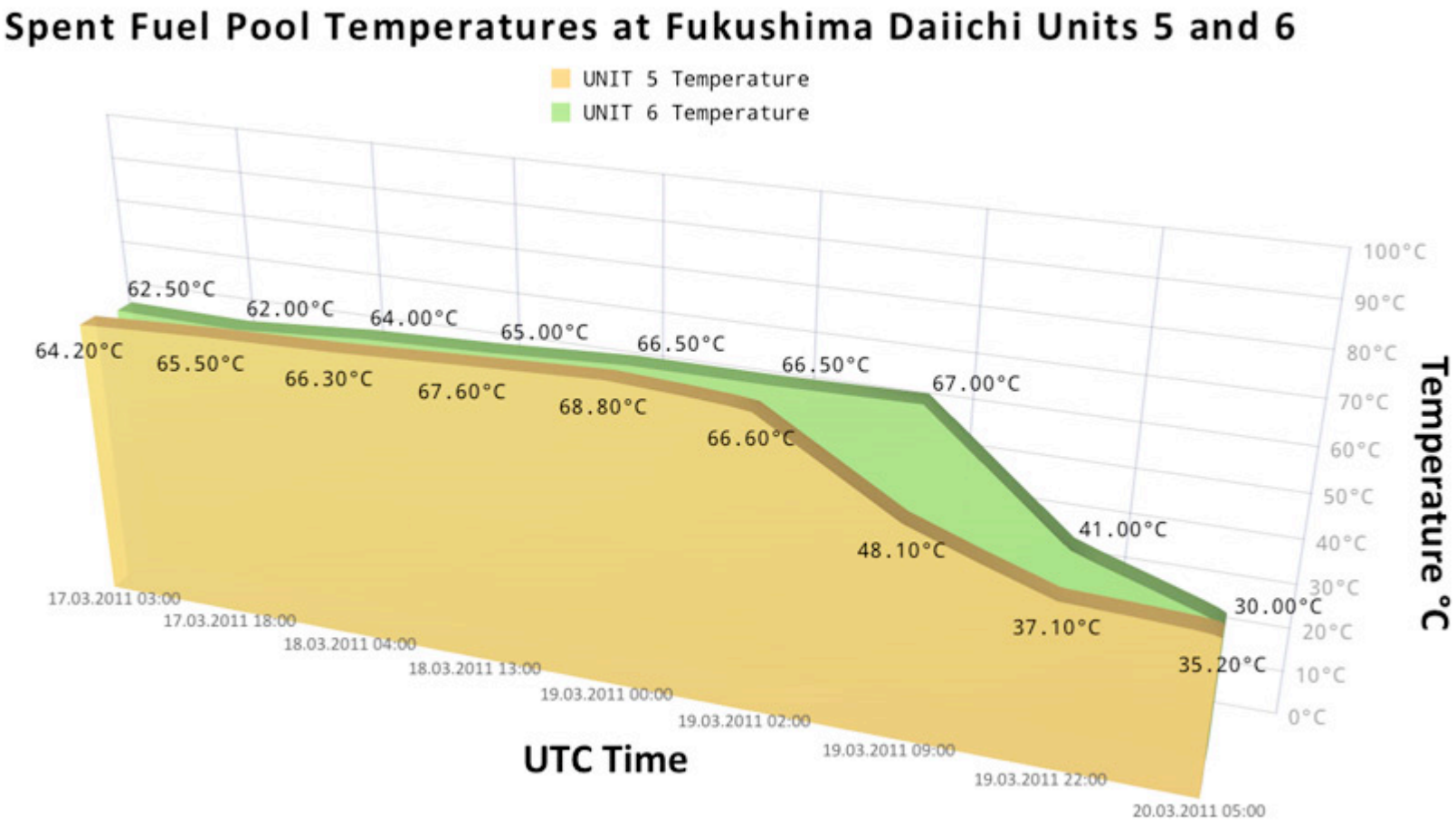
On Jan. 1, 1995, a 84-foot wave hit the Draupner oil platform in the North Sea off Norway. The Draupner wave is the first measured and confirmed rogue wave.



Source: Norwegian Meteorological Institute

The New York Times

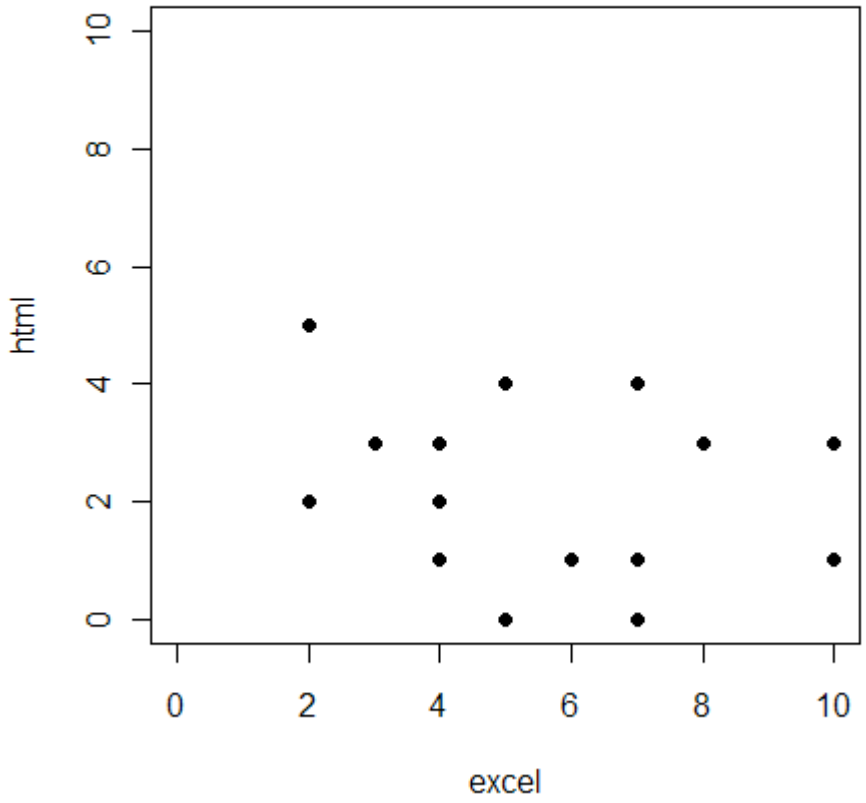
Line Charts


Spent Fuel Pool Temperatures at Fukushima Daiichi Units 5 and 6
UNIT 5 Temperature
UNIT 6 Temperature
64.20°C
65.50°C
66.30°C
67.60°C
68.80°C
66.60°C
48.10°C
37.10°C
35.20°C
62.50°C
62.00°C
64.00°C
65.00°C
66.50°C
66.50°C
67.00°C
41.00°C
30.00°C
17.03.2011 03:00
17.03.2011 18:00
18.03.2011 04:00
18.03.2011 13:00
19.03.2011 00:00
19.03.2011 02:00
19.03.2011 09:00
19.03.2011 22:00
20.03.2011 05:00
UTC Time
100°C
90°C
80°C
70°C
60°C
50°C
40°C
30°C
20°C
10°C
0°C
Temperature °C

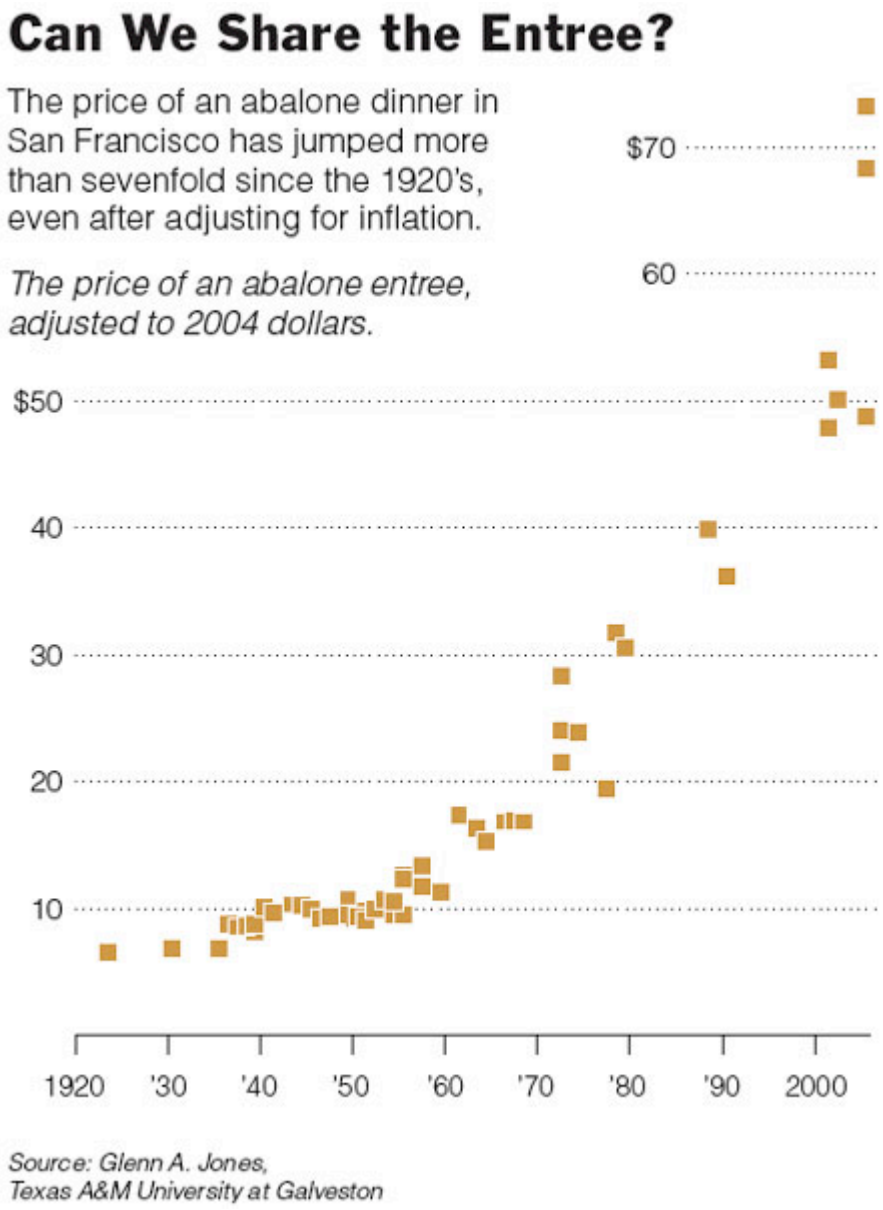
Scatterplots

- Best for showing relationships
- Great for showing individual data points
- Common mistakes include:
  - Drawing dubious conclusions
  - Forgetting to show some kind of trend line, even when there's an obvious one to show

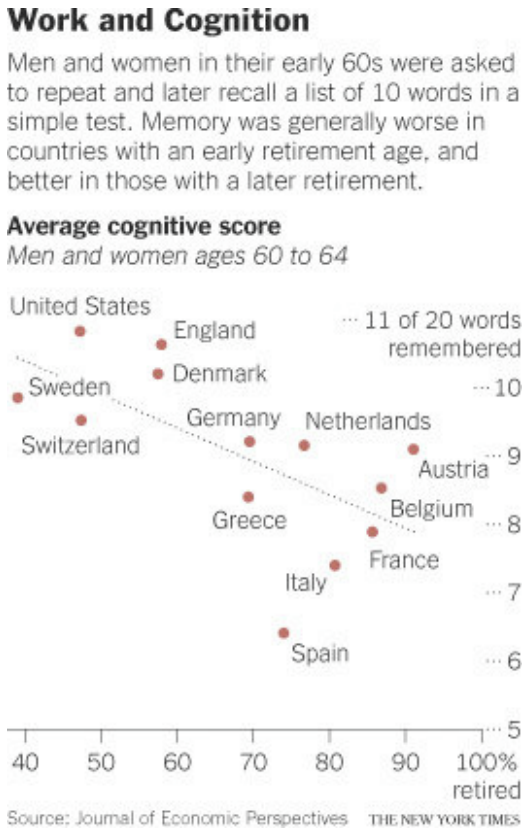
Scatterplots



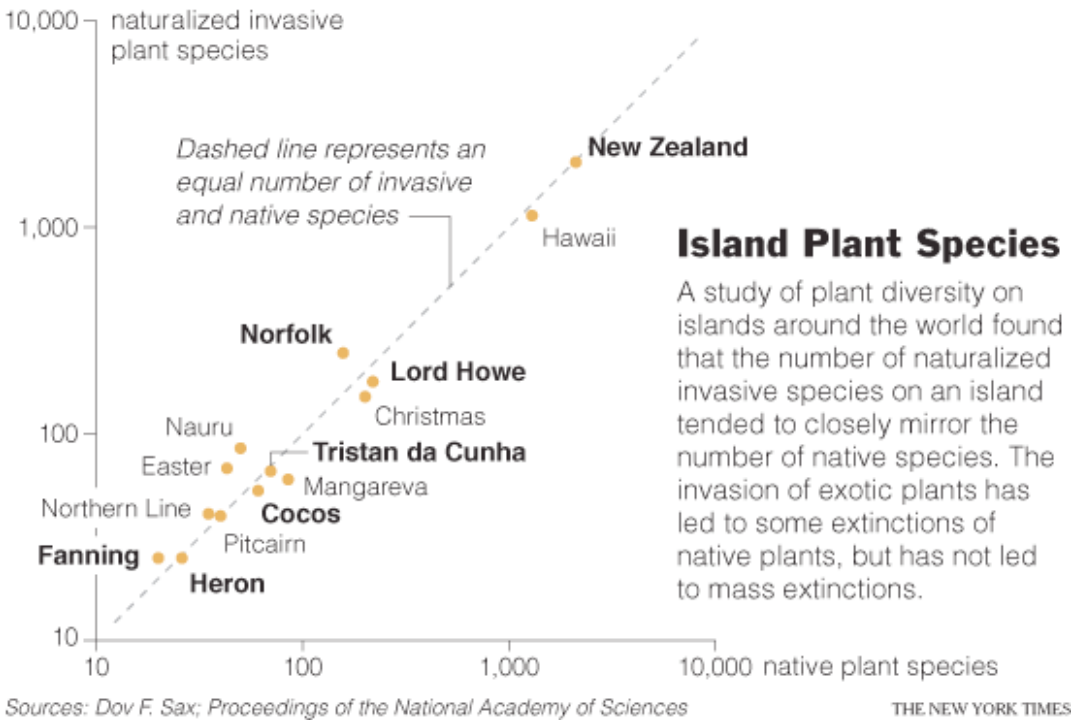
Scatterplots



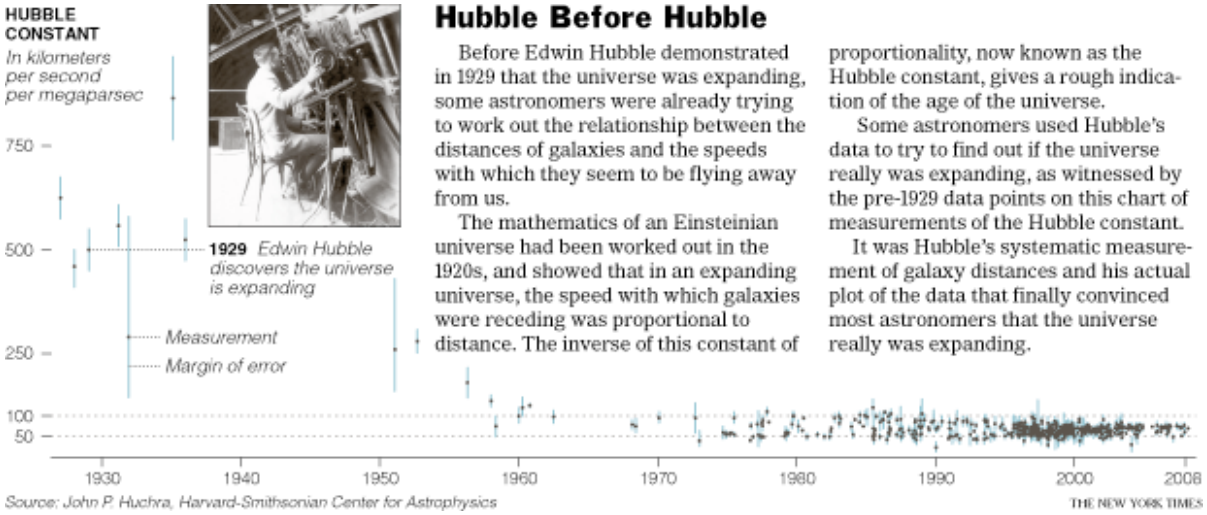
Scatterplots



Scatterplots



Scatterplots



Hubble Before Hubble

Before Edwin Hubble demonstrated in 1929 that the universe was expanding, some astronomers were already trying to work out the relationship between the distances of galaxies and the speeds with which they seem to be flying away from us.

The mathematics of an Einsteinian universe had been worked out in the 1920s, and showed that in an expanding universe, the speed with which galaxies were receding was proportional to distance. The inverse of this constant of proportionality, now known as the Hubble constant, gives a rough indication of the age of the universe.

Some astronomers used Hubble's data to try to find out if the universe really was expanding, as witnessed by the pre-1929 data points on this chart of measurements of the Hubble constant.

It was Hubble's systematic measurement of galaxy distances and his actual plot of the data that finally convinced most astronomers that the universe really was expanding.

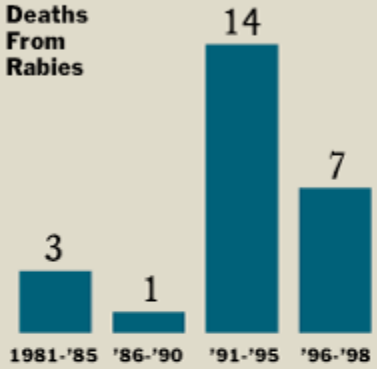
Scatterplots

Pie/waffle

- Good for showing composition
- Common mistakes include:
  - Putting too many pieces in a pie chart
  - Being gratuitous
  - Overly complex legends
  - Unthoughtful colors

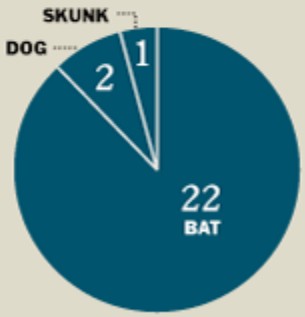
Rabies, Rare But Deadly

Cases of rabies in the United States increased in the 1990's over the 1980's.



Animal Transmission of the Disease

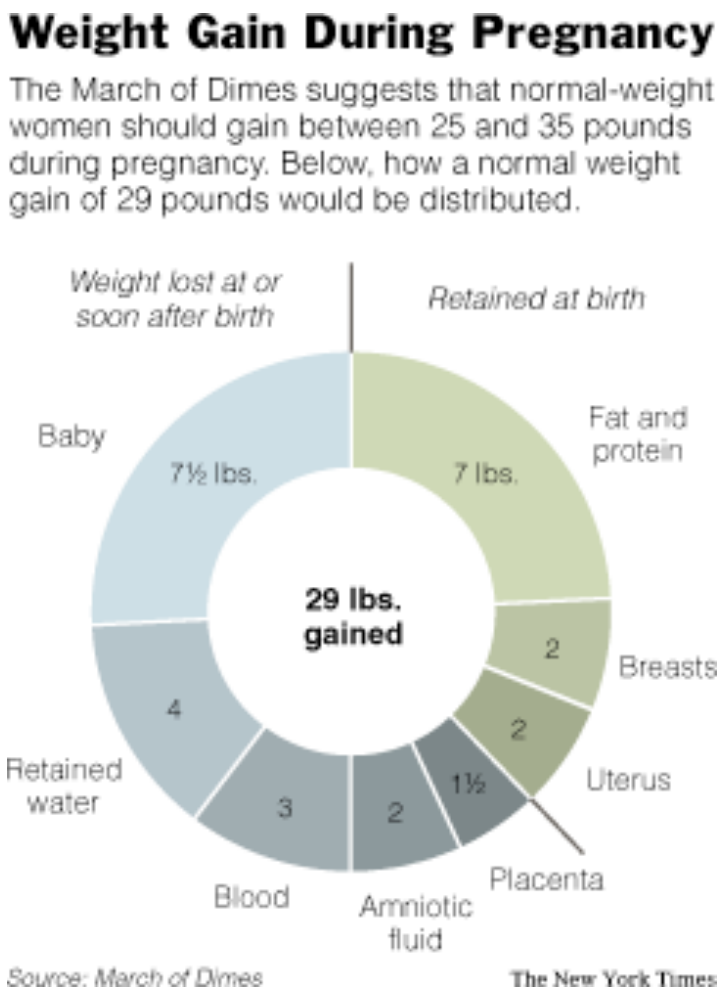
The 25 cases of rabies since 1981 have been the result of contact with the following animals:



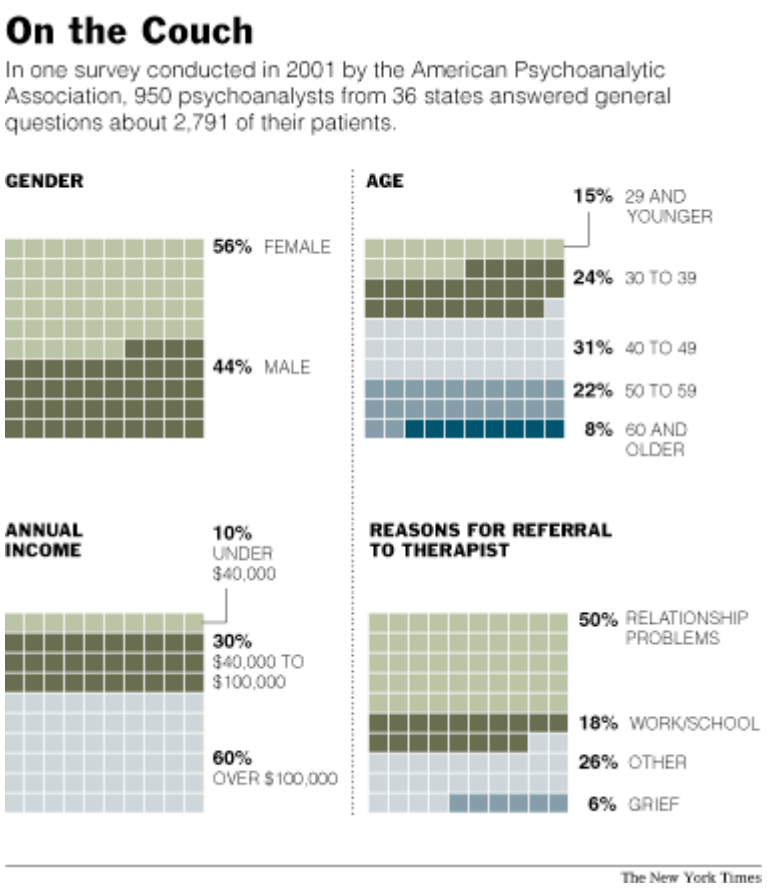
Sources: "Re-emergence of Rabies" from the Infections in Medicine Journal; Centers for Disease Control and Prevention

The New York Times

Pie/waffle


Weight Gain During Pregnancy
The March of Dimes suggests that normal-weight women should gain between 25 and 35 pounds during pregnancy. Below, how a normal weight gain of 29 pounds would be distributed.
Weight lost at or soon after birth
Retained at birth
Baby
7½ lbs.
7 lbs.
Fat and protein
29 lbs. gained
2
Breasts
2
Uterus
1½
Placenta
4
Retained water
3
Blood
2
Amniotic fluid
Source: March of Dimes
The New York Times

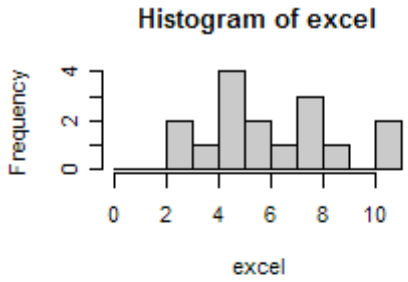
Pie/waffle

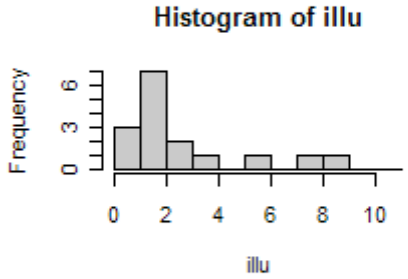

On the Couch
In one survey conducted in 2001 by the American Psychoanalytic Association, 950 psychoanalysts from 36 states answered general questions about 2,791 of their patients.
GENDER
56% FEMALE
44% MALE
AGE
15% 29 AND YOUNGER
24% 30 TO 39
31% 40 TO 49
22% 50 TO 59
8% 60 AND OLDER
ANNUAL INCOME
10% UNDER $40,000
30% $40,000 TO $100,000
60% OVER $100,000
REASONS FOR REFERRAL TO THERAPIST
50% RELATIONSHIP PROBLEMS
18% WORK/SCHOOL
26% OTHER
6% GRIEF
The New York Times

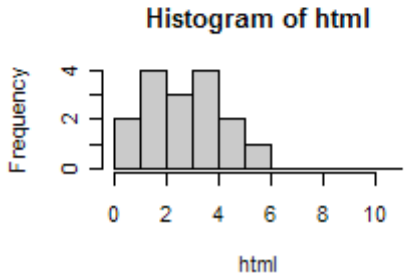
Histograms

- Good for showing distributions / variability.
- Common mistakes include:
  - Using icons that are more noisy than illuminating
  - Perhaps thinking people understand them immediately?

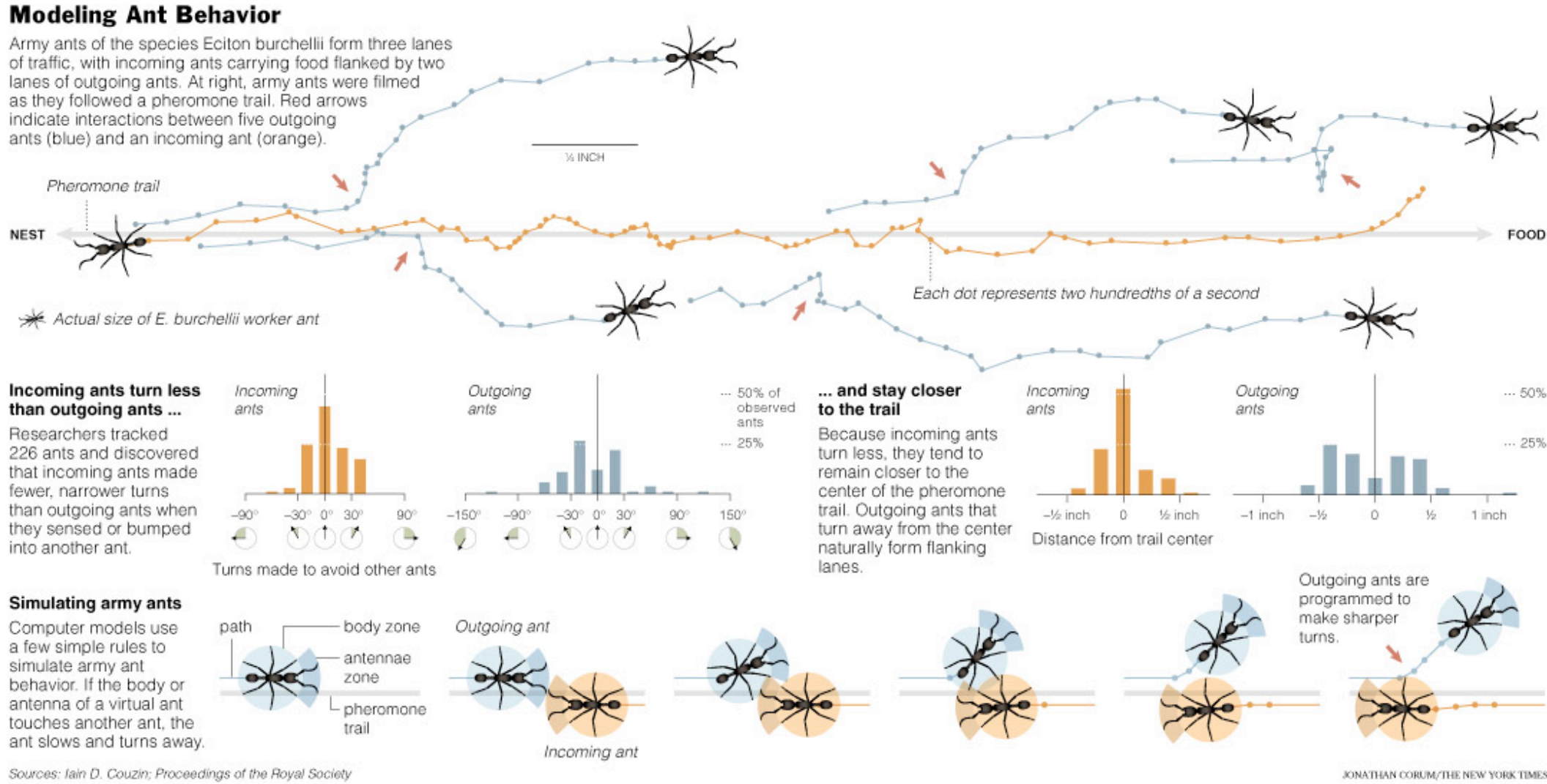
Histograms


Histogram of excel
Frequency
0
2
4
0
2
4
6
8
10
excel

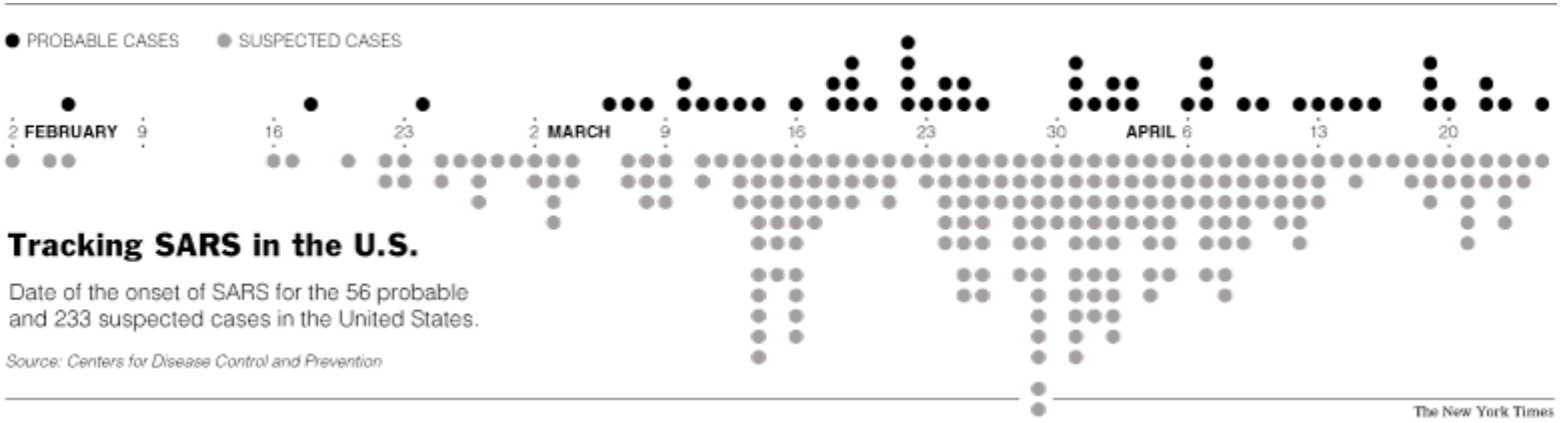

Histogram of illu
Frequency
0
3
6
0
2
4
6
8
10
illu


Histogram of html
Frequency
0
2
4
0
2
4
6
8
10
html

Histograms


Modeling Ant Behavior
Army ants of the species Eciton burchellii form three lanes of traffic, with incoming ants carrying food flanked by two lanes of outgoing ants. At right, army ants were filmed as they followed a pheromone trail. Red arrows indicate interactions between five outgoing ants (blue) and an incoming ant (orange).
¼ INCH
Pheromone trail
NEST
FOOD
Each dot represents two hundredths of a second
Actual size of E. burchellii worker ant
Incoming ants turn less than outgoing ants ...
Researchers tracked 226 ants and discovered that incoming ants made fewer, narrower turns than outgoing ants when they sensed or bumped into another ant.
Incoming ants
Outgoing ants
50% of observed ants
25%
–90° –30° 0° 30° 90°
–150° –90° –30° 0° 30° 90° 150°
Turns made to avoid other ants
... and stay closer to the trail
Because incoming ants turn less, they tend to remain closer to the center of the pheromone trail. Outgoing ants that turn away from the center naturally form flanking lanes.
Incoming ants
Outgoing ants
50%
25%
–½ inch 0 ½ inch
–1 inch –½ 0 ½ 1 inch
Distance from trail center
Simulating army ants
Computer models use a few simple rules to simulate army ant behavior. If the body or antenna of a virtual ant touches another ant, the ant slows and turns away.
path
body zone
antennae zone
pheromone trail
Outgoing ant
Incoming ant
Outgoing ants are programmed to make sharper turns.
Sources: Iain D. Couzin; Proceedings of the Royal Society
JONATHAN CORUM/THE NEW YORK TIMES

Histograms


PROBABLE CASES
SUSPECTED CASES
2 FEBRUARY 9 16 23 2 MARCH 9 16 23 30 APRIL 6 13 20
Tracking SARS in the U.S.
Date of the onset of SARS for the 56 probable and 233 suspected cases in the United States.
Source: Centers for Disease Control and Prevention
The New York Times

Other: Tables

Running the Numbers

These tables, developed by the economist Dr. Ray C. Fair, allow runners to continue racing against themselves even as they age and slow down. Using the fastest marathon times ever run by people of a given age, Mr. Fair calculated an "age factor" for every age after 35, which is the last time many people are able to set a personal best.

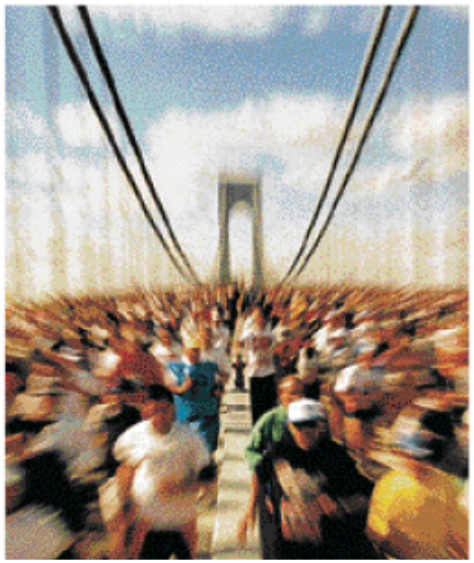
If a **50-year-old** woman ran a marathon in 4 hours when she was 35, she multiplies:

4 HOURS x 1.098 = 4.392 HOURS

To convert to minutes: .392 x 60 = 23.52.
So her goal is 4:23:30.

If she beats that time at age 50, she is actually running a better race than she did 15 years earlier.

Because the body appears to slow down at a different pace for shorter distances, Mr. Fair created a separate table for the middle distances, those from 400 to 10,000 meters.



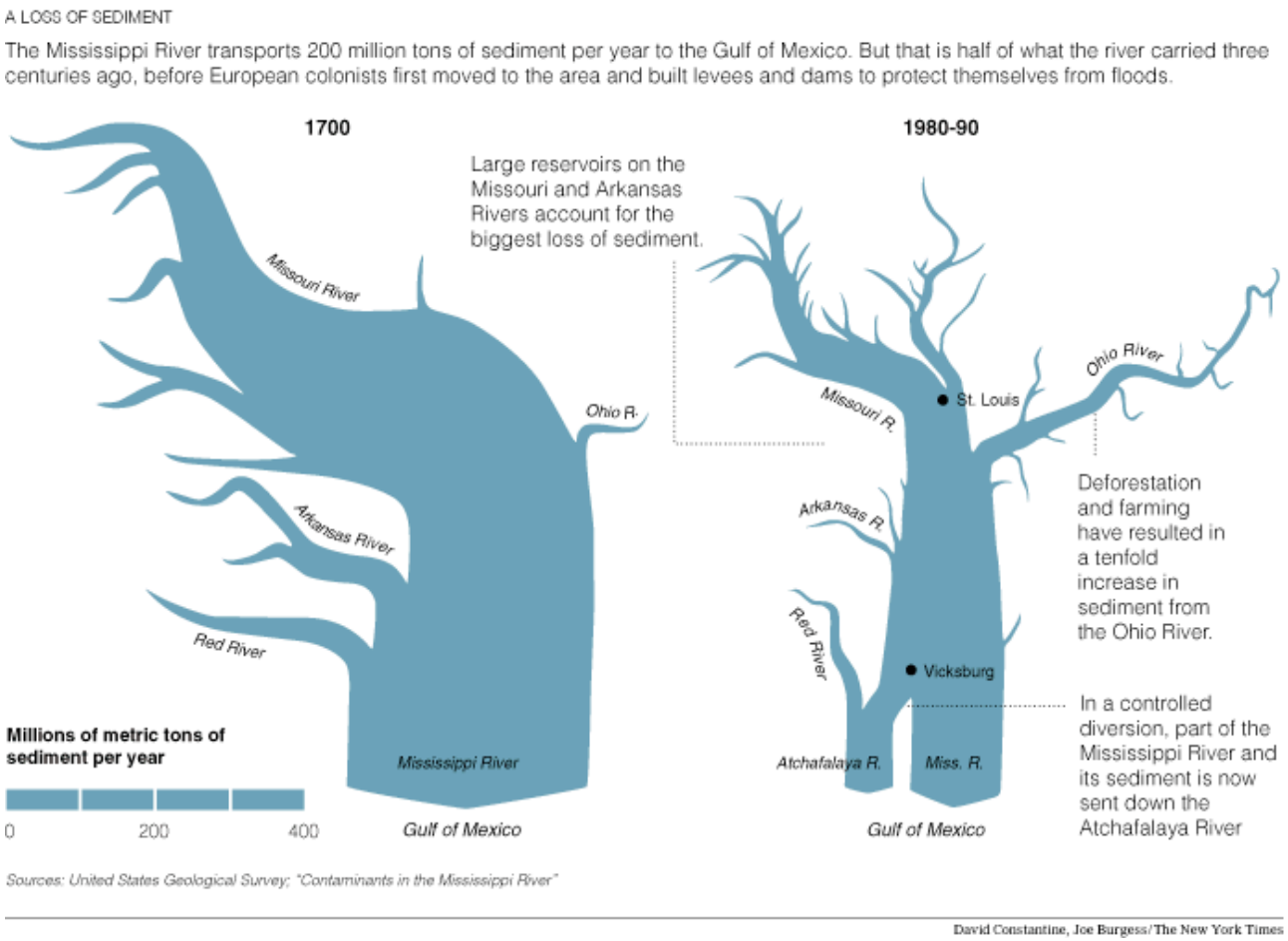
MARATHONS

AGE	FACTOR	AGE	FACTOR
35	1.000	61	1.178
36	1.006	62	1.189
37	1.013	63	1.202
38	1.019	64	1.216
39	1.025	65	1.232
40	1.032	66	1.249
41	1.038	67	1.269
42	1.045	68	1.290
43	1.051	69	1.313
44	1.058	70	1.338
45	1.064	71	1.365
46	1.071	72	1.395
47	1.078	73	1.427
48	1.084	74	1.462
49	1.091	75	1.499
50	1.098	76	1.538
51	1.105	77	1.581
52	1.112	78	1.628
53	1.119	79	1.677
54	1.126	80	1.730
55	1.133	81	1.787
56	1.140	82	1.848
57	1.147	83	1.913
58	1.154	84	1.983
59	1.161	85	2.058
60	1.169	86	2.138

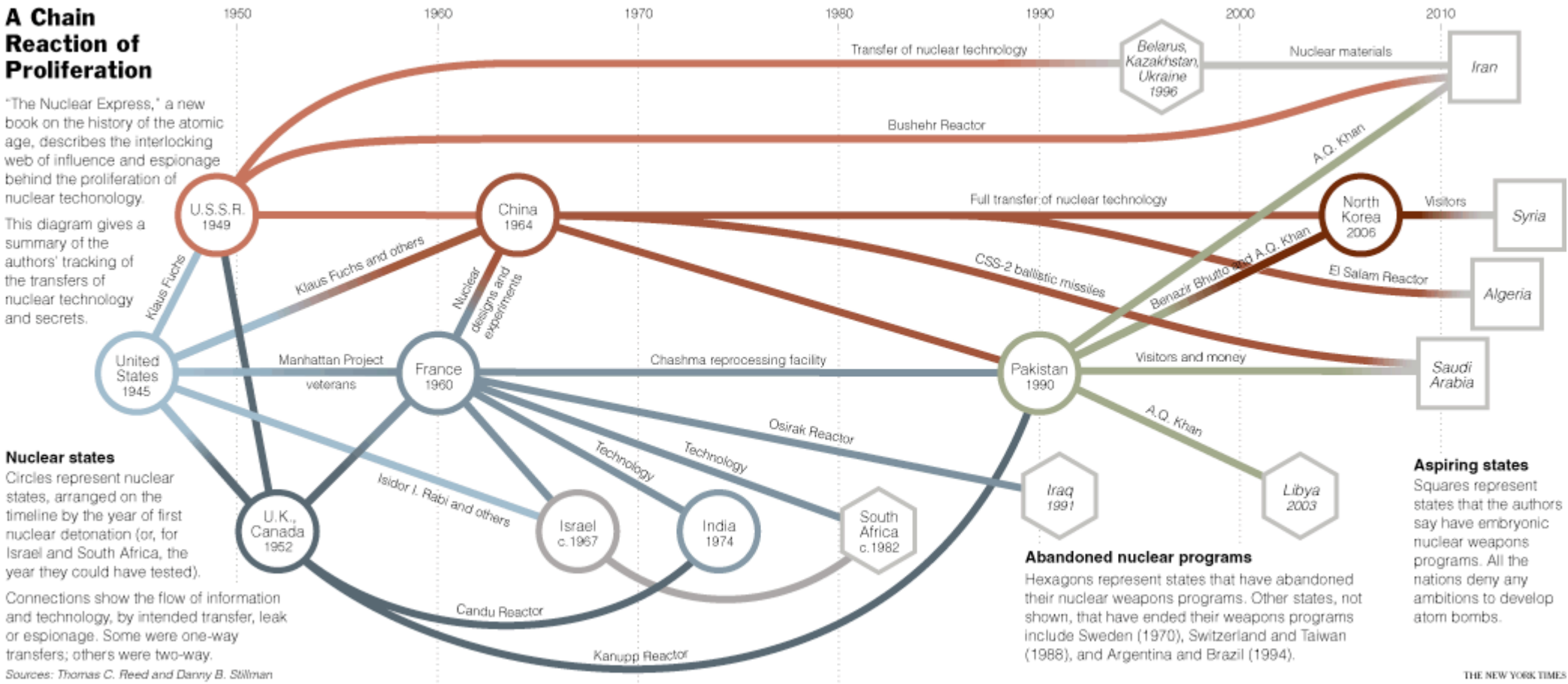
400-10,000-METER RACES

AGE	FACTOR	AGE	FACTOR
35	1.000	61	1.235
36	1.008	62	1.247
37	1.016	63	1.260
38	1.025	64	1.273
39	1.033	65	1.288
40	1.041	66	1.303
41	1.050	67	1.319
42	1.058	68	1.337
43	1.067	69	1.355
44	1.075	70	1.374
45	1.084	71	1.395
46	1.093	72	1.416
47	1.102	73	1.439
48	1.111	74	1.463
49	1.120	75	1.488

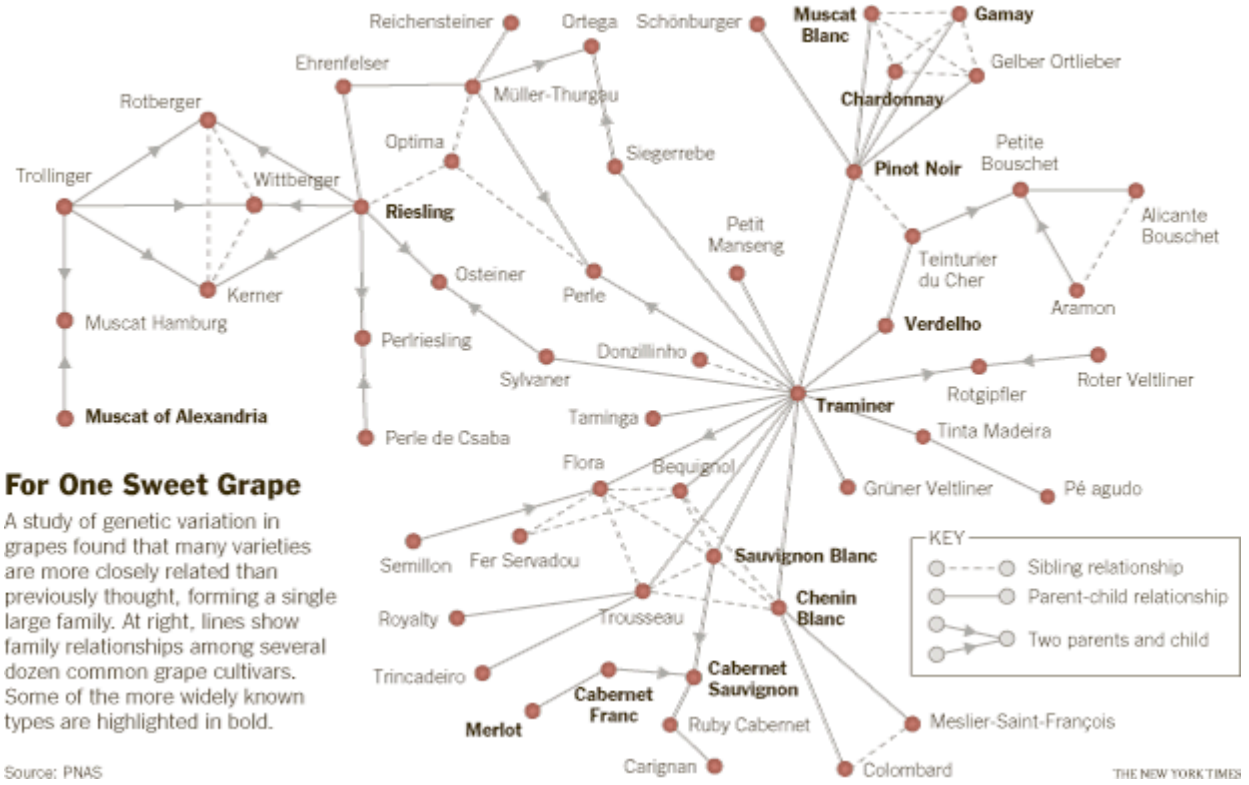
Other: flow diagrams



Other: network diagrams



Other: network diagrams



For One Sweet Grape

A study of genetic variation in grapes found that many varieties are more closely related than previously thought, forming a single large family. At right, lines show family relationships among several dozen common grape cultivars. Some of the more widely known types are highlighted in bold.

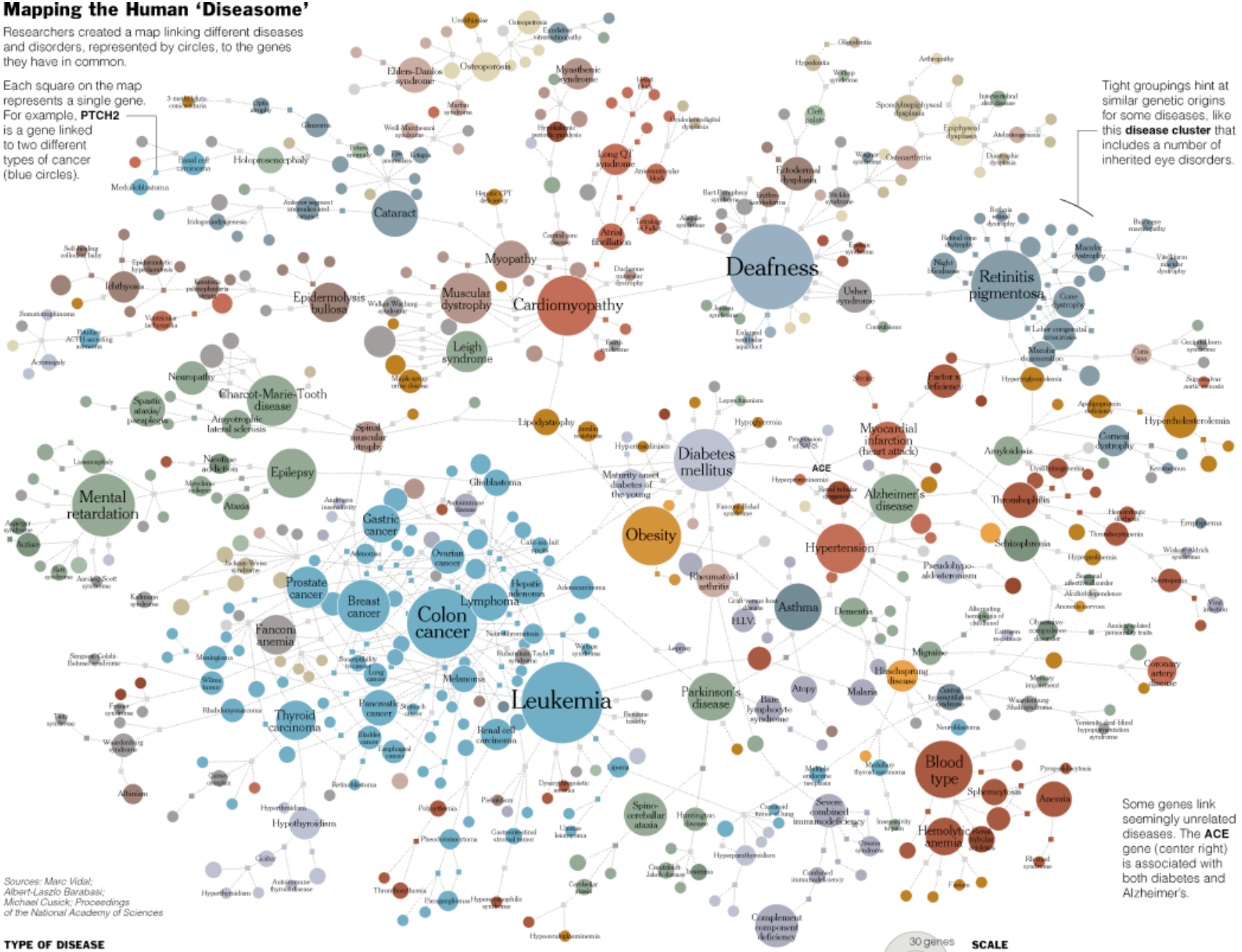
Source: PNAS

Mapping the Human 'Diseasome'

Researchers created a map linking different diseases and disorders, represented by circles, to the genes they have in common.

Each square on the map represents a single gene. For example, **PTCH2** is a gene linked to two different types of cancer (blue circles).

Tight groupings hint at similar genetic origins for some diseases, like this **disease cluster** that includes a number of inherited eye disorders.



Some genes link seemingly unrelated diseases. The **ACE** gene (center right) is associated with both diabetes and Alzheimer's.

Sources: Marc Vidal; Albert-Laszlo Barabasi; Michael Cusick; Proceedings of the National Academy of Sciences

TYPE OF DISEASE

- Cancer
- Bone
- Skeletal
- Connective tissue
- Muscular
- Dermatological
- Cardiovascular
- Hematological
- Renal
- Endocrine
- Immunological
- Gastrointestinal
- Nutritional
- Metabolic
- Ear, nose, throat
- Ophthalmological
- Respiratory
- Developmental
- Neurological
- Psychiatric
- Multiple types
- Unclassified

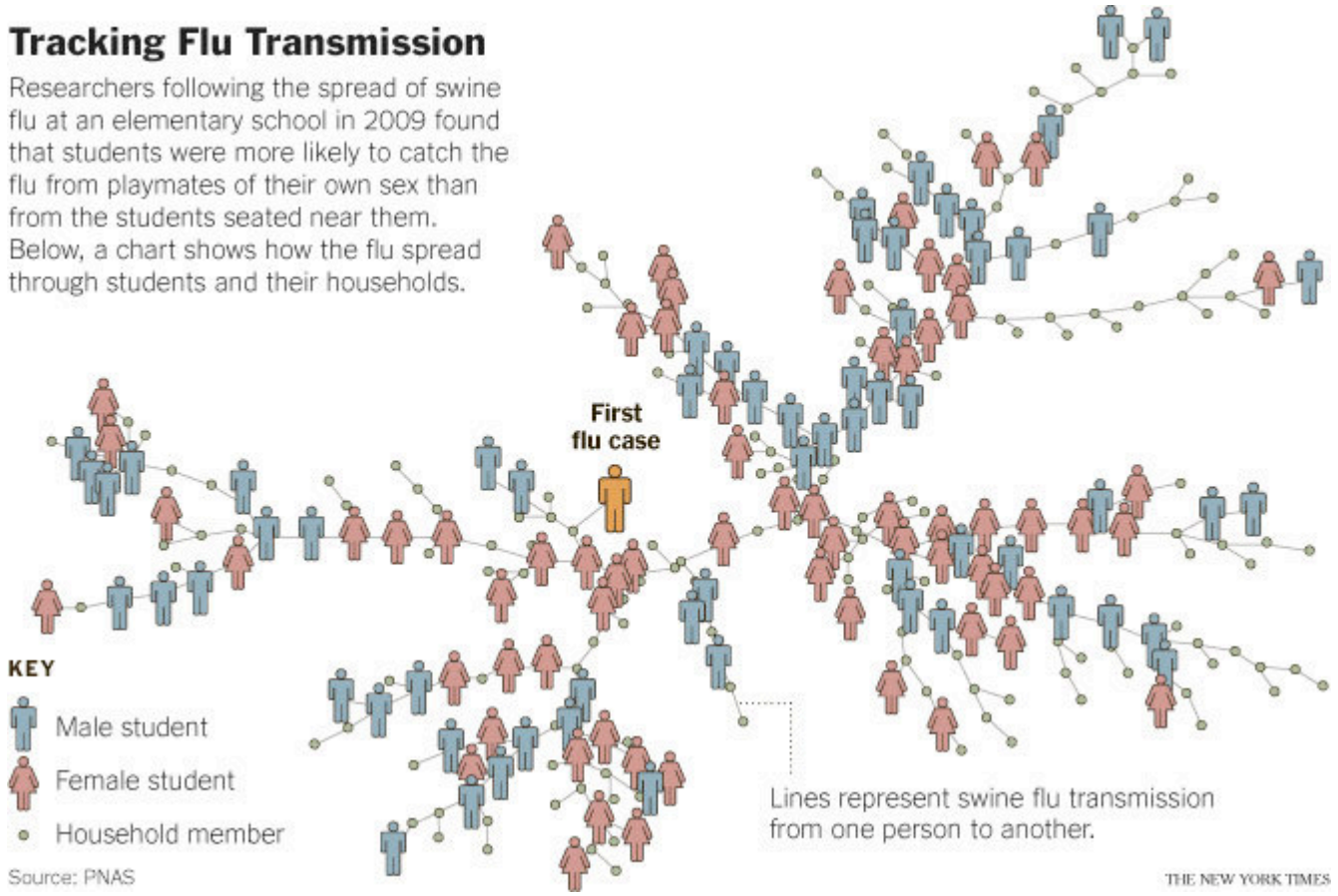
SCALE

30 genes
15
5
1

Each circle represents a disease or disorder and is scaled in proportion to the number of genes associated with that disease.

THE NEW YORK TIMES

Other: network diagrams

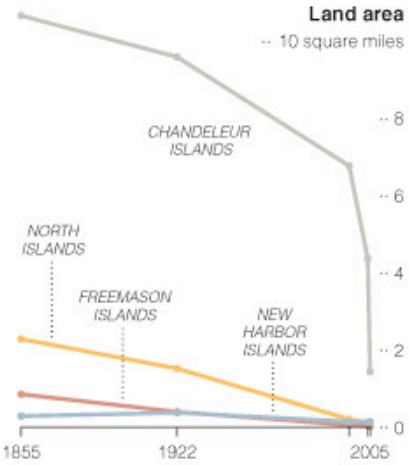


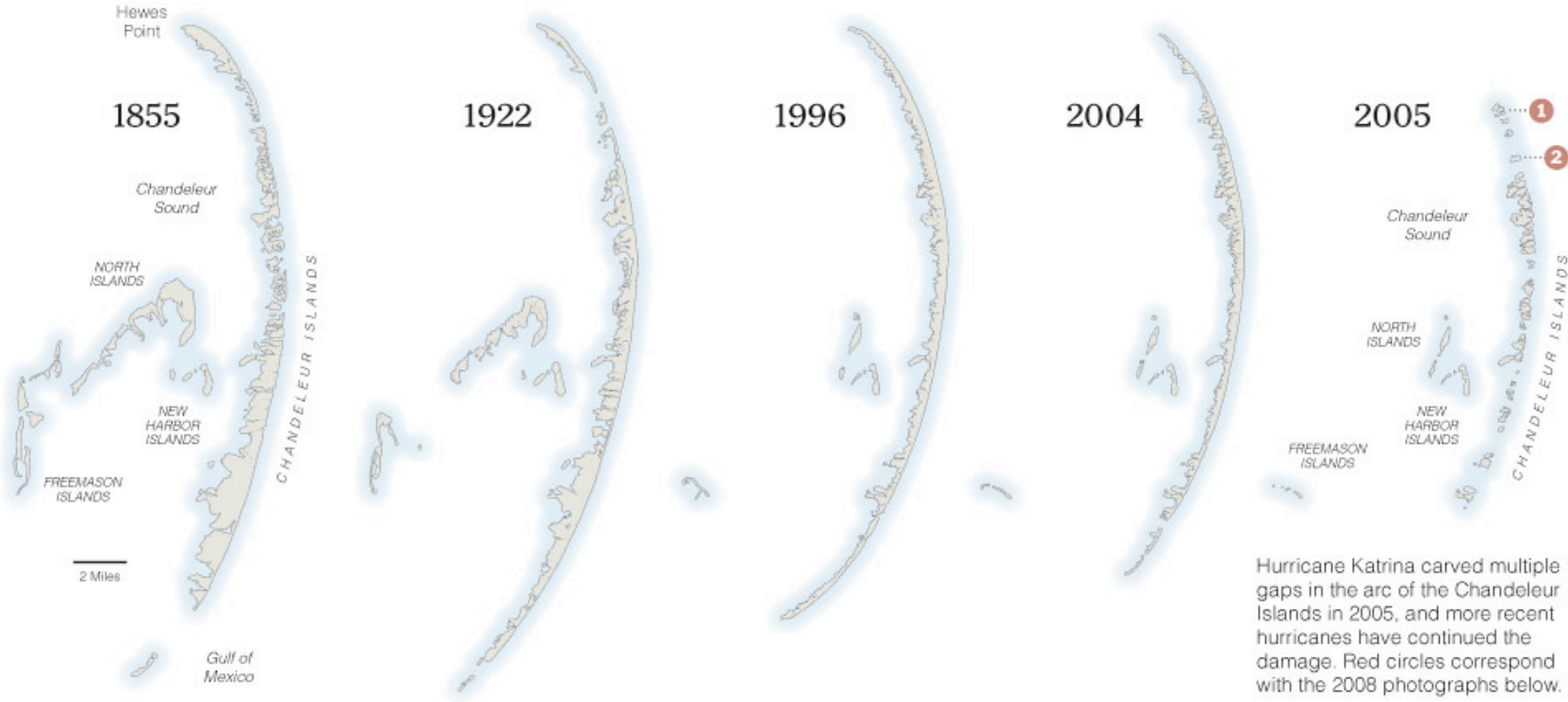
Two ideas independent of form

- Small multiples
- Annotation layer

Lost to the Sea

The Chandeleur Islands formed thousands of years ago in a now-defunct delta of the Mississippi River. Over the past 150 years, subsiding land, climate change, erosion and storm damage have reduced the barrier islands to a chain of island remnants.





Hurricane Katrina carved multiple gaps in the arc of the Chandeleur Islands in 2005, and more recent hurricanes have continued the damage. Red circles correspond with the 2008 photographs below.

AFTER THE STORMS

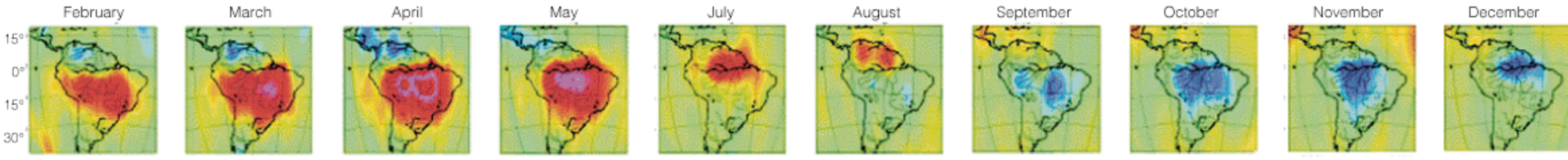
Two sets of photographs taken during aerial surveys this summer show the continued erosion of two of the Chandeleur Islands from Hurricane Gustav and Hurricane Ike. Red circles show the location of these islands on the map above.

Two photographs of the eastern part of Ship Island show hurricane damage sustained this summer. Much of the eastern part of the island is now underwater.

Sources: U.S. Geological Survey; University of New Orleans; Louisiana State University; Louisiana Dept. of Natural Resources

THE NEW YORK TIMES; PHOTOGRAPHS BY THE U.S. GEOLOGICAL SURVEY

Small multiples



Monthly maps from 2003 show gravitational force increasing as water collects in the Amazon basin, then decreasing as the region gets drier. The colors represent very small changes in the height of the geoid, a mathematical representation of the Earth's gravitational field; there was not enough data for January and June.

The New York Times; images courtesy of University of Texas Center for Space Researc

Cells migrate around the embryonic region, forming membranes around the inner cells.

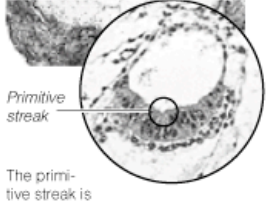
PRIMITIVE STREAK

A small group of cells called the primitive streak appears, and it will determine the embryo's main body axes, top and bottom, front and back, and left and right.

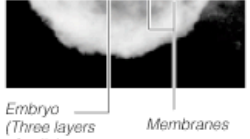
Most abnormal embryos that spontaneously abort do so by this time.

PRIMARY GERM LAYERS

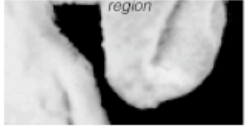
Also, a portion of the inner cell mass differentiates into three layers: ectoderm, mesoderm and endoderm. These three layers of cells will give rise to the body's tissues and organs.



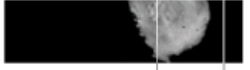
The primitive streak is visible, and the embryo's main body axes are established.



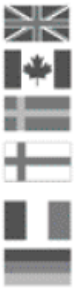
The images from this point forward are not sections of the embryonic interior. Rather, the entire embryo and surrounding membranes are shown.



Heart and brain regions become apparent.



The heart begins to beat. Small blocks, called somites, develop and will give rise to the vertebral column and body muscles.

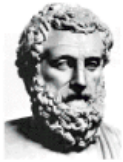


This is the last day that research is allowed on embryos in Britain, Canada, Sweden and Finland, where, with the permission of the couple, unused embryos can be donated for research purposes.

France and Germany prohibit embryonic stem cell research, but are reviewing their laws. They have proposed a joint resolution of the United Nations General Assembly to ban human cloning in all member countries.

Abdulaziz Sachedina, professor of Islamic studies at the University of Virginia: "It is correct to suggest that a majority of the Sunni and Shiite jurists will have little problem endorsing ethically regulated research on stem cells that promises potential therapeutic value, provided that the expected therapeutic benefits are not simply speculative."

In a report on ethical implications of human embryonic research for the National Institutes of Health, bioethicists concluded that the process of developing sentience (feeling or consciousness) begins with the formation of the primitive streak. Sentience is a defining human characteristic: Aristotle wrote that an animal "first and foremost lives because it can feel."

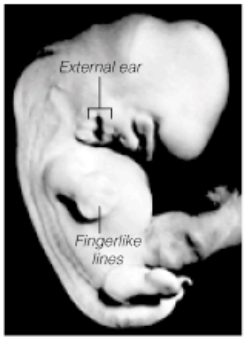


While many religious traditions equate sentience and the start of life, they differ on when it begins. Some Buddhist and Hindu thinkers believe that "transmigration of consciousness" happens at conception, and therefore research on stem cells is wrong. Historically, however, some Buddhists believed that life began in the third or fourth month of pregnancy.

A 1994 National Institutes of Health advisory panel weighed the importance of biological markers other than the formation of the primitive streak: "The onset of a hearbeat at Day 22, for example, marks the first time the embryo can be perceived (through ultrasound) by the outside world. Thus it marks a moment when the relational element increases. Also, despite experience with brain death, it is the beating heart that is most strongly perceived to be the difference between life and death."

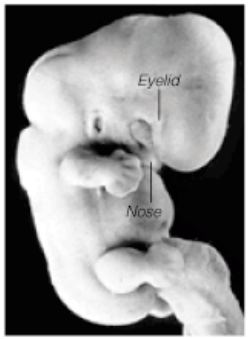
Embryonic images courtesy of the National Museum of Health and Medicine, Armed Forces Institute of Pathology; Photographs by Associated Press (Pope John Paul II, President Bush); Reuters (Orrin Hatch)

DAY 42



The main axis of the trunk straightens.

DAY 44

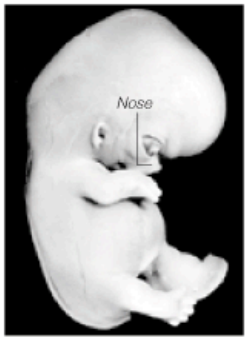


Eyelids appear, and the nose can be distinguished.

DAY 48

Various parts in arm and leg can be identified.

DAY 51



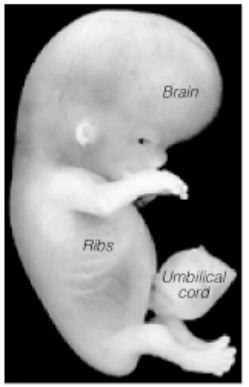
Arms increase in length and bend slightly at the elbows.

DAY 52

ACTUAL SIZE

DAY 54

DAY 56



ACTUAL SIZE

From this point until birth, the embryo is known as a fetus.

Later stages of embryonic growth

"Part of our identification with this entity is that it looks human," said LeRoy Walters, a bioethicist at Georgetown University. He also pointed out that the ability to see the embryo in utero through ultrasound has enhanced the bonding that takes place between parent and child.

The Greek Orthodox Church sees human beings "as still possessing a strong residue of the God-given likeness which is the essence of our humanity," said the Rev. Stanley Harakas of the Holy Cross School of Theology. "In my view, the establishment of embryonic stem cell lines was done at the cost of human lives. Even though not yet a human person, an embryo should not be used for or sacrificed in experimentation, no matter how noble the goal may seem."

Sources: U.N. Report: "The Use of Embryonic Stem Cells in the Therapeutic Research"; National Bioethics Advisory Commission: "Ethical Issues in Human Stem Cell Research"; Elizabeth Lockett, National Museum of Health and Medicine; Dr. Raymond F. Gasser, Louisiana State University; Dr. Brigid Hogan, Vanderbilt University; "The Developing Human," by Keith L. Moore and T. V. N. Persaud

STEVE DUENES and KRIS GOODFELLOW/The New York Times

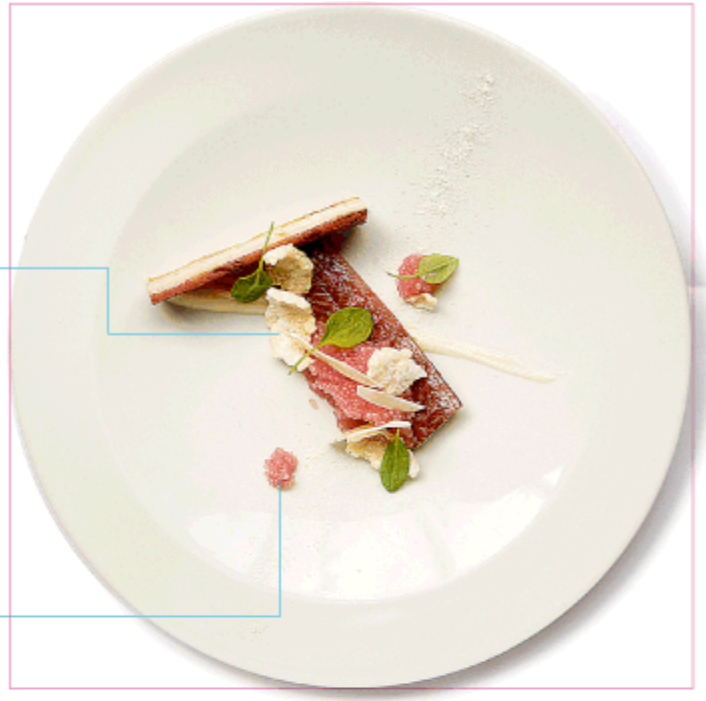
Annotation layer

Nouvelle Chimie

Chefs learn from the lab how to fry mayonnaise, congeal coconut milk and tie foie gras in a knot.

SMOKED EEL
Slices of eel are served with **puffed yuzu**, inspired by airy puffed snacks like Cheez Doodles. The dough, flavored with juice from yuzu, a citrus fruit, contains two hydrocolloids. One, a waxy maize, expands significantly when fried. The other, a modified tapioca flour, expands more modestly and provides structure.

The dish is garnished with **guava roe** and slivers of the vegetable salsify. The roe is made by adding agar and locust bean gum to guava juice and simmering, then adding drops of the modified juice to 60-degree oil. The guava mixture gels into spheres that resemble fish roe.



BEEF TONGUE
Framed by a reverse comma of tomato molasses and an exclamation point of minced romaine lettuce and powdered onions, the beef tongue is accompanied by small pieces of lettuce and a high-tech version of **fried mayonnaise**.

The mayonnaise contains no eggs, but gelatin and gellan, a hydrocolloid produced by the bacterium Sphingomonas elodea. If eggs were used the proteins would be scrambled by the heat of frying, ruining the creamy texture.

WAGYU BEEF
A plate of Waygu flat iron beef, coffee gnocchi, cipollini onions and sylvetta arugula, also known as wild arugula, is adorned with a brushing of **coconut gel**.

The coconut gel is made by blending coconut milk and gellan together and adding calcium lactate. The calcium ions and gellan react to form a gel

KNOT FOIE
A **flexible foie gras terrine** is made pliant with the addition of xanthan gum, a sugar fermented by the bacterium Xanthomonas campestris, and konjac flour from an Asian tuber.

The knot foie is dressed with rice crackers and dollops of puréed golden raisins and puréed kimchee

Annotation layer

Don't Forget to Chew

The star-nosed mole, native to eastern United States wetlands, has developed a super-efficient feeding system that allows it to grab and eat food in roughly a fifth of a second.

Nose: Twenty-two tentacles covered by 25,000 sensory receptors probe potential prey.

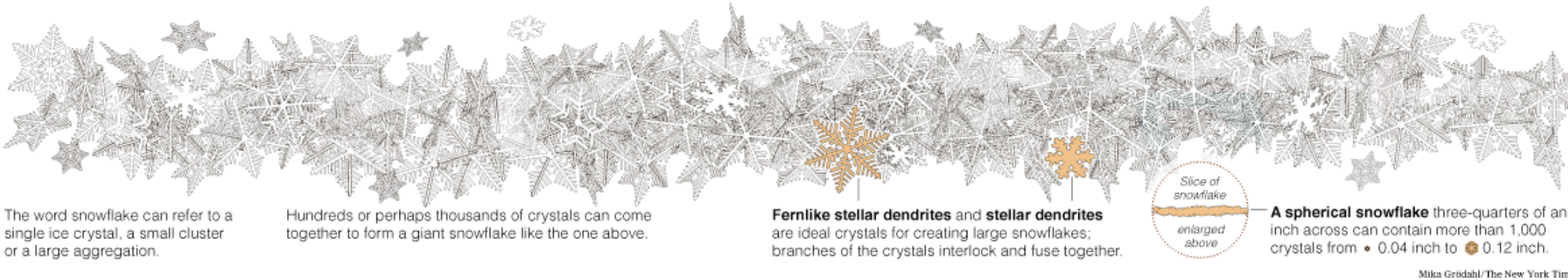
Teeth: Tweezer-like to help the mole quickly and precisely grasp small prey.

Mole width two inches, length four to five inches.

EATING

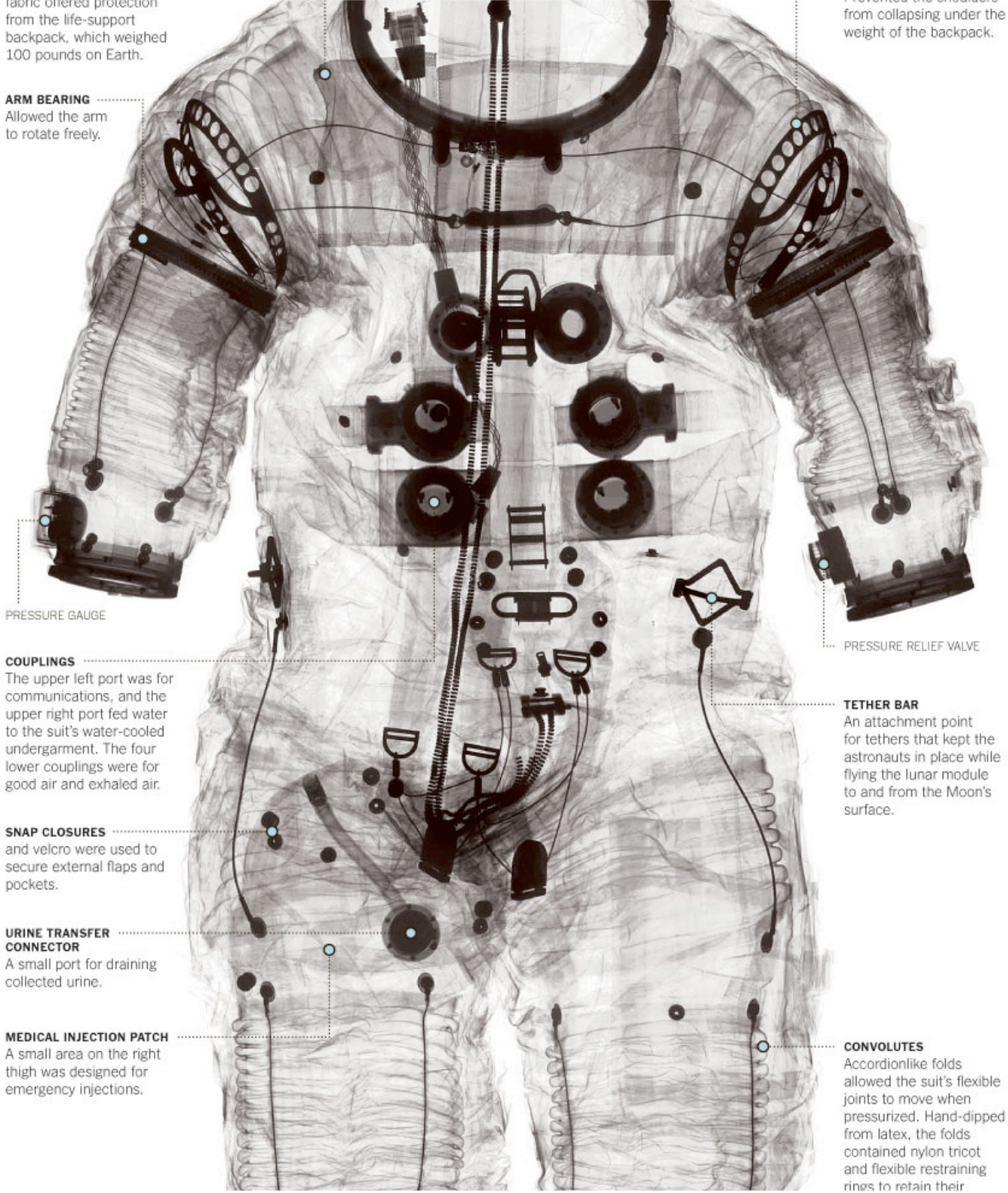
It takes the mole around 82 milliseconds (0.082 second) to decide whether to eat small prey it encounters and 146 milliseconds more to eat and begin a new search. Its diet includes earthworms, insect larvae and small fish.

Annotation layer



fabric offered protection from the life-support backpack, which weighed 100 pounds on Earth.

ARM BEARING
Allowed the arm to rotate freely.



PRESSURE GAUGE

COUPLINGS
The upper left port was for communications, and the upper right port fed water to the suit's water-cooled undergarment. The four lower couplings were for good air and exhaled air.

SNAP CLOSURES
and velcro were used to secure external flaps and pockets.

URINE TRANSFER CONNECTOR
A small port for draining collected urine.

MEDICAL INJECTION PATCH
A small area on the right thigh was designed for emergency injections.

from collapsing under the weight of the backpack.

PRESSURE RELIEF VALVE

TETHER BAR
An attachment point for tethers that kept the astronauts in place while flying the lunar module to and from the Moon's surface.

CONVOLUTES
Accordionlike folds allowed the suit's flexible joints to move when pressurized. Hand-dipped from latex, the folds contained nylon tricot and flexible restraining rings to retain their