01. Introduction to Data Visualization

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Cholera epidemic 1854 London – Dr Snow

Cholera epidemic 1854 London – Dr Snow

A COURT FOR KING CHOLERA.

SEPTEMBER 25, 1852.

Cholera epidemic 1854 London – Dr Snow

FATHER THAMES INTRODUCING HIS OFFSPRING TO THE FAIR CITY OF LONDON.

(A Design for a Fresco in the New Houses of Parliament.)

Cholera epidemic 1854 London – Dr Snow

Cholera epidemic 1854 London – Dr Snow

DEATH'S DISPENSARY.

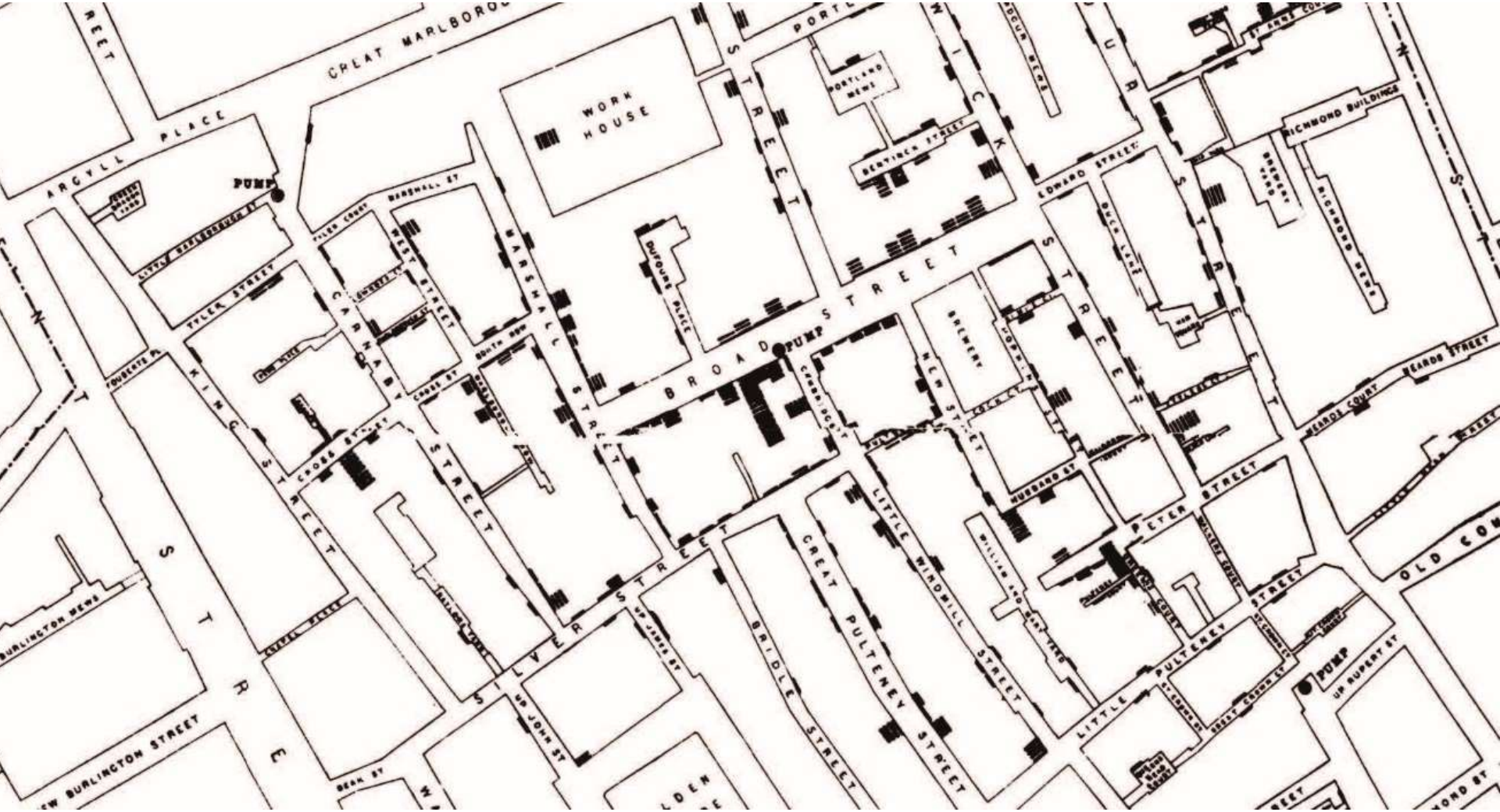
OPEN TO THE POOR, GRATIS, BY PERMISSION OF THE PARISH.

Cholera epidemic 1854 London – Dr Snow

The graphical display was aimed at conveying information about a possible cause-effect relationship.

Snow marked
- deaths from cholera (IIIIIII)
- locations of 11 community water pumps.

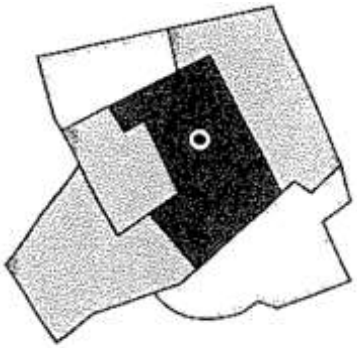
Cholera epidemic 1854 London – Dr Snow



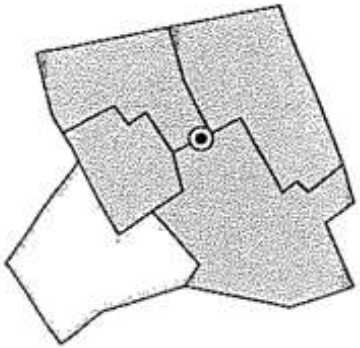
Cholera epidemic 1854 London – Dr Snow

Snow drew a “dot map”, which marks each individual death

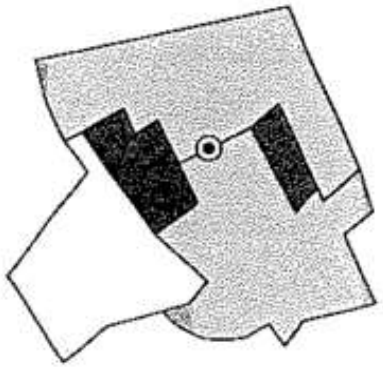
Why not aggregate?



In this aggregation of individual deaths into six areas, the greatest number is concentrated at the Broad Street pump.



Using different geographic subdivisions, the cholera numbers are nearly the same in four of the five areas.



In this aggregation of the deaths, the two areas with the most deaths do not even include the infected pump!

CHOLERA
AND
WATER.

BOARD OF WORKS
FOR THE LIMEHOUSE DISTRICT,
Comprising Limehouse, Ratcliff, Shadwell, and Wapping.

The INHABITANTS of the District within which CHOLERA IS PREVAILING, are earnestly advised

NOT TO DRINK ANY WATER
WHICH HAS NOT PREVIOUSLY BEEN BOILED.

Fresh Water ought to be Boiled every Morning for the day's use, and what remains of it ought to be thrown away at night. The Water ought not to stand where any kind of dirt can get into it, and great care ought to be given to see that Water Butts and Cisterns are free from dirt.

BY ORDER,

THOS. W. RATCLIFF,
CLERK OF THE BOARD.

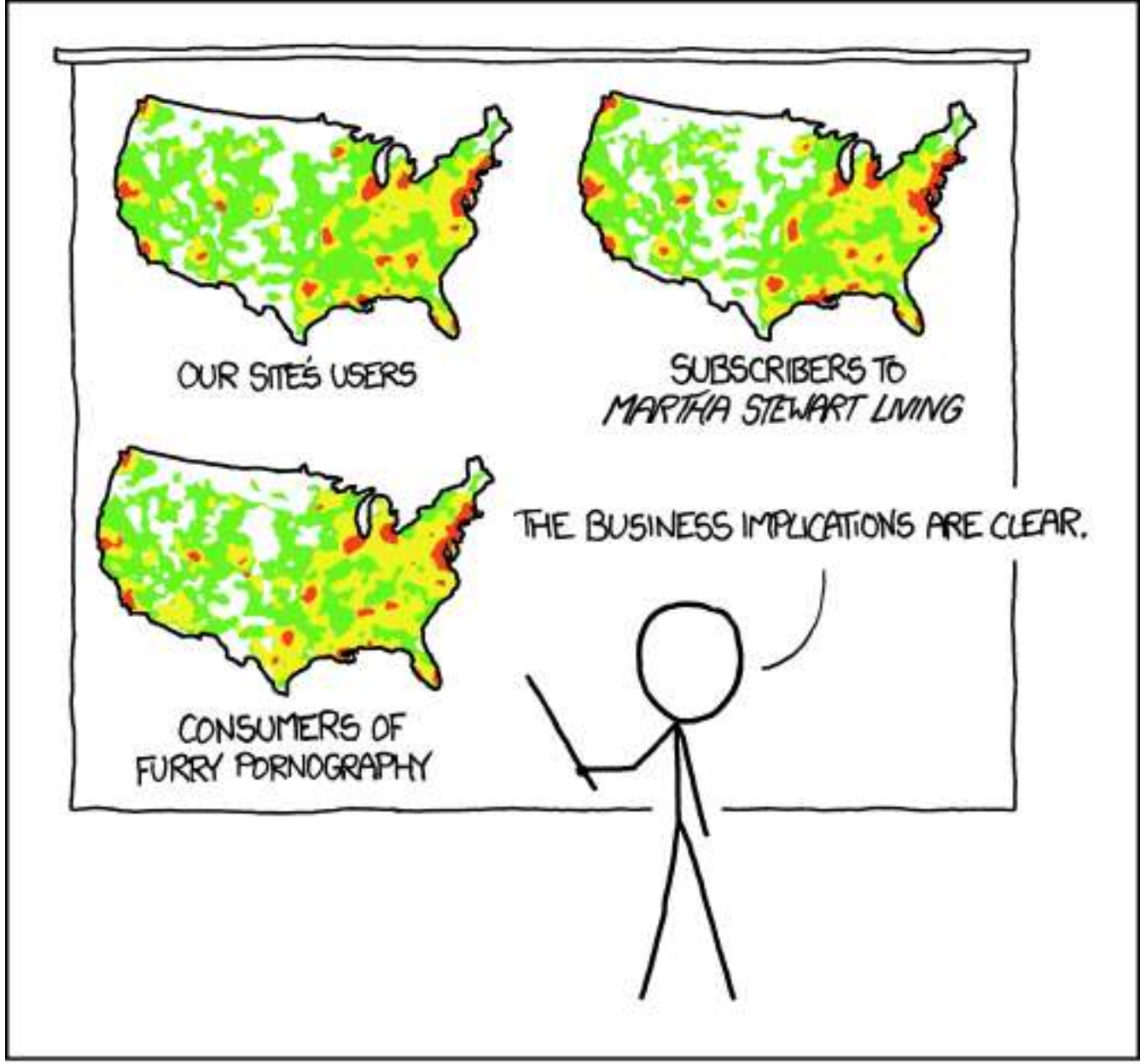
Board Offices, White Horse Street, 1st August, 1866.

Cholera epidemic 1854 London – Dr Snow

But what is the flip side of Snow's Display?

The dot map does not take into account the number of people living in an area

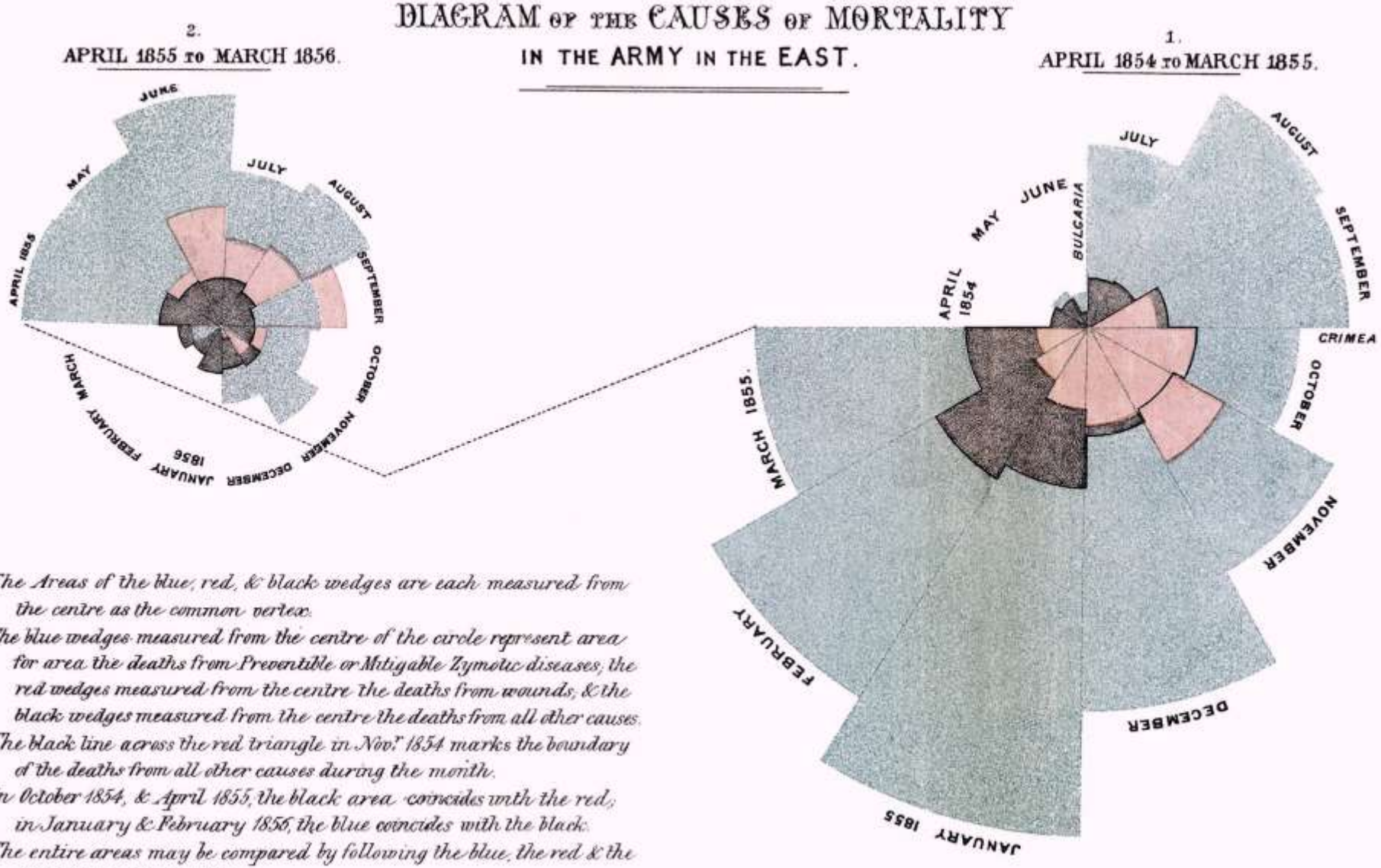
(an area may be free of cases because it is not populated, maybe more people lived near Broad Street pump?)



PET PEEVE #208:

GEOGRAPHIC PROFILE MAPS WHICH ARE BASICALLY JUST POPULATION MAPS

Florence Nightingale on Crimean War. 1858



The Areas of the blue, red, & black wedges are each measured from the centre as the common vertex.

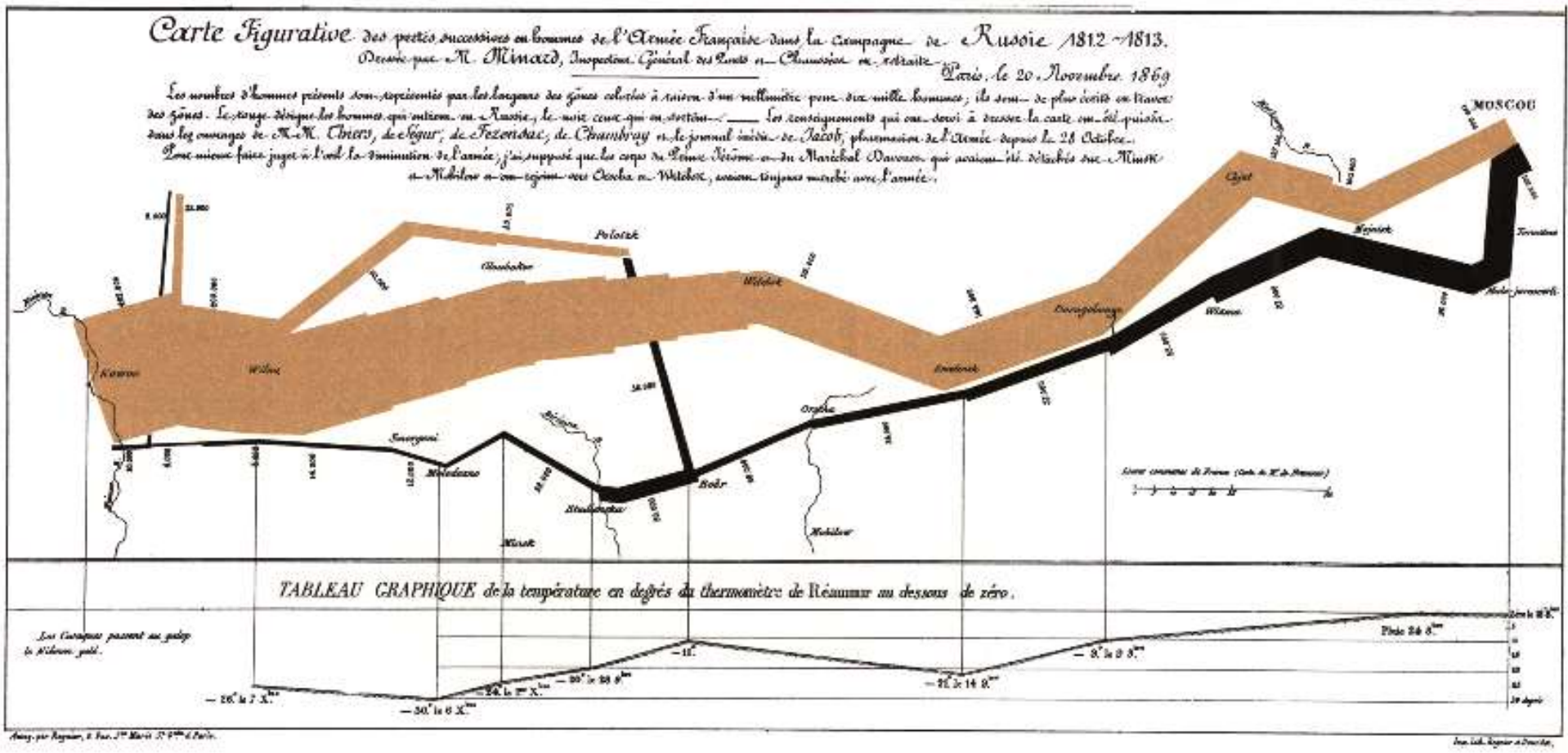
The blue wedges measured from the centre of the circle represent area for area the deaths from Preventible or Mitigable Zymotic diseases, the red wedges measured from the centre the deaths from wounds, & the black wedges measured from the centre the deaths from all other causes.

The black line across the red triangle in Nov.r 1854 marks the boundary of the deaths from all other causes during the month.

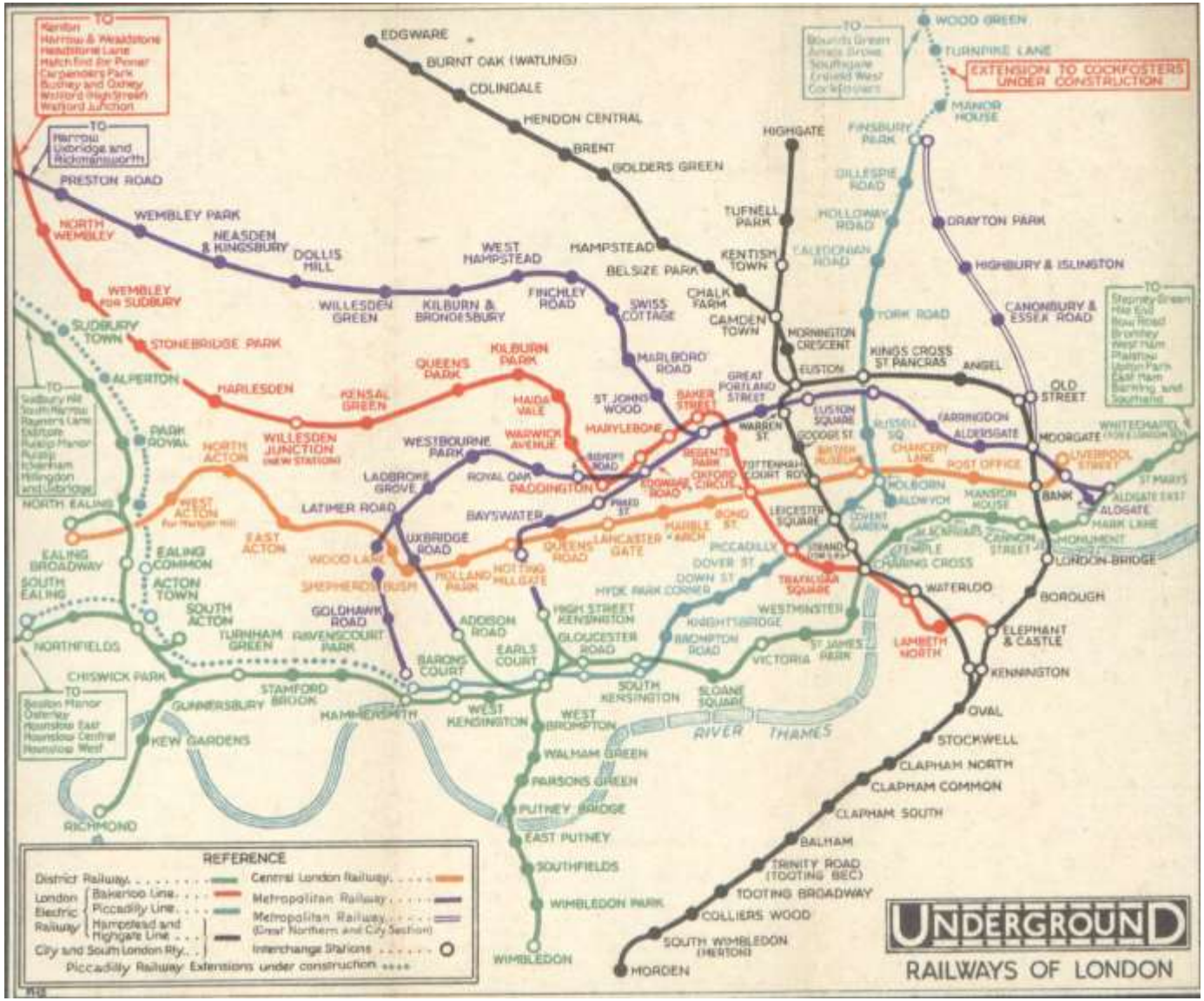
In October 1854, & April 1855, the black area coincides with the red; in January & February 1856, the blue coincides with the black.

The entire areas may be compared by following the blue, the red & the black lines enclosing them.

Napoleon's 1812 Russian campaign – Charles Minard



London Underground Map 1931 – Henry Beck



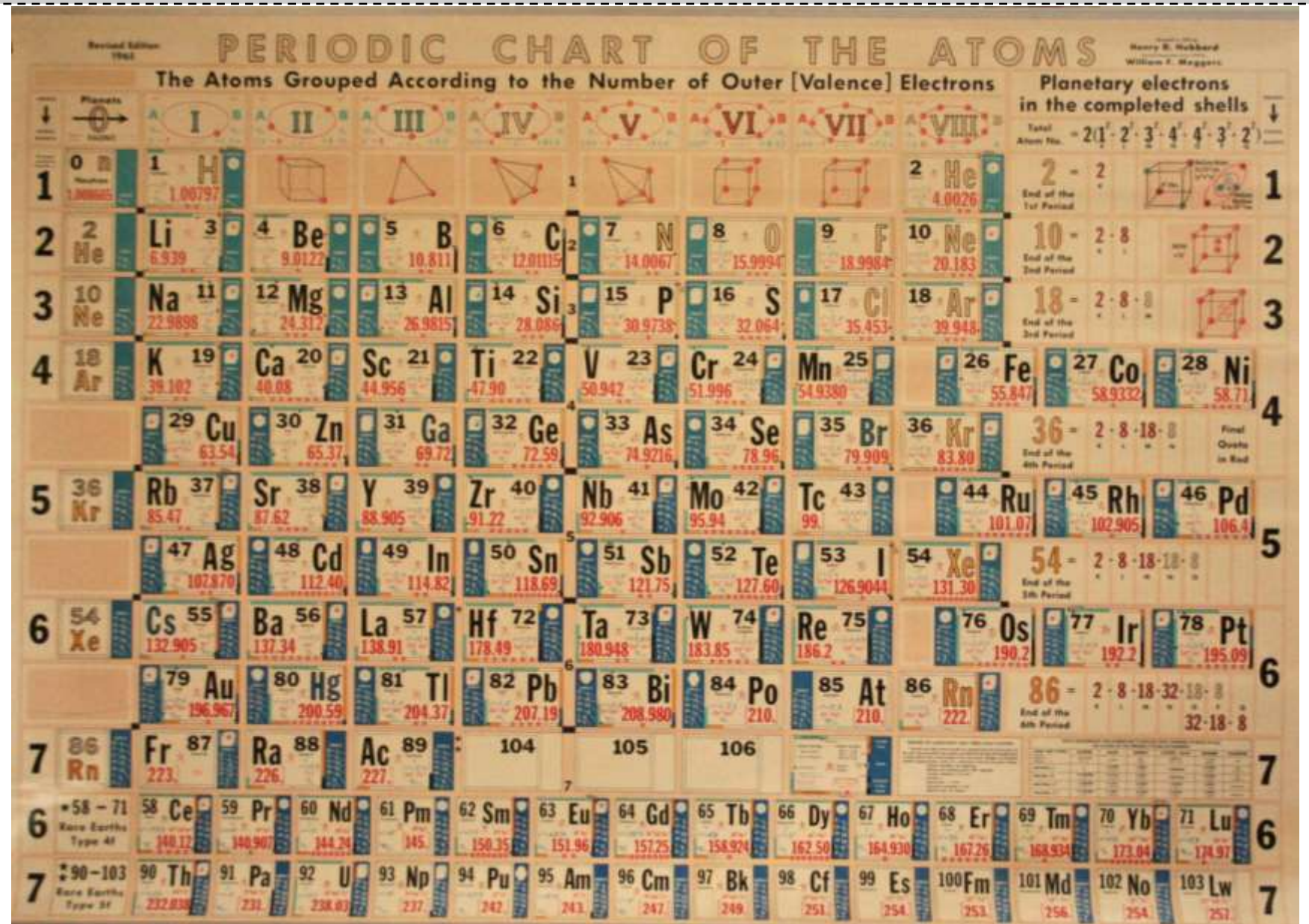
London Underground Map 1931 – Henry Beck

Periodic Table 1869 – Dimitri Mendeleev

Ueber die Beziehungen der Eigenschaften zu den Atomgewichten der Elemente. Von D. Mendelejeff. — Ordnet man Elemente nach zunehmenden Atomgewichten in verticale Reihen so, dass die Horizontalreihen analoge Elemente enthalten, wieder nach zunehmendem Atomgewicht geordnet, so erhält man folgende Zusammenstellung, aus der sich einige allgemeinere Folgerungen ableiten lassen.

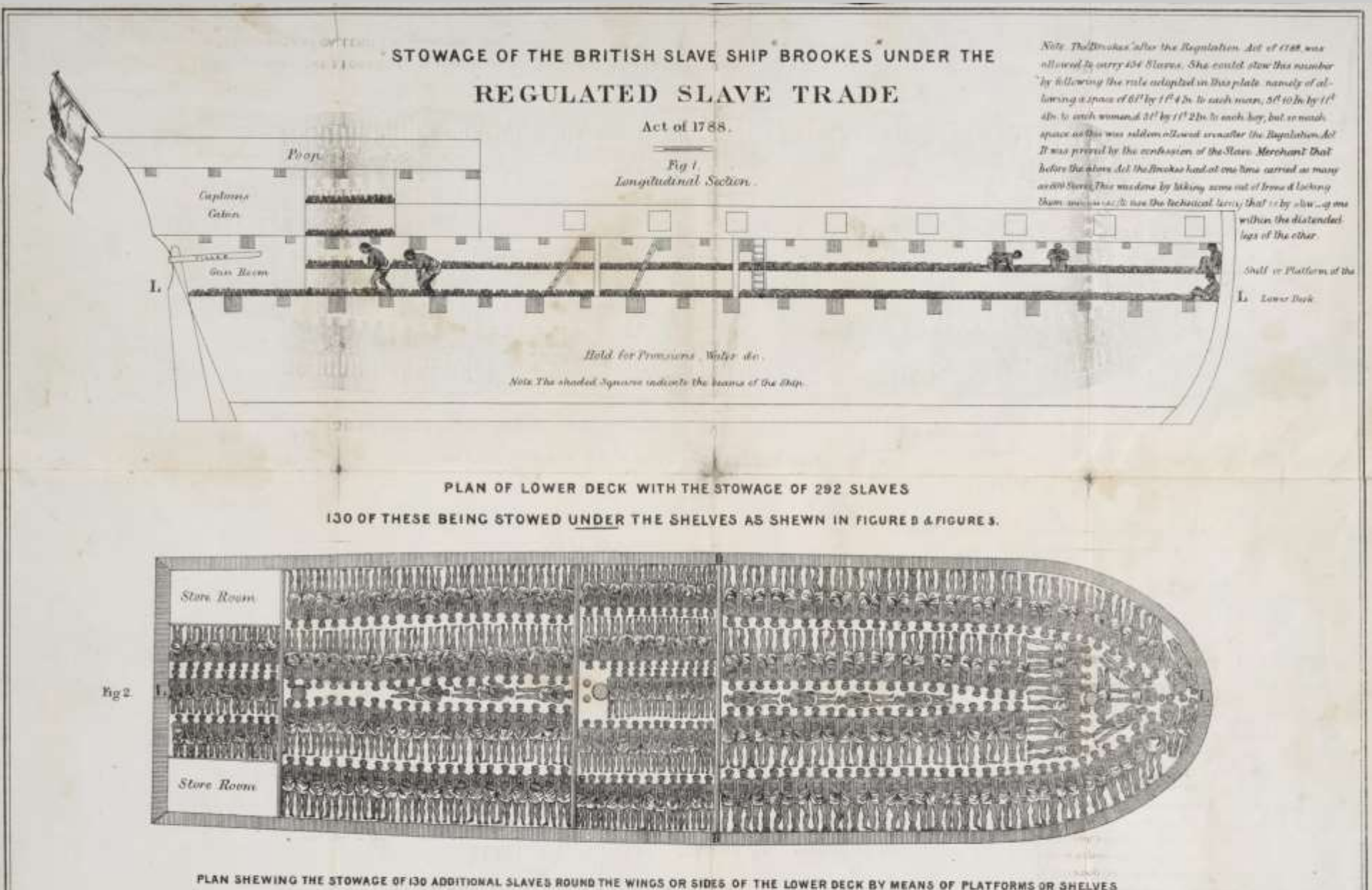
			Ti = 50	Zr = 90	? = 180
			V = 51	Nb = 94	Ta = 182
			Cr = 52	Mo = 96	W = 186
			Mn = 55	Rh = 104,4	Pt = 197,4
			Fe = 56	Ru = 104,4	Ir = 198
			Ni = Co = 59	Pd = 106,6	Os = 199
H = 1			Cu = 63,4	Ag = 108	Hg = 200
	Be = 9,4	Mg = 24	Zn = 65,2	Cd = 112	
	B = 11	Al = 27,4	? = 68	Ur = 116	Au = 197?
	C = 12	Si = 28	? = 70	Sn = 118	
	N = 14	P = 31	As = 75	Sb = 122	Bi = 210?
	O = 16	S = 32	Se = 79,4	Te = 128?	
	F = 19	Cl = 35,5	Br = 80	J = 127	
Li = 7	Na = 23	K = 39	Rb = 85,4	Cs = 133	Tl = 204
		Ca = 40	Sr = 87,6	Ba = 137	Pb = 207
		? = 45	Ce = 92		
		?Er = 56	La = 94		
		?Yt = 60	Di = 95		
		?In = 75,6	Th = 118?		

Periodic Table 1950 – Henry Hubbard

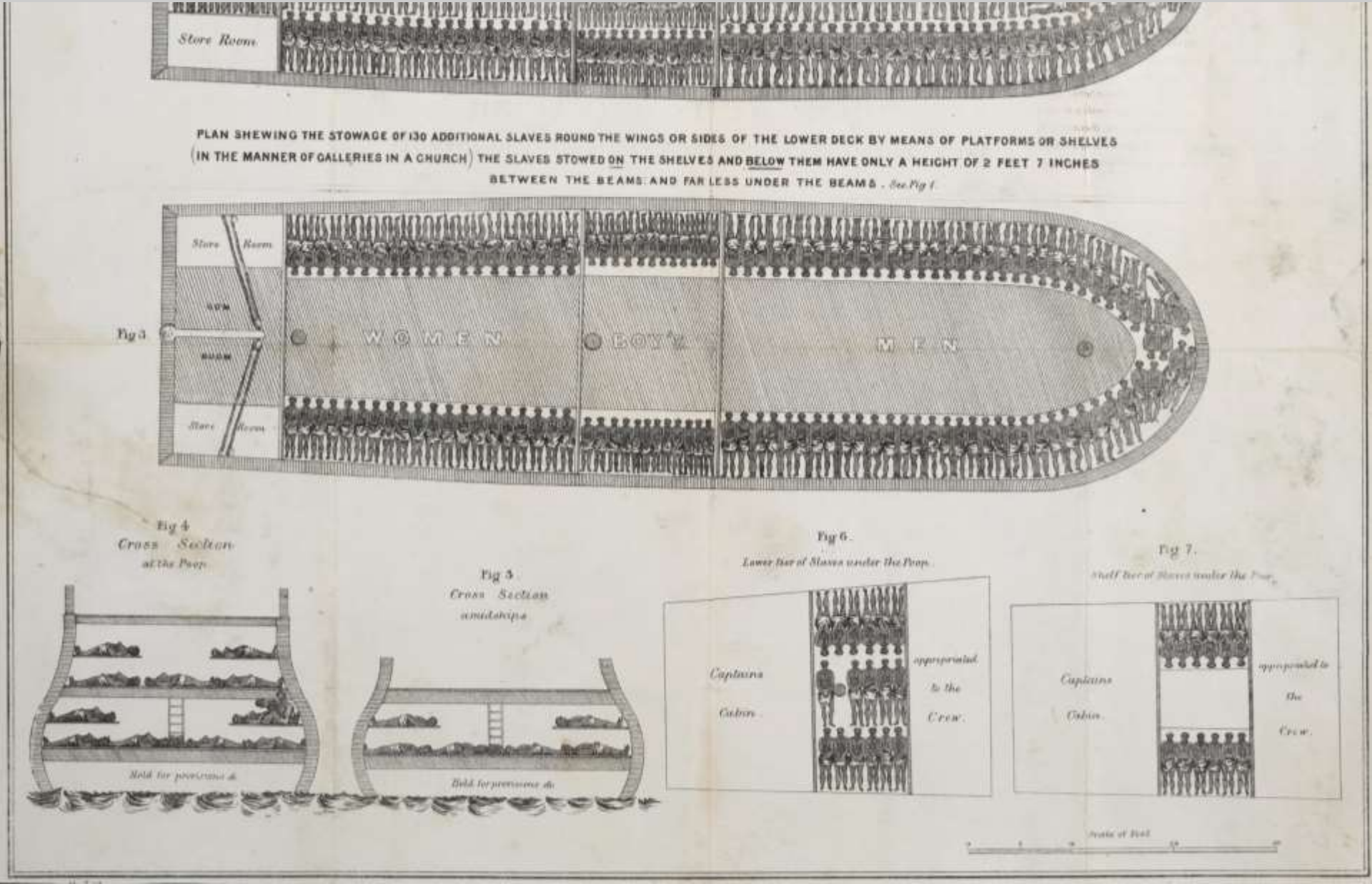


Drawings of slave ship Brookes by British abolitionist William Elford. 1788

Drawings of slave ship Brookes by British abolitionist William Elford. 1788



Drawings of slave ship Brookes by British abolitionist William Elford. 1788



What is visualization?

Clear thinking made visible – Edward Tufte

It is not about designing graphics. It is all about designing information – Richard Saul Wurman

Vision can no longer be employed simply to support verbal and conceptual meanings: Its potential as a cognitive power in its own right must be exploited – Kepes

Visualization is really about external cognition, that is, how resources outside the mind can be used to boost the cognitive capabilities of the mind – Stuart Card

Why visualize?

To convey information through visual representations in order to:

- Map/record
- Clarify/explain
- Instruct/communicate
- Discover
- Inspire/tell a story

// PROGRAMM

MITTWOCH 21.04.2004

12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00

LAGERHALLE

KUNSTHALLE DOMINIKANERKIRCHE

DONNERSTAG 22.04.2004

12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00

LAGERHALLE

- BRAVE NEW WORLD
  12:00 // 58 min
- ELSEWHERE
  13:30 Le Gout du Kosmiz // 66 min
- MEMORIES ARE MADE OF THIS
  15:00 // 64 min
- JONAS AT THE OCEAN
  16:00 // Peter Sempel / 16mm / 2003 / 85 min

ARTHOUSE 4

- DIE PERLE IN DER KACKE
  13:30 // Dirk Bill / 82 min
- EWIG
  17:30 /
  »Artik

ARTHOUSE 5

- NIWATORI WA HADASHI DA
  13:30 // Atsuna Morisaki / Japan 2003 / 114 min / OmU
- ARAG
  17:30 /
  / Farb

HAUS DER JUGEND (HDJ)

- STUDENT FORUM: MEDIA ACADEMIES / PART I
  12:00 IAMAS Kyoto
  Chrlara Sommerer (A/JP)
  13:00 Academy of Fine Arts, Prague
  Anetta Mona Chisa (SK/CZ)
- STUDENT FORUM: MEDIA ACADEMIES / PART II
  15:00 HfG Offenbach
  Reinaud Papo (D)
  16:00 AKI Enschede
  Bill Sylnhoven (NL)
  17:00 KHM Köln
  Katrin Peters (D)

FREITAG 23.04.2004

12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00

LAGERHALLE

- SUICIDE
  12:00 // Amanda Trevelogue / 70 min
- 0F(F) BALANCE
  13:30 // 60 min
- RETROSPEKTIVE: C. MACLAINE
  15:00 // 16mm / 60 min
- VISIONS OF DELIGHT
  16:00 // 58 min

ARTHOUSE 4

- EWIGE SCHÖNHEIT
  13:30 // Marcel Schwierin / 90 min / mit Vorfilm: »Achkarfreu«
- DIE P
  17:30 /

ARTHOUSE 5

- VAMPIRE HUNTER
  13:30 // Yoshiaki Kawajiri / Japan 2000 / Anime / 105 min / 35mm / Deutsche Fassung
- NIWA
  17:30 /

HAUS DER JUGEND (HDJ)

- TRANSMITTER PART I
  12:00 Dr. Katja Kwastek, Uni München / Introduction
  13:00 Ken Feingold (USA) »Dve-Art«
  14:00 Tim Fritzlow/Chaos Computer Club (D) »Einkonfight«
- TRANSMITTER PART II
  15:30 Fadeloun (D) »Transmitter, Transponder, RFID«
  16:30 Enric Ruiz Geli (E) »The Media House«
  17:30 Antin

DGB-GEBÄUDE

was one of three direct hits on the New Orleans area
ast 100 years. Almost a Category 5 storm when it
shore at Grand Isle, Betsy had weakened to a
ry 3 an hour later when its eye was 35 miles
vest of New Orleans, battering the city with 125-mph
A storm surge ranging from 6 to 16 feet flooded
han 5,000 square miles of the coast, topping 8-foot
in Chalmette, along the Mississippi River-Gulf Outlet
ern New Orleans, and at Camp Leroy Johnson on
ontchartrain. The surge also pushed through a
underneath a levee along the Inner Harbor
tion Canal, flooding the 9th Ward.

E DAMAGE

ss widespread in St. Bernard Parish, eastern New Orleans and the
, and 58 people lost their lives in Louisiana. Many drowned in their
ere they attempted to escape floodwaters that rose 20 feet in some
to minutes. About 17,000 people were injured and 200,000
ed. Some buildings washed off their foundations, were carried 30
surge water and ended up against levees or in the middle of
ons. Several ships ran aground on the Mississippa River levees.

E SOLUTION

ed by public opinion resulting from Betsy, the Army Corps of Engineers
ngressional financing for a series of flood-control and levee building
that were already under way to protect the New Orleans area from
ilar to hurricanes that hit the city in 1915 and 1947.

T ARE WE REALLY SAFE? ...

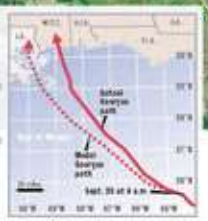
'GEORGES' HADN'T TURNED

New Orleans most recently dodged catastrophic flooding in 1998, when Hurricane Georges cut across the Gulf of Mexico on a beeline to the mouth of the Mississippi River. As half the population fled, the storm veered to the east and made landfall in Mississippi. The hurricane caused flooding in St. Bernard Parish and also pushed waves from Lake Pontchartrain up against its south shore levees, leaving many to ponder: What if?

1 THE MODEL

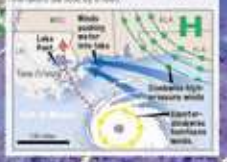
A computer model designed by LSU scientists Joseph Suhayda and Shimon Wax examines and used by government agencies to prepare evacuation plans shows what would have happened if Georges had not turned. The scientists assumes that the storm continued on the track and intensity forecast by the National Hurricane Center on Saturday, Sept. 26, 1998, at 4 a.m. in the model, Georges intensifies to a Category 3 with 115-mph winds when it makes landfall just west of the mouth of the Mississippi. During the next two days, it moves slowly northward, weakening to a Category 1 and stalling over eastern New Orleans.

Here's what would happen ...



2 PUMPED UP LAKE

Easterly winds in advance of the storm would pump water from Lake Borgne and from Breton and Chandeleur sounds into Lake Pontchartrain, raising the lake's surface by 5 feet.



3 SLIDELL SOAKED

Large parts of Slidell would be inundated, but the waters would recede rapidly with no means to contain them.

4 LAKE LEVEES HOLD

Winds on the west side would push water against the hurricane-protection levees.

5 ST. CHARLES SUBMERGED

Here, water in the lake would reach heights of 3-6 feet above normal, spilling into wetlands and lowlands in St. Charles and St. John parishes. The water would be deepest near the river levees.

6 GRAVITY'S GATEWAY

Relentless winds from the stalled hurricane push a dome of water 14 feet above sea level at the levees. The model says that water would top low levees and floodwalls and move east into Jefferson and Orleans parishes. Jefferson Parish officials say some areas would be overtopped in 10 feet but protection would be lower near the river.

7 FILLING THE BOWL

With the storm stalled, water continues to pour into Jefferson and Orleans, filling the bowl with as much as 9 feet of water until it reaches natural ridges or the Mississippi River levees.

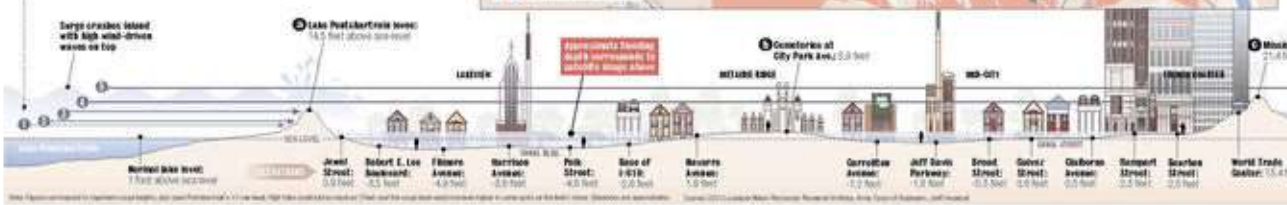
EXPLAINING THE BOWL

Much of the area is below sea level, creating a natural "bowl." Storm surge simply follows the law of gravity and inundates to the lowest points.

CITY BELOW THE SEA

When a hurricane even stronger than Georges hits New Orleans, Lake Pontchartrain — a foot higher than sea level — will be the city's biggest threat. Surge water from the Gulf of Mexico, topped by towering waves, will swell the lake above levees and cause widespread flooding. A look at average cut get level by category, compared to a cross-section of the city known as "the bowl".

Hurricane Category	Surge and waves at low tide*	Effect on New Orleans
1	7 feet	Lake Pontchartrain's levees stop the low-level surge.
2	9 feet	Levees stop the surge, but some waves could flow over.
3	14 feet	Levees stop bulk of surge, but waves could cause considerable flooding.
4	18 feet	Levees topped, causing catastrophic flooding.
5	24 feet	Entire city submerged including Mississippi River levees.



FOREIGN INVADERS

Nutria are large, beaver-like rodents imported from Argentina for the fur trade at the beginning of the 20th century. With few natural enemies, they turned Louisiana wetlands into their dinner table. They munch marsh grass and roots in large "eat-outs" without roots to hold it in place, marsh soils erode and turn into open water. Dozens of a few dollars a piece have failed to control the invaders.

CANALS/CHANNELS

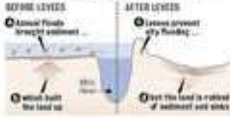
Thousands of miles of wildlife pipeline and navigation canals have destroyed some marshes and cut off others from natural water flow, opening them up to saltwater intrusion and erosion by boat traffic. Louisiana loses an acre of land from all causes, equivalent in size to three football fields, every 24 minutes.

SALTWATER INTRUSION

Saltwater from the Gulf moves inland through coastal and waterways such as the Mississippi River-Gulf Outlet. Freshwater plants that can't stand the salt. As the plants die, the soil their roots hold together is eroded away.

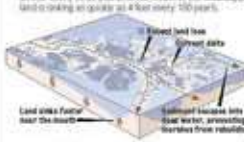
LEVEES

The Mississippi River's springtime floods piqued New Orleans for two centuries until levees protected the city and drained marsh channels for shipping. But the levees also cut off the sediment-rich floodwaters that built the land on which the city sits, and that kept sea the coastal marshes that help protect the city from hurricanes.



SUBSIDENCE

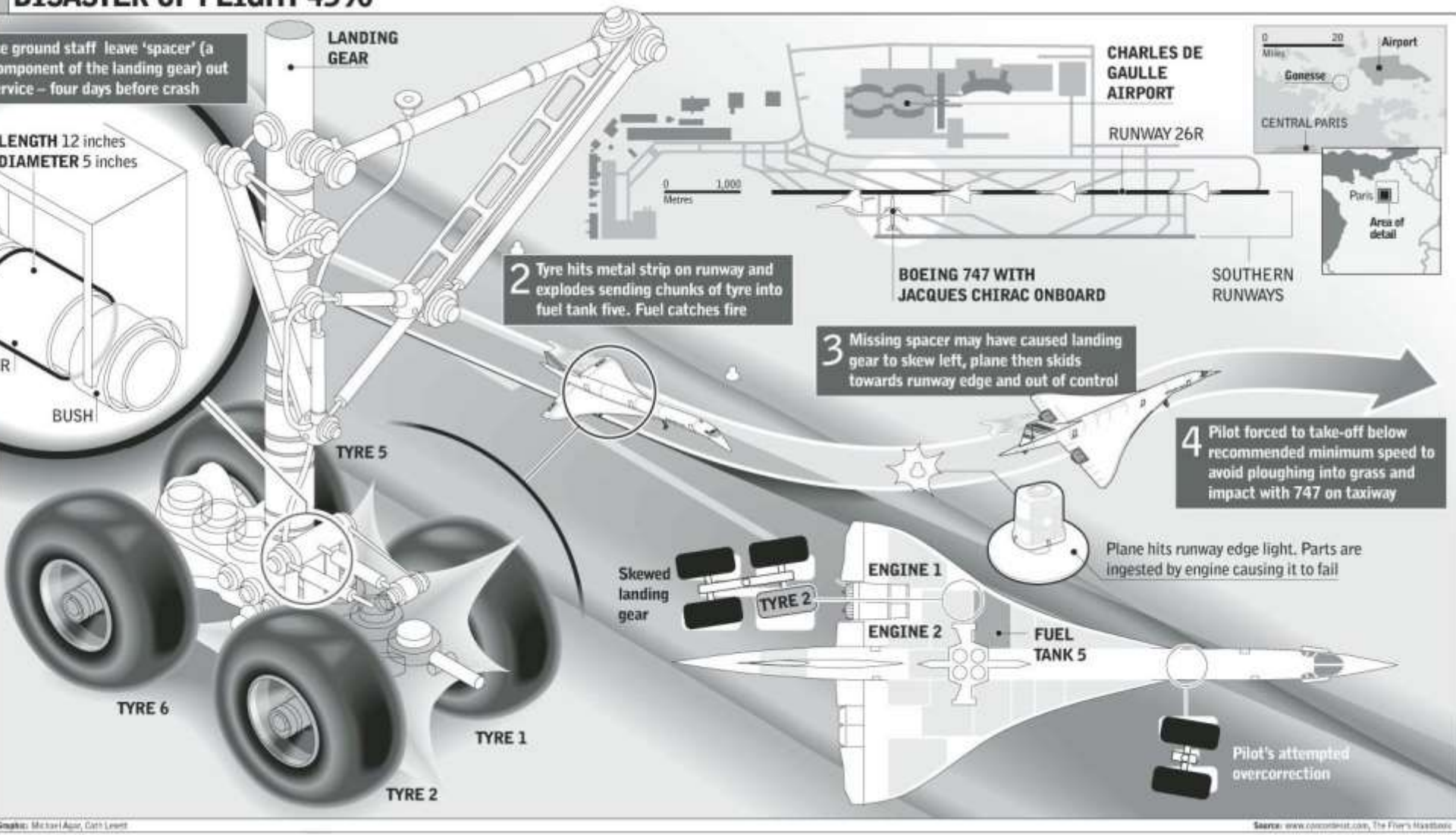
Soft sediment beneath Louisiana's coast is sinking, as wate and gases are squeezed out by the soil's own weight and new sediment fails to replenish the loss. In New Orleans, already 6 feet below sea level, land is sinking an average an inch every three years. At the mouth of the Mississipp land is sinking an average an 8 feet every 100 years.



SEA-LEVEL RISE

Scientists say global warming is adding to existing sea-lev rise and subsidence, and the Gulf of Mexico could rise by as much as 3 feet along Louisiana's coast in 100 years. A high tide and without coastal restoration, the following areas could flood:

DISASTER OF FLIGHT 4590

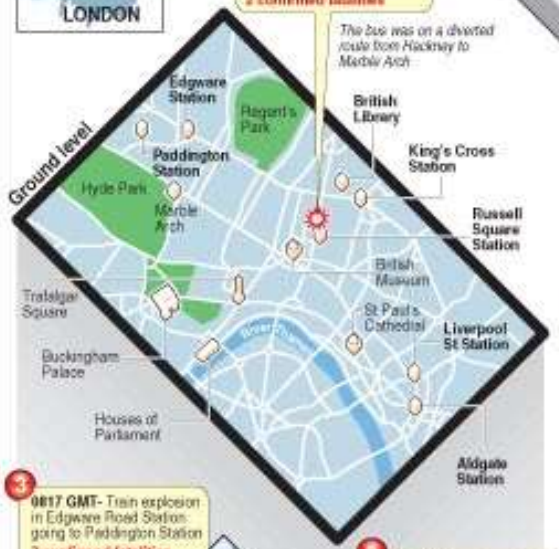


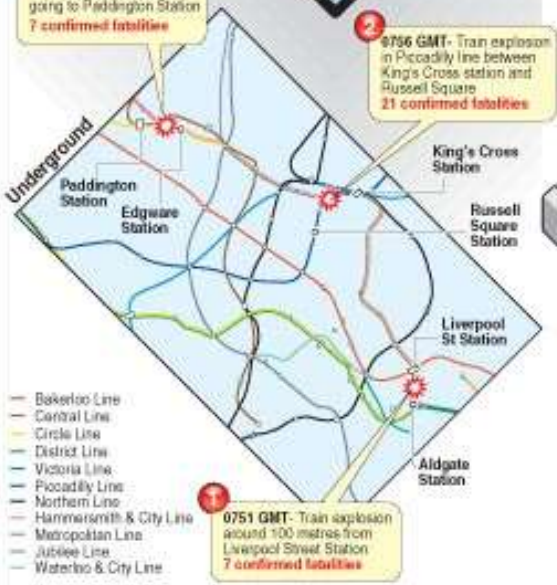
Graphics: Michael Agar, Cath Levett

Source: www.concordesst.com, The Flyer's Handbook

LONDON BLASTS

More than 50 people were killed and 700 injured in bomb attacks on a bus and several underground trains in London on Thursday. Officials believe the blasts bore hallmarks of an al-Qaeda terrorist attack





4 **0847 GMT**- Explosion rips through a No.30 double-decker bus on Woburn Place at Tavistock Square
2 confirmed fatalities

The bus was on a diverted route from Hackney to Marble Arch

3 **0817 GMT**- Train explosion in Edgware Road Station going to Paddington Station
7 confirmed fatalities

2 **0756 GMT**- Train explosion in Piccadilly line between King's Cross station and Russell Square
21 confirmed fatalities

1 **0751 GMT**- Train explosion around 100 metres from Liverpool Street Station
7 confirmed fatalities

1st explosion

- Train was 100 meters from Liverpool Street station headed from Aldgate carrying about 700 people
- Explosion ripped through third carriage tearing off roof and part of side wall
- Thick smoke and ash began to fill other carriages
- Doors were fixed shut and drivers were unsuccessful in opening them
- Passengers started moving towards back of train to escape from smoke and blaze
- Rescuers from Aldgate freed and escorted the passengers to Liverpool Street station

Bombs
The bombs were 4.5 kg explosives according to London Police specialists

All bombs on the trains were in a rucksack or carrier bag

4th explosion

The explosion ripped off the roof of the double-decker bus. Investigations are now relying on a CCTV camera present in the bus

The bomb was in a metal box placed on the rear upper deck

2nd explosion

From King's Cross Station

- Explosion occured in the first carriage
- Passengers smashed through windows and were lifted out by rescuers
- They were led out of both start and destination stations

3rd explosion

To Paddington Station

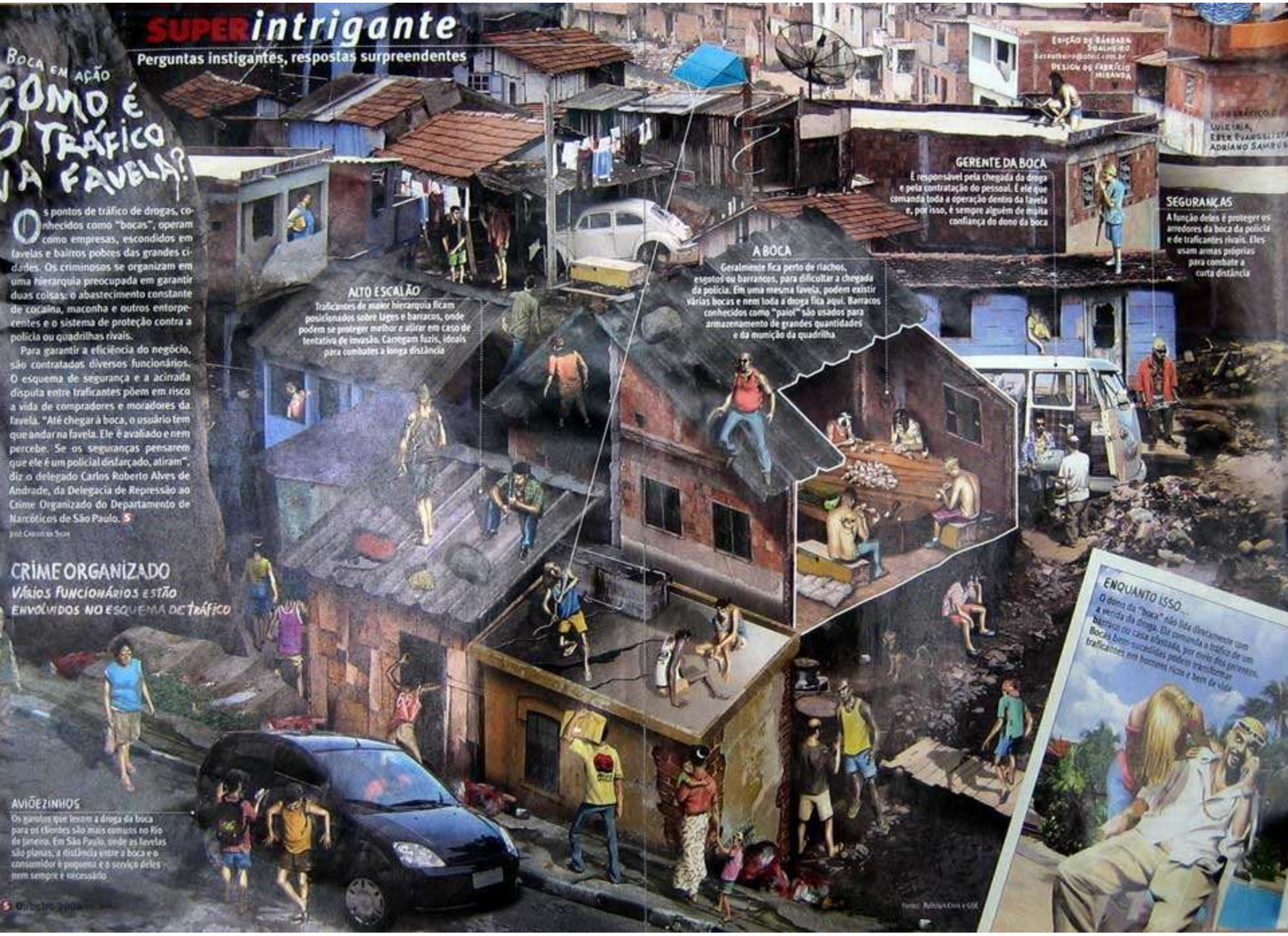
To Russell Square Station

- Train was pulling out of Edgware Road station towards Paddington
- Force of the blast tore through the carriage, the wall and a train traveling towards Edgware Road on the opposite platform
- The explosion occured in the second carriage
- Passengers in the middle carriages broke carriage door with fire-extinguishers and escaped
- Rescuers have yet gone into the worst affected carriage because of danger of tunnel collapsing
- Underground staff arrived from Edgware station and began evacuating passengers from back of train

To Edgware Road Station

Source: London Metropolitan Police, Guardian Unlimited

REUTERS


SUPER intrigante
Perguntas instigantes, respostas surpreendentes
BOCA EM AÇÃO
COMO É O TRÁFICO NA FAVELA?
Os pontos de tráfico de drogas, conhecidos como "bocas", operam como empresas, escondidos em favelas e bairros pobres das grandes cidades. Os criminosos se organizam em uma hierarquia preocupada em garantir duas coisas: o abastecimento constante de cocaína, maconha e outros entorpecentes e o sistema de proteção contra a polícia ou quadrilhas rivais.
Para garantir a eficiência do negócio, são contratados diversos funcionários. O esquema de segurança e a acirrada disputa entre traficantes põem em risco a vida de compradores e moradores da favela. "Até chegar à boca, o usuário tem que andar na favela. Ele é avaliado e nem percebe. Se os seguranças pensarem que ele é um policial disfarçado, atiram", diz o delegado Carlos Roberto Alves de Andrade, da Delegacia de Repressão ao Crime Organizado do Departamento de Narcóticos de São Paulo.
CRIME ORGANIZADO
Vários funcionários estão envolvidos no esquema de tráfico
ALTO ESCALÃO
Traficantes de maior hierarquia ficam posicionados sobre lajes e barracos, onde podem se proteger melhor e atirar em caso de tentativa de invasão. Carregam fuzis, ideais para combates a longa distância
A BOCA
Geralmente fica perto de riachos, esgotos ou barrancos, para dificultar a chegada da polícia. Em uma mesma favela, podem existir várias bocas e nem toda a droga fica aqui. Barracos conhecidos como "paiol" são usados para armazenamento de grandes quantidades e da munição da quadrilha
GERENTE DA BOCA
É responsável pela chegada da droga e pela contratação do pessoal. É ele que comanda toda a operação dentro da favela e, por isso, é sempre alguém de muita confiança do dono da boca
SEGURANÇAS
A função deles é proteger os arredores da boca da polícia e de traficantes rivais. Eles usam armas próprias para combate a curta distância
AVIÕEZINHOS
Os garotos que levam a droga da boca para os clientes são mais comuns no Rio de Janeiro. Em São Paulo, onde as favelas são planas, a distância entre a boca e o consumidor é pequena e o serviço deles nem sempre é necessário
ENQUANTO ISSO...
O dono da "boca" não lida diretamente com a venda da droga. Ele comanda o tráfico de um barraco ou casa afastada, por meio dos gerentes. Bocas bem-sucedidas podem transformar traficantes em homens ricos e bem de vida

THE TRANSATLANTIC SUPERHIGHWAY

Every day, about 1,200 aircraft fly inside the North Atlantic Organized Track System. Here we follow a typical evening flight from New York's JFK to London's Heathrow as it cruises along the V track at 35,000 feet.

Graphics by John Grimwade

Concorde flew between 50,000 and 60,000 feet, far above the main traffic flow.

4 HALFWAY POINT
At 30W,* responsibility for the flight is transferred from Gander to Prestwick Oceanic Air Traffic Control in Scotland.

Some flight levels are reserved for aircraft flying in the direction opposite the peak flow.

360 MILES

3 POSITION CHECK
Aircraft in oceanic airspace are out of radar contact for about four hours. Position reports are made by radio at every 10 degrees of longitude, and the information is used to update displays at the oceanic control centers.

Aircraft crossing the main traffic flow (for example, Madrid to Los Angeles) are routed above or below the track system.

FLIGHT LEVELS (FEET)
39,000
37,000
35,000
33,000
31,000
29,000

ORGANIZED TRACK SYSTEM

T
U
V
W
X

2 SAFETY ENVELOPE
Aircraft must keep minimum distances from one another in the track system, while maintaining constant altitude and speed.

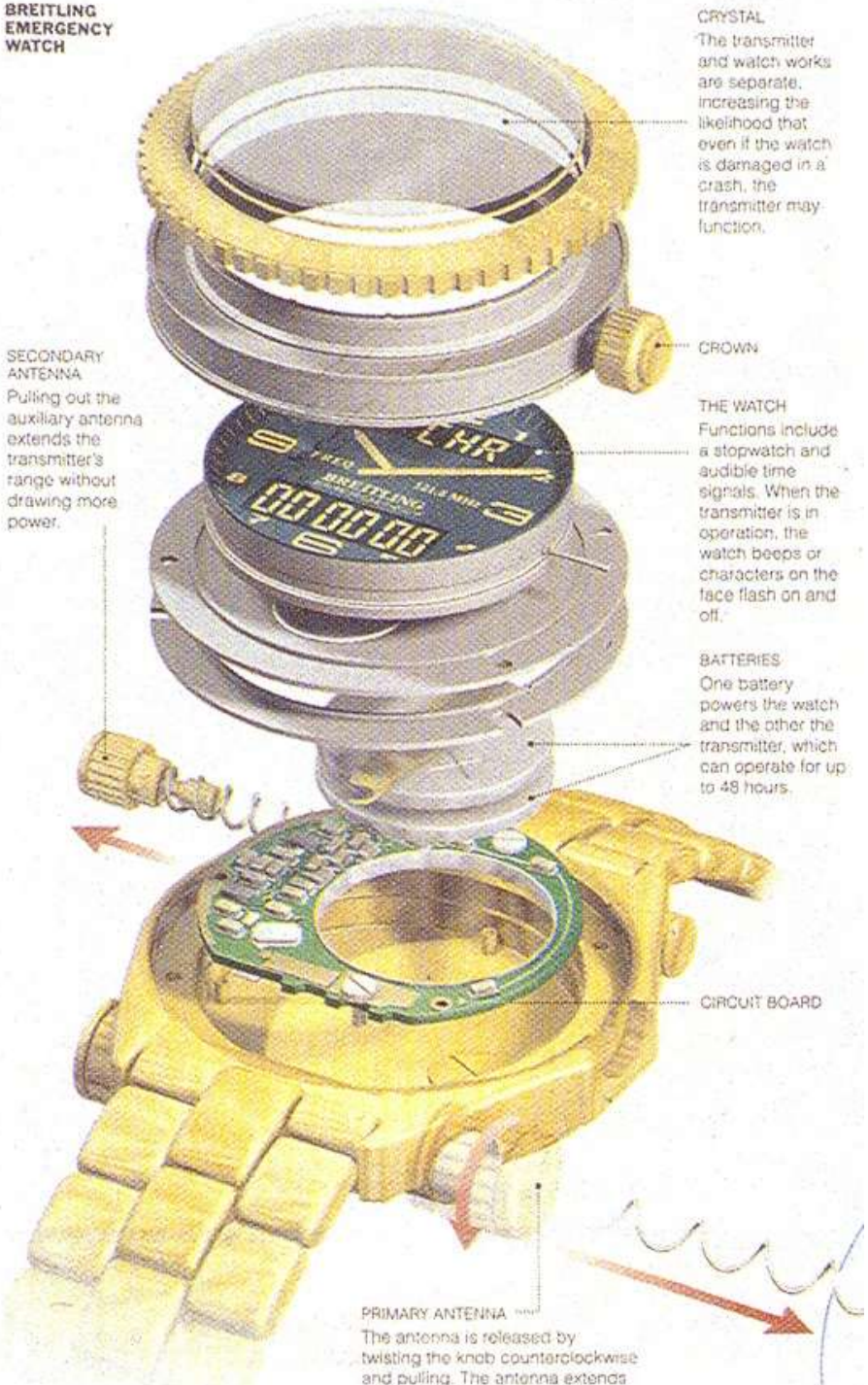
1 GETTING IN LINE
Taking into account airlines' preferred routes, oceanic controllers at Gander, Newfoundland, organize aircraft approaching from different directions into position for the Atlantic crossing. This flight is entering the system on track V at 35,000 feet.

ICELAND
GREENLAND
CANADA
NEWFOUNDLAND
Gander
UNITED KINGDOM
Prestwick
Shannon
IRELAND
SHANWICK OCEANIC CONTROL AREA
GANDER OCEANIC CONTROL AREA
WESTBOUND (DAY)
EASTBOUND (NIGHT)
A B C D E
T U V W X
30°W
JET STREAM
NORTH ATLANTIC OCEAN

EAST INTO THE NIGHT

As a result of passenger demand, time zone differences, and airport noise restrictions, North Atlantic air traffic has two peak flows: eastbound, leaving North America in the evening, and westbound, leaving Europe in the morning. Every 12 hours a new track system is prepared, to allow as many aircraft as possible to follow the most economical flight paths. Because of changing weather conditions, the track positions are rarely identical.

BREITLING EMERGENCY WATCH



CRYSTAL
The transmitter and watch works are separate, increasing the likelihood that even if the watch is damaged in a crash, the transmitter may function.

CROWN

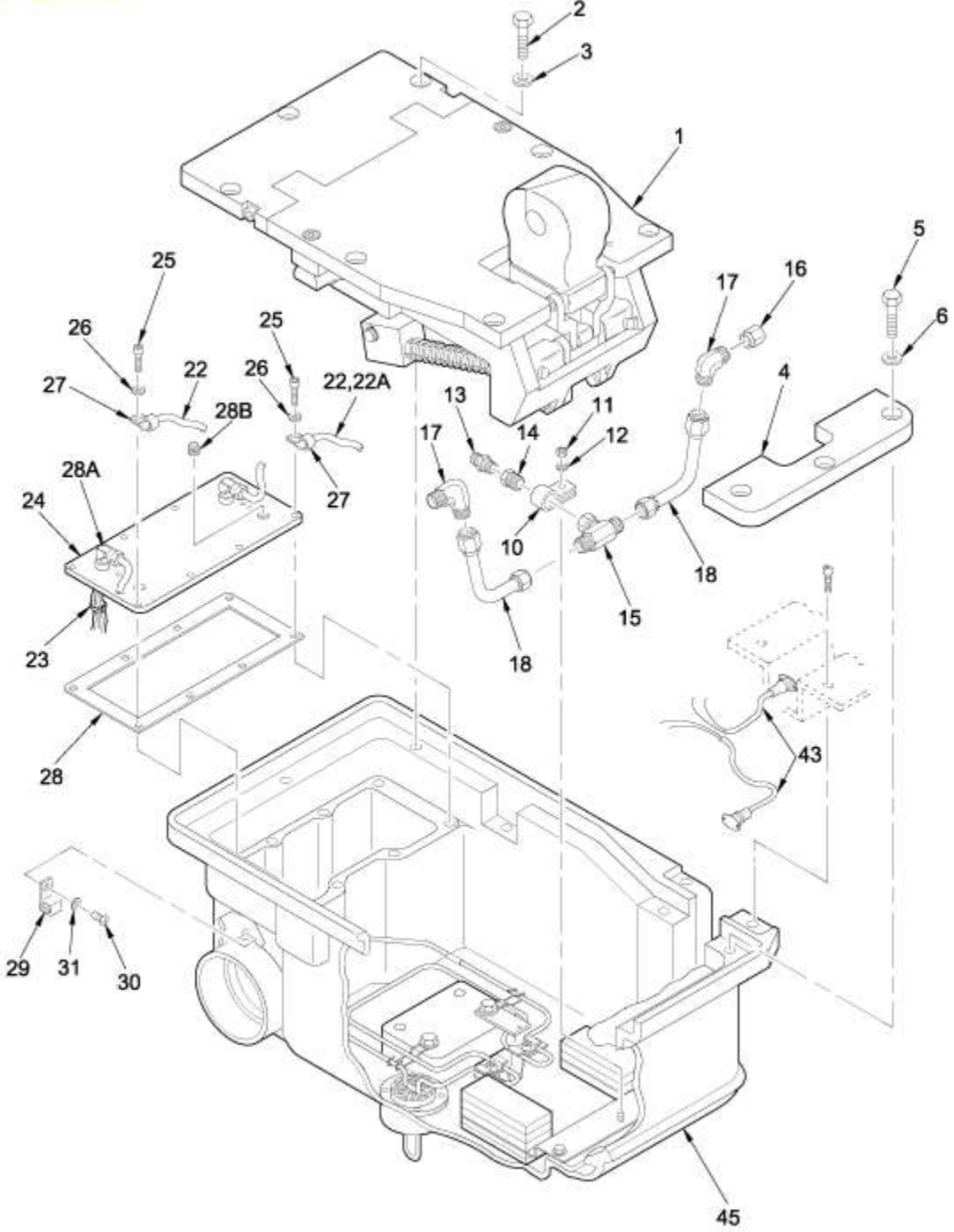
THE WATCH
Functions include a stopwatch and audible time signals. When the transmitter is in operation, the watch beeps or characters on the face flash on and off.

BATTERIES
One battery powers the watch and the other the transmitter, which can operate for up to 48 hours.

CIRCUIT BOARD

SECONDARY ANTENNA
Pulling out the auxiliary antenna extends the transmitter's range without drawing more power.

PRIMARY ANTENNA
The antenna is released by twisting the knob counterclockwise and pulling. The antenna extends


2
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17
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25
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27
22
28B
25
26
22,22A
27
13
14
11
12
17
10
18
15
18
28A
24
23
28
43
29
31
30
45

"All the News That's Fit to Print"

The New York Times

FRIDAY, MARCH 27, 2020

JOB LOSSES SOAR; U.S. VIRUS CASES TOP WORLD

New Data Shows Staggering Toll of Outbreak

Unfilled Posts Force Scramble By Washington

Online Class With No Way To Get There

Courage at a Brooklyn Hospital, At the Front of an Invisible War

With Supplies Waning, Workers Soldier On

No Crowd, but I'll Take You Out to the Ballgame

A Fan Writes a Fantasy for Opening Day

Armed With Sewing Machines

A Gusher Can't Be Contained

Maduro Is Indicted in U.S.

Netanyahu Rival Relents

New Focus on Health System

Starting Over on Foster Care

Slow to Embrace a Delay

For Pint-Size Paleontologists

It's Virtually Perfect

Chronicler of U.S. History

Globetrotters' Dean of Dribble

Paul Krugman

The New York Times

JOB LOSSES SOAR; U.S. VIRUS CASES TOP WORLD

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Online Class With No Way To Get There

Courage at a Brooklyn Hospital, At the Front of an Invisible War

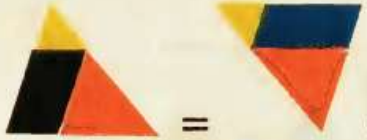
No Crowd, but I'll Take You Out to the Ballgame

Oliver Byrne's *Elements of Euclid*. 1847

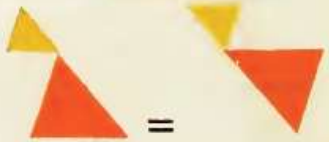
THE *complements*

and

of the parallelograms which are about the diagonal of a parallelogram are equal.



= (pr. 34.)

and  = (pr. 34.)

∴  = (ax. 3.)

Q. E. D.

TO *a given ſtraight line* (——) *to apply a parallelogram equal to a given triangle* ( ), *and having an angle equal to a given rectilinear angle* ( ).

Make  =  with  = 

(pr. 42.)

and having one of its ſides ------ conterminous with and in continuation of ——.

Produce —— till it meets  || ------

draw —— produce it till it meets - - - - continued;

draw - - - - || ·····—— meeting 

produced, and produce ·····.

 = (pr. 43.)

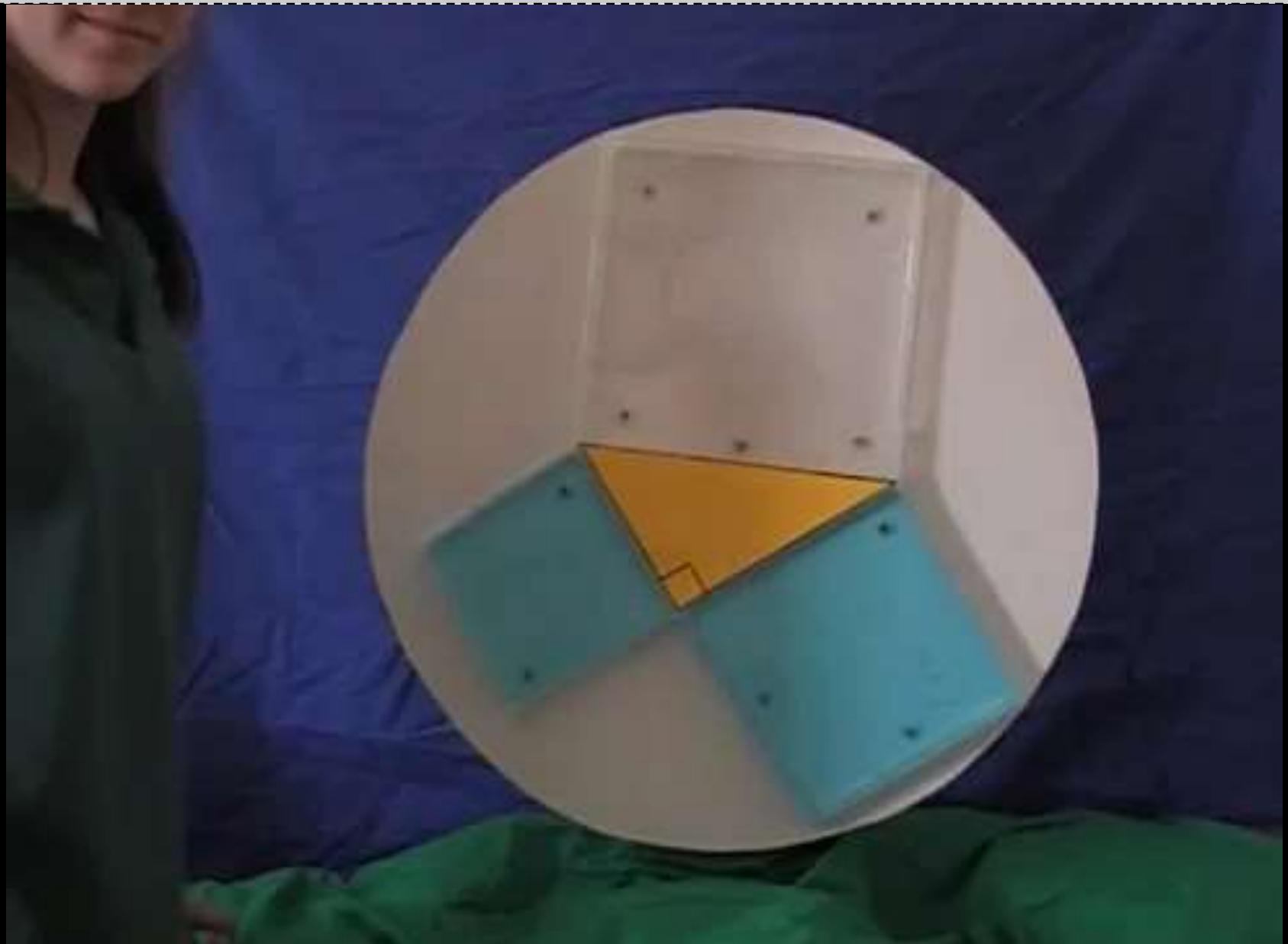
but  = (conſt.)

∴  = ; and

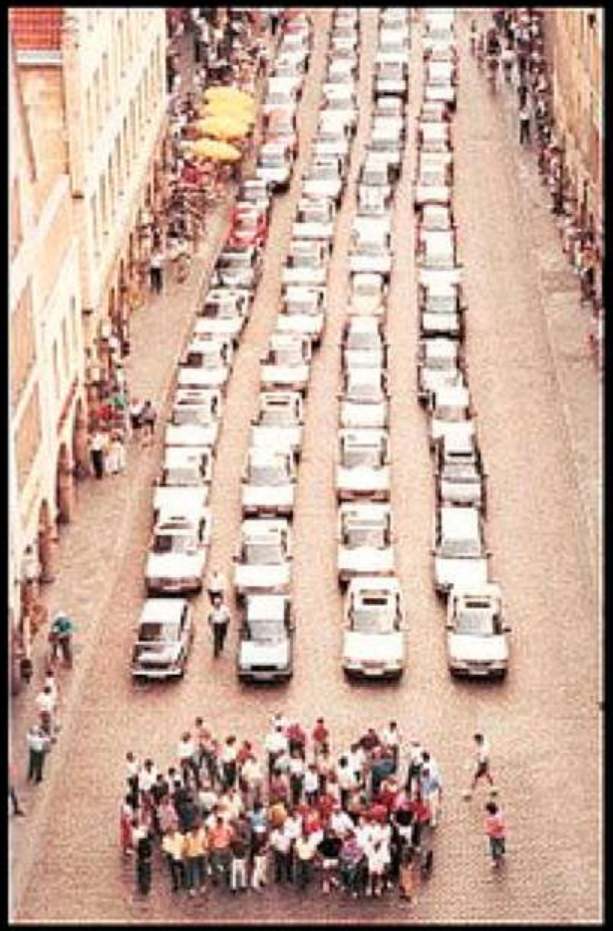
 (pr. 19. and conſt.)

Q. E. D.

A tangible visualization of Pythagorean theorem



space required to transport **60 people**

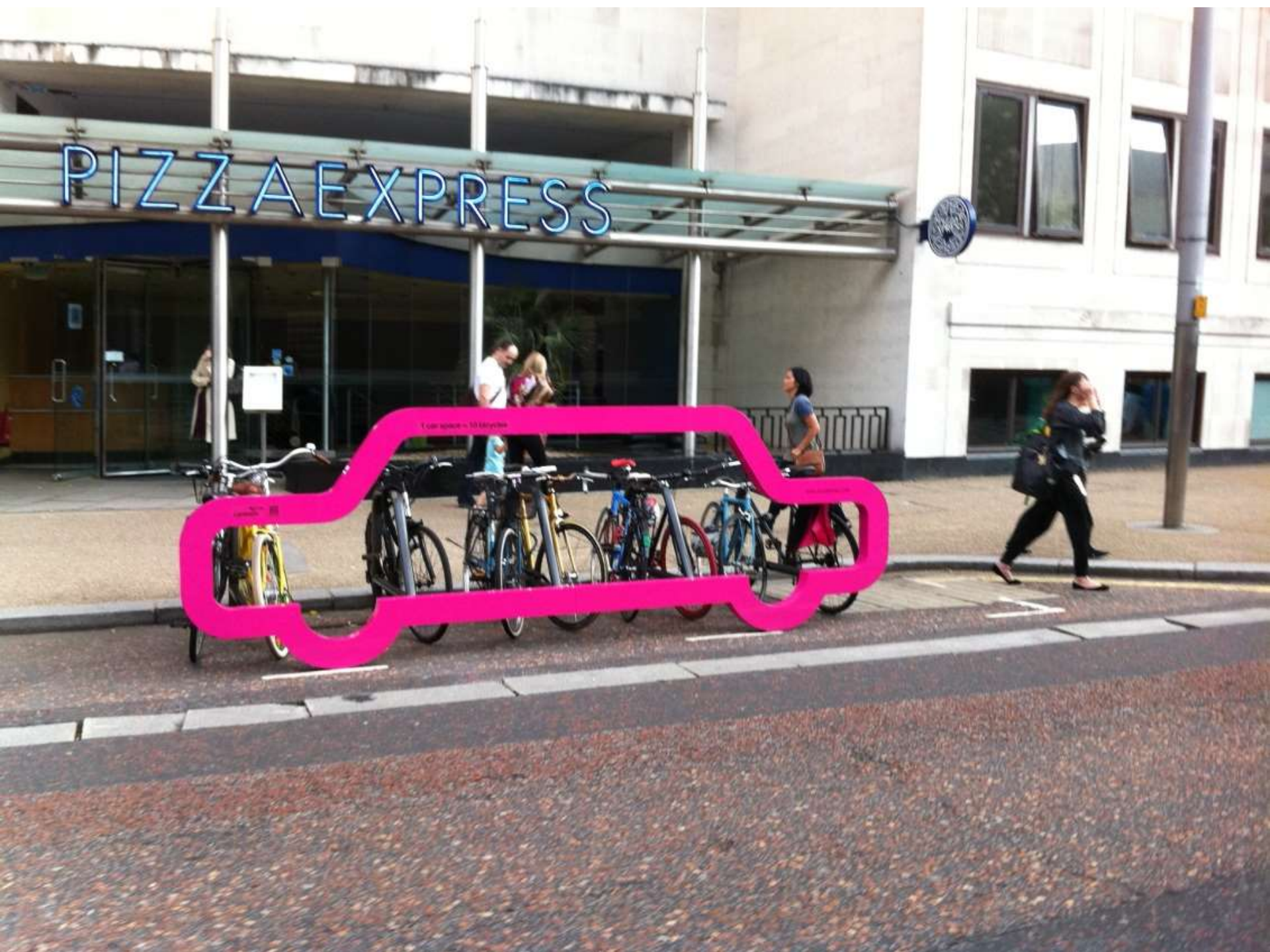


car

bus

bicycle

Nadeem Haidary's visualization of caloric consumption per capita


PIZZAEXPRESS

Hungry Planet: What The World Eats – Peter Menzel

https://time.com/8515/what-the-world-eats-hungry-planet/

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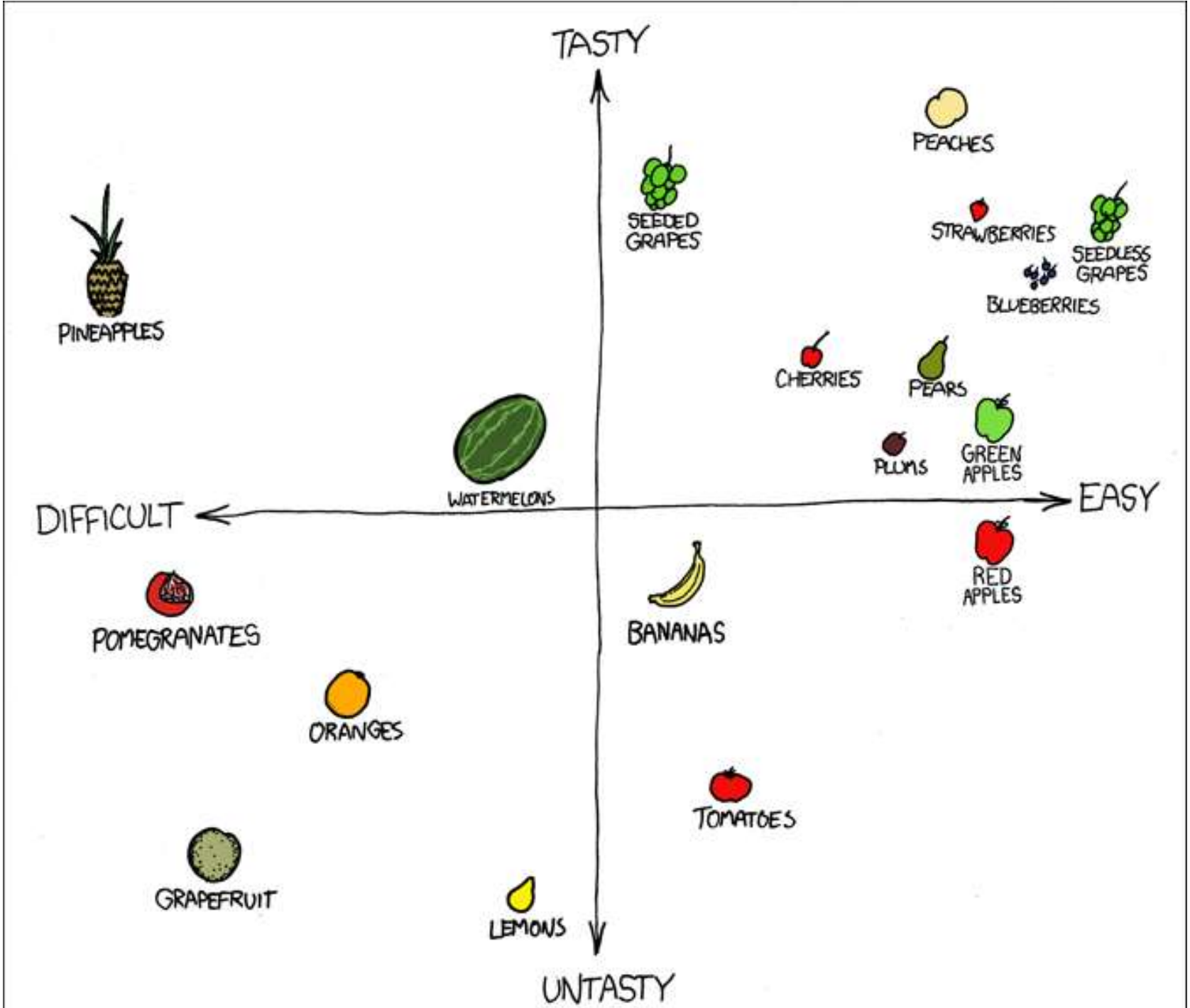
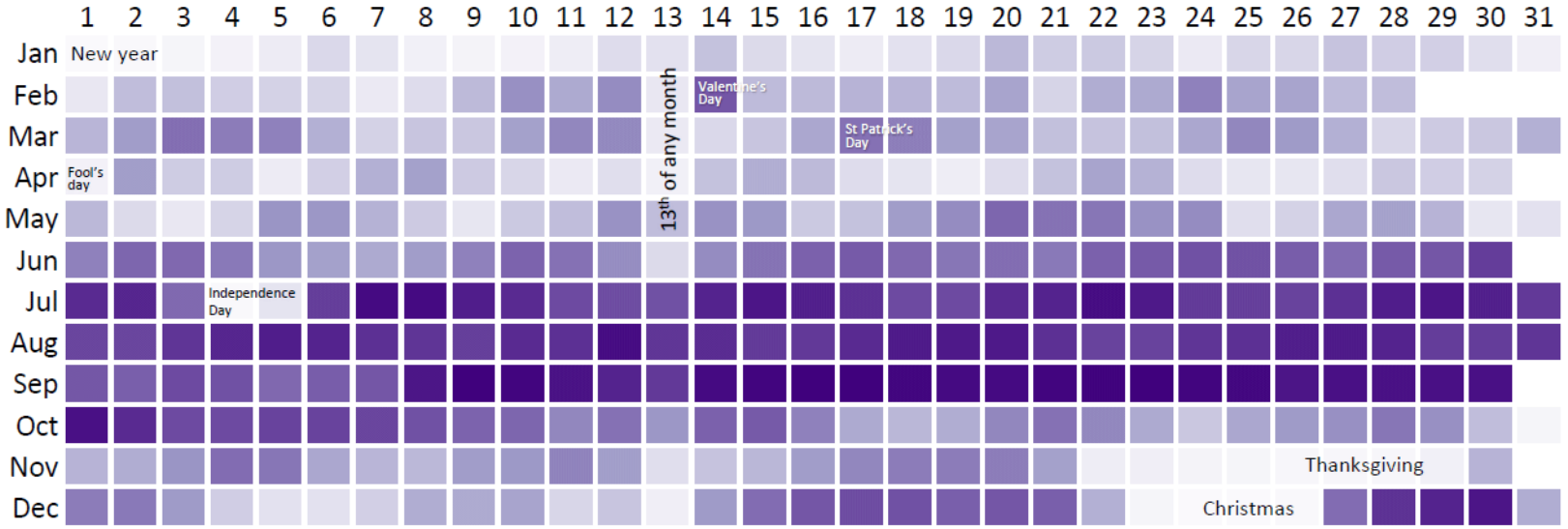

TASTY
UNTASTY
DIFFICULT
EASY
PINEAPPLES
SEEDED GRAPES
PEACHES
STRAWBERRIES
SEEDLESS GRAPES
BLUEBERRIES
CHERRIES
PEARS
PLUMS
GREEN APPLES
WATERMELONS
RED APPLES
POMEGRANATES
BANANAS
ORANGES
TOMATOES
GRAPEFRUIT
LEMONS

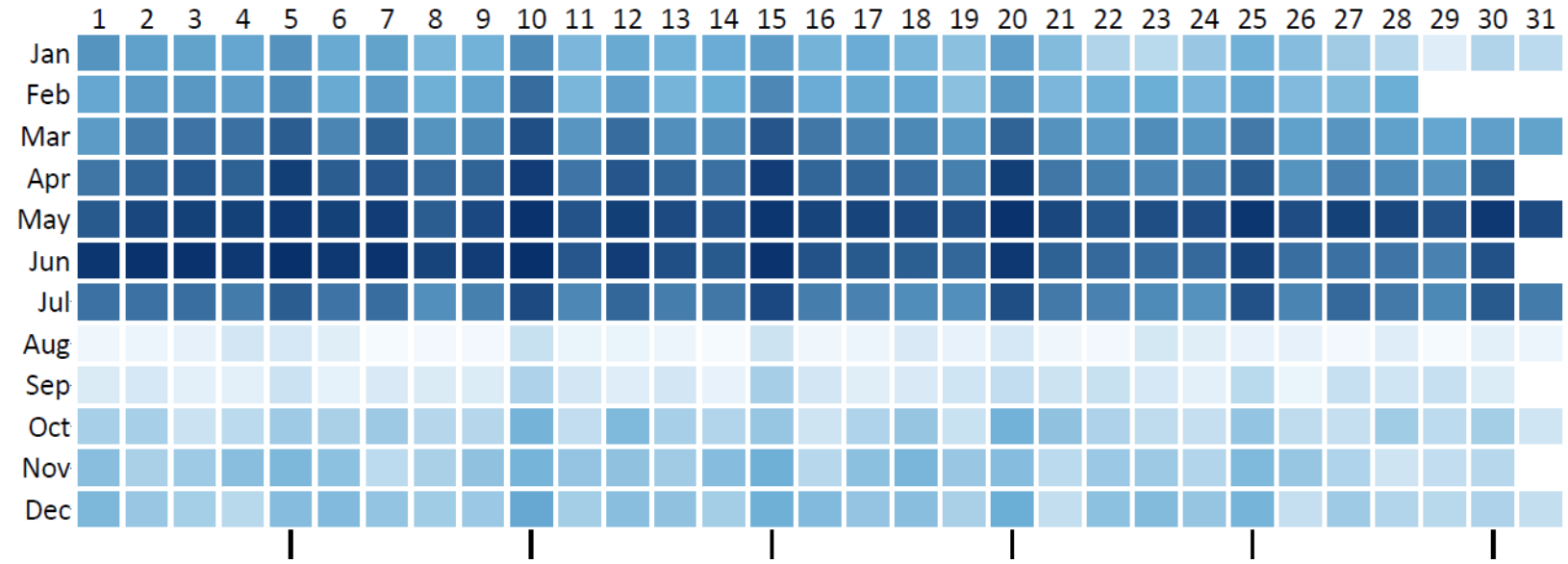
Birthdays in the U.S and in India, Gramener



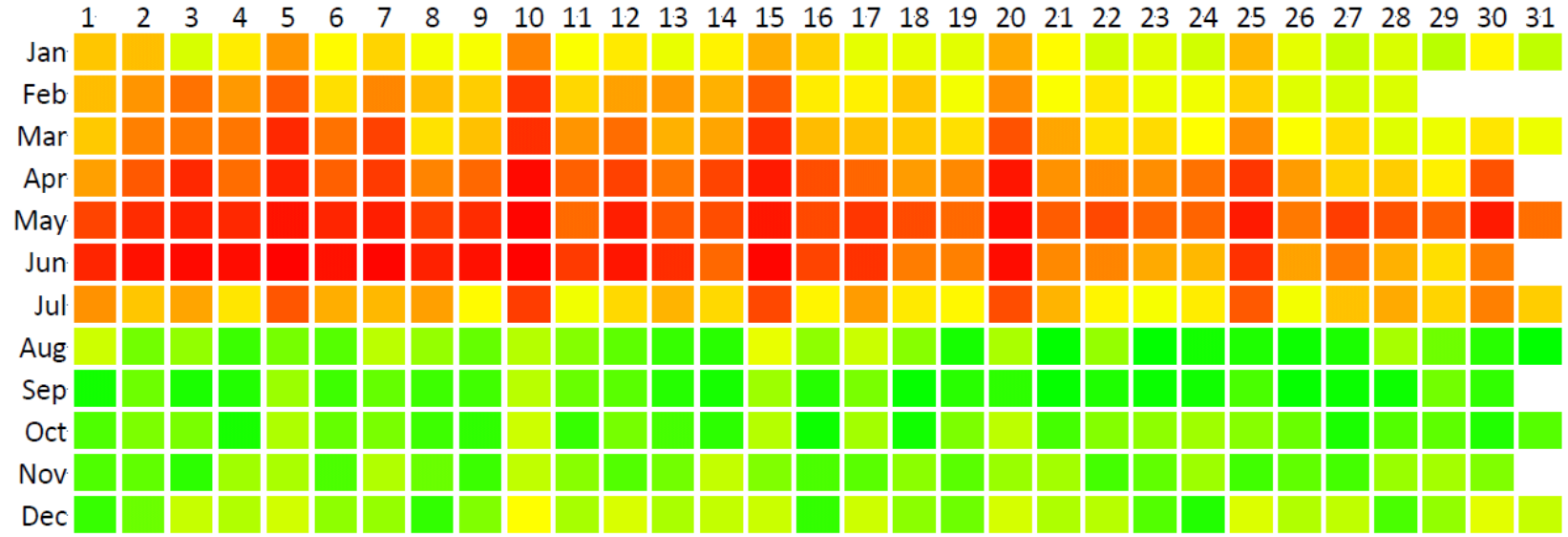
U.S. Birthdays

Most birthdays are in Jul – Sep, roughly 9 months after the winter holidays

Birthdays in the U.S and in India, Gramener

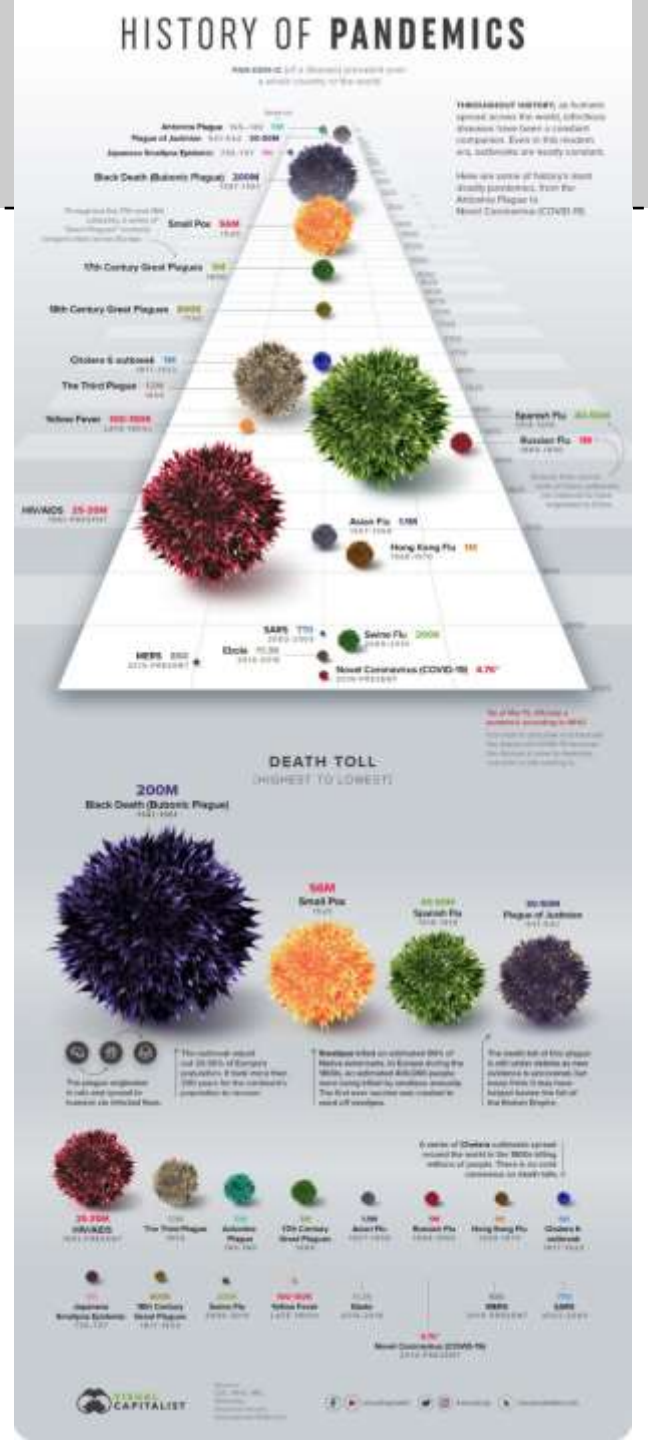


Birthdays in the U.S and in India, Gramener



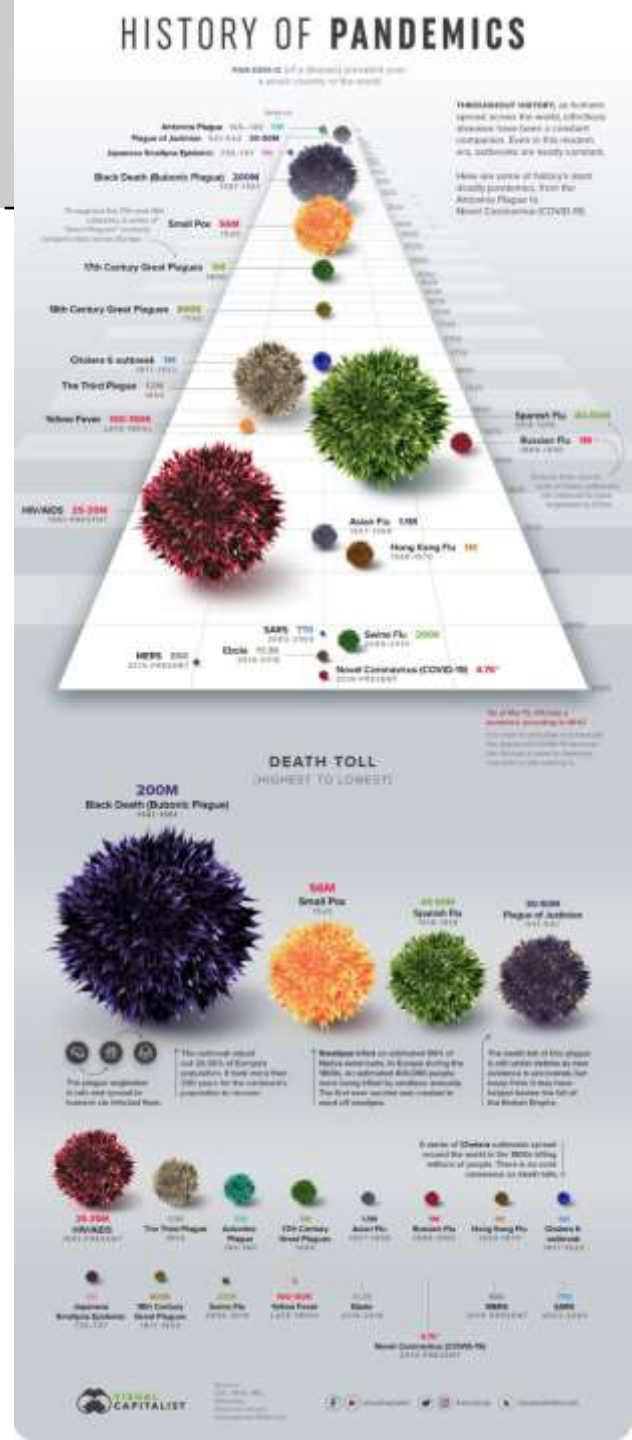
Assignment 1

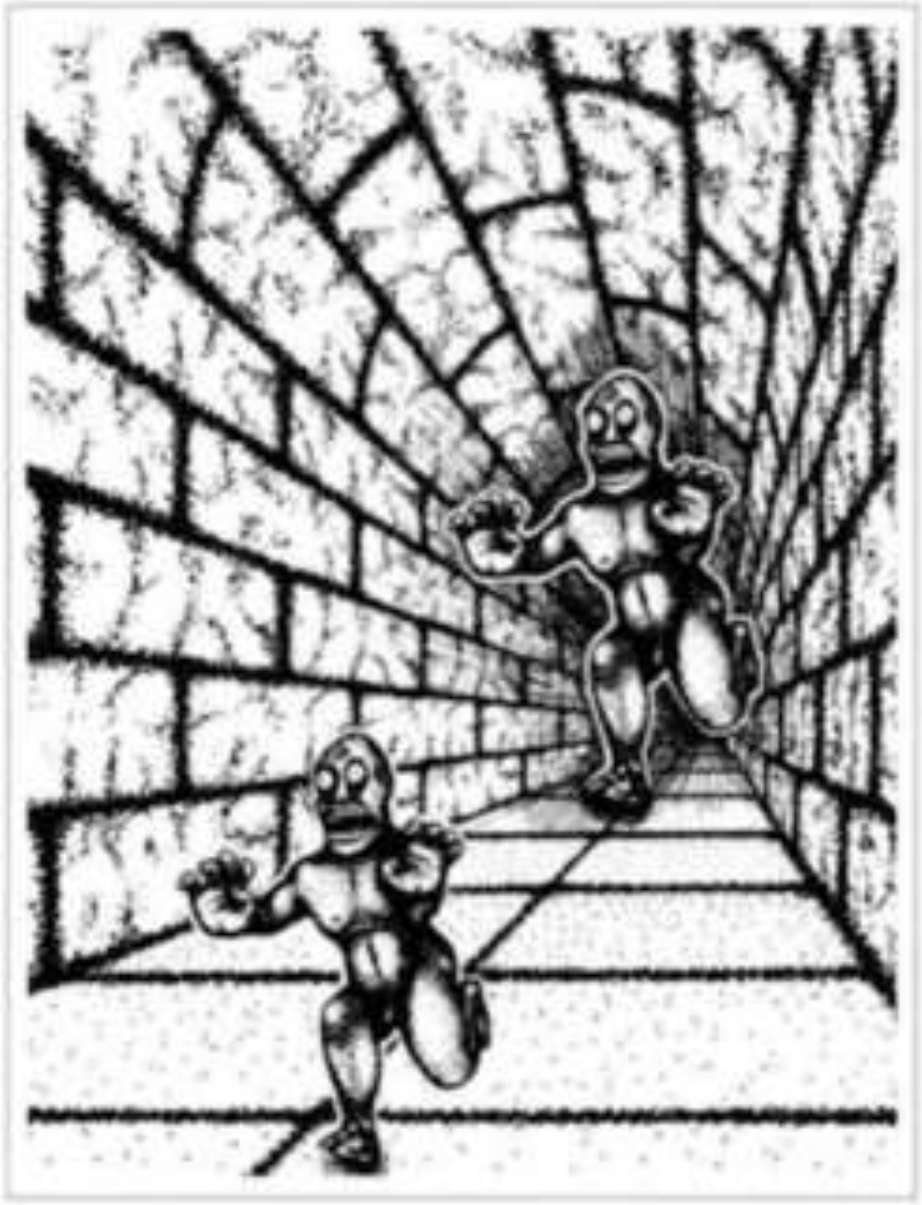
https://www.visualcapitalist.com/history-of-pandemics-deadliest/

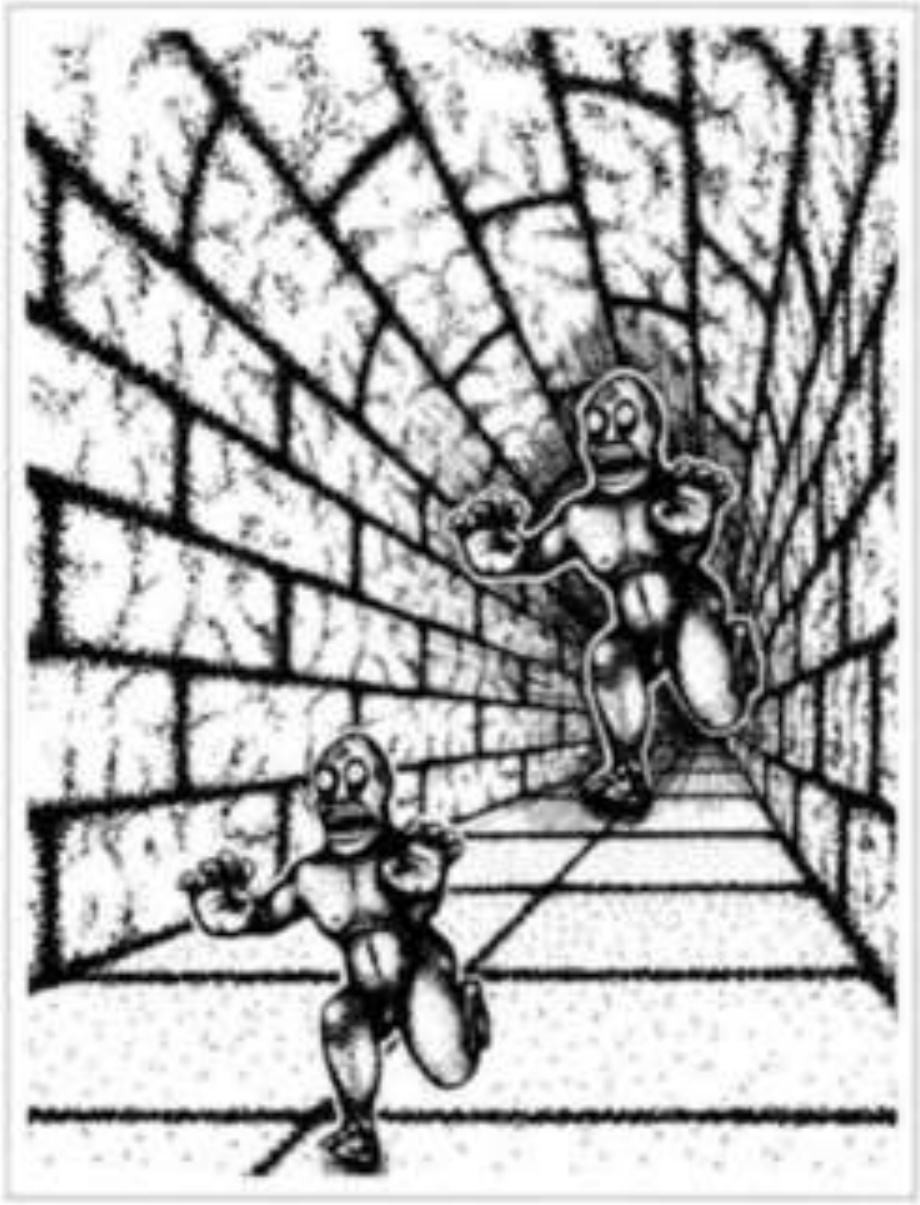


Assignment 1

- Comparison of length, area, or volume?
- Fuzzy edges
- Colour coding?
- Shape coding?
- Semantic coding?
- *Ponzo illusion* (linear perspective - unless blobs are created inside some strictly observed three-dimensioned model of space)
- Annotations?
- Should it be relative to time? How does 1 million in 6 years compare with half a million in 6 weeks?
- Should it be adjusted for era? (5 million deaths from 165 to 180 AD would be something like 180 million today)
- 7 of them are caused by bacteria, not viruses







Assignment 1

https://www.forbes.com/sites/matthewherper/2013/02/19/a-graphic-that-drives-home-how-vaccines-have-changed-our-world/#4ca9fb2b3302