

Developing scientific data visualizations for non-specialist audiences

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**SCIENTIFIC
AMERICAN**

www.ScientificAmerican.com

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data visualization

Information (chiefly numerical),
made visible.

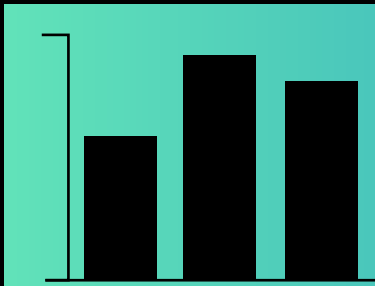
data visualization

Information (chiefly numerical),
made visible.

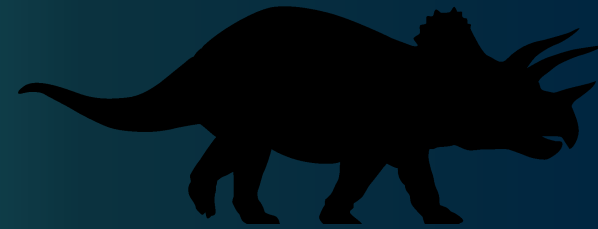


data visualization

Information (chiefly numerical),
made visible.



abstract representations



figurative illustrations

[content]

Information (chiefly numerical),
made visible.

[content]

Information (chiefly numerical),
made visible.

[context]

For whom and why?

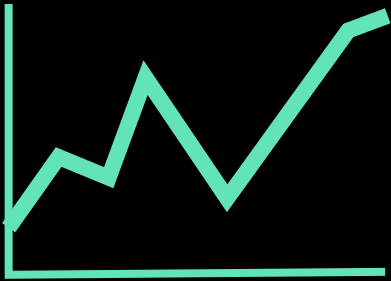
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[content]

data / information

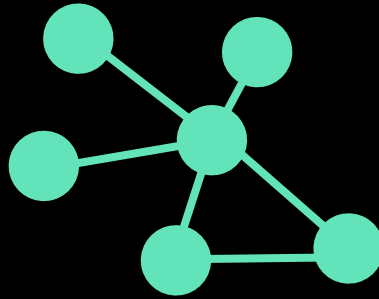
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data / information



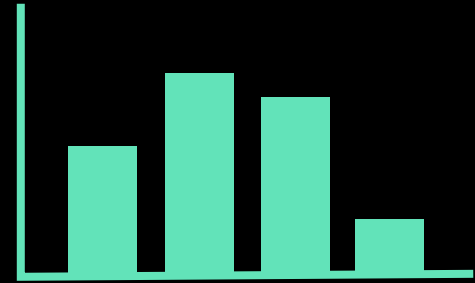
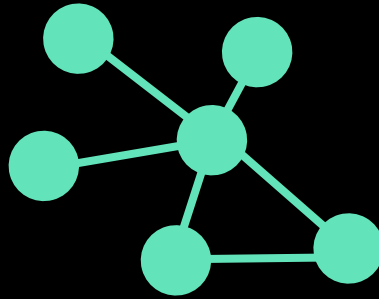
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data / information



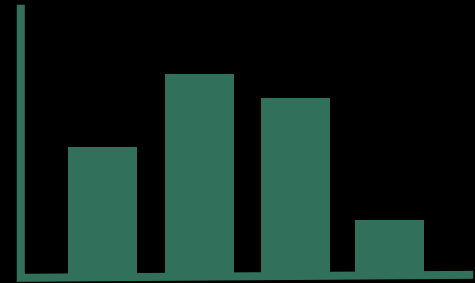
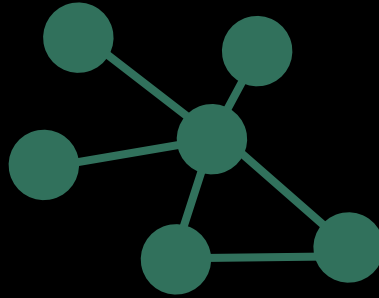
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data / information



[content]

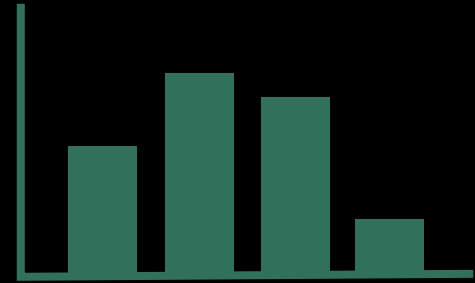
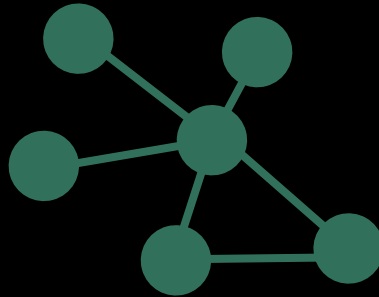
data / information



[context]

[content]

data / information



[context]

audience and purpose

Developing scientific data
visualizations for non-specialist
audiences

[content]

Developing scientific data
visualizations for non-specialist
audiences

[context]

organizing your [content]

- basic design tips
- choosing the right chart type
- more resources

organizing your **[content]**

- basic design tips
- choosing the right chart type
- more resources

customizing for a different **[context]**

- simple edits / reframing
- moderate reworks
- custom solutions

Data Visualization Advice for Scientists

Dataviz engineer Robert Simmon demonstrates how adhering to a few best-practice design principles can make graphics easier to read

By Robert Simmon on February 19, 2016

http://bit.ly/SST_redesign

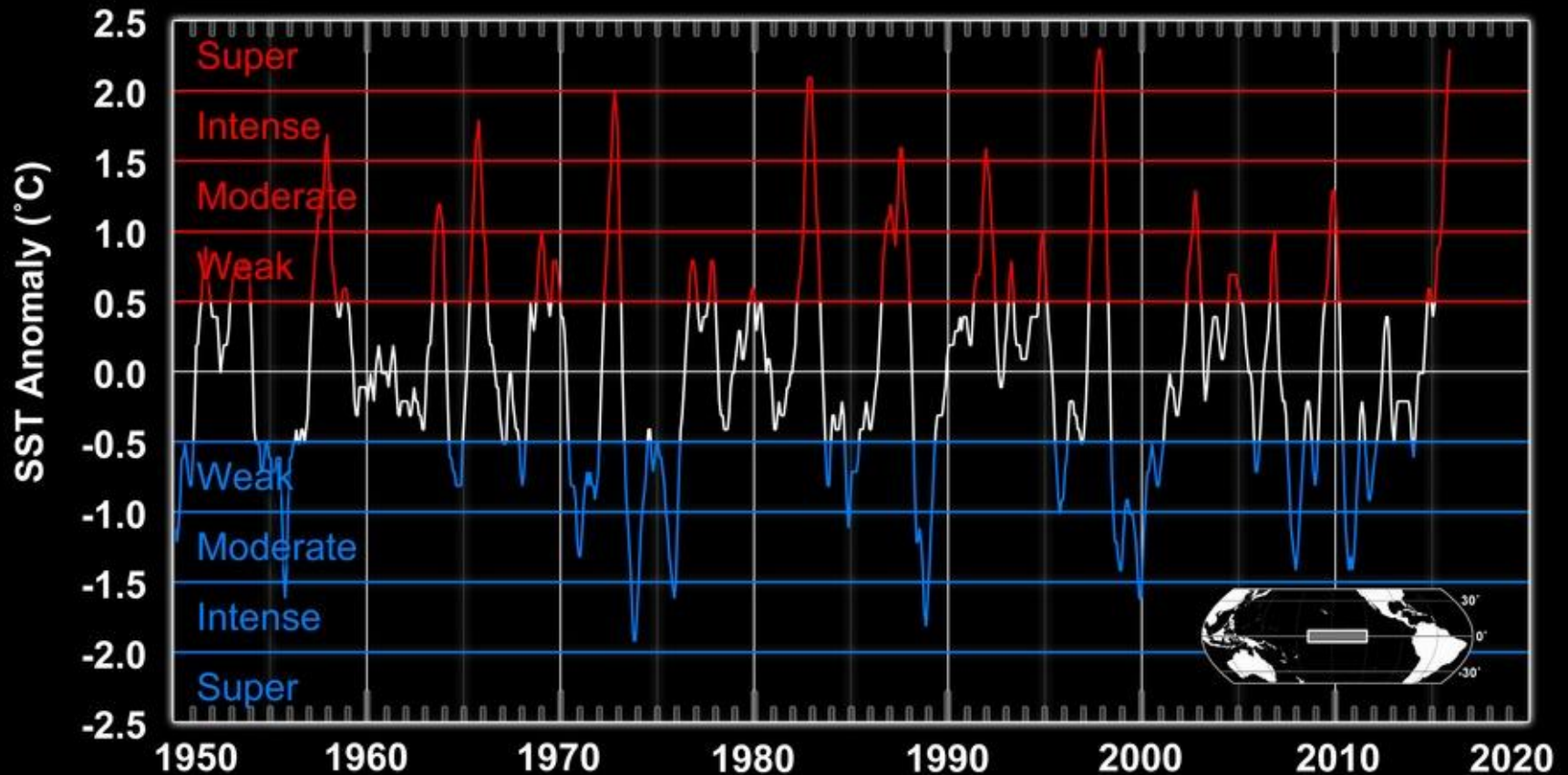
NOAA Sea Surface Temperature Anomaly ($^{\circ}$ C)
for Oceanic Niño Region 3.4 (5° S– 5° N, 170° W– 120° W)

2

Super

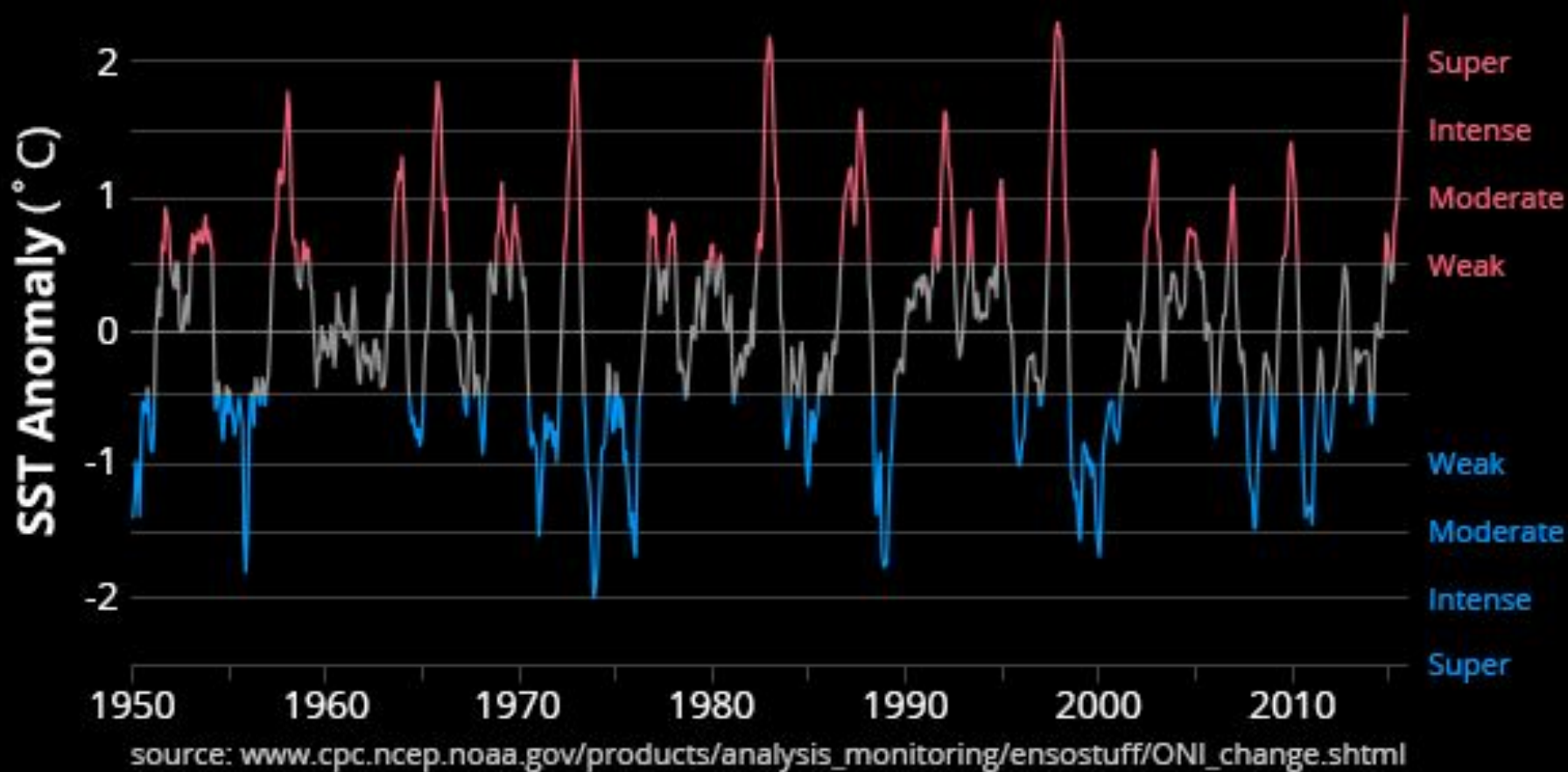
NOAA Sea Surface Temperature Anomaly (°C)

for Oceanic Nino Index Region 3.4 (5°S - 5°N, 170°W - 120°W)



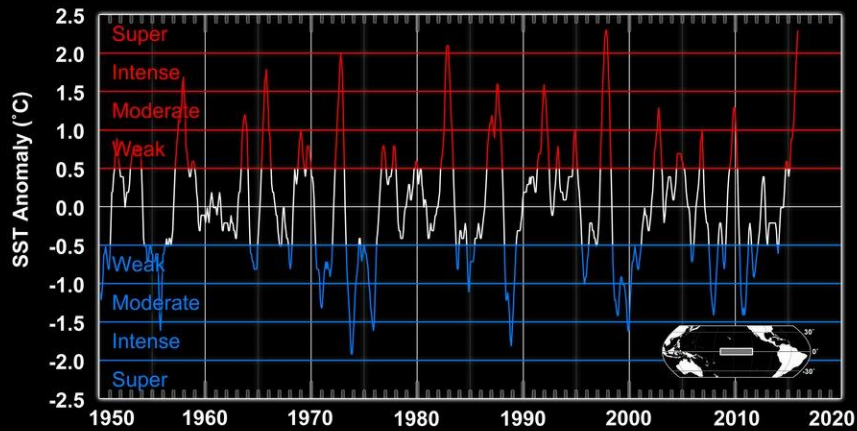
NOAA Sea Surface Temperature Anomaly (° C)

for Oceanic Niño Region 3.4 (5 ° S–5 ° N, 170 ° W–120 ° W)



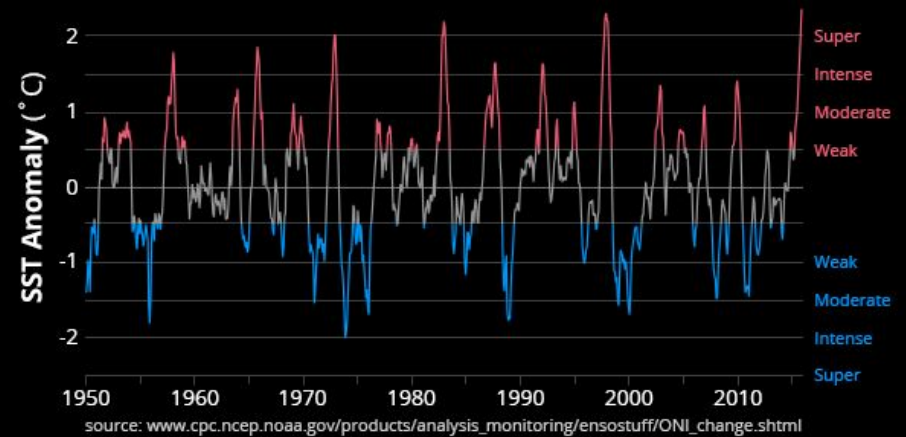
original

NOAA Sea Surface Temperature Anomaly (°C)
for Oceanic Niño Index Region 3.4 (5°S - 5°N, 170°W - 120°W)



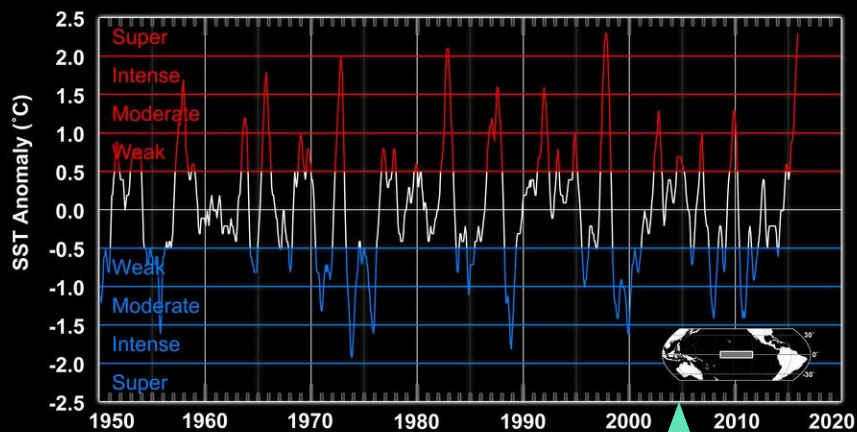
redesign

NOAA Sea Surface Temperature Anomaly (°C)
for Oceanic Niño Region 3.4 (5°S-5°N, 170°W-120°W)



original

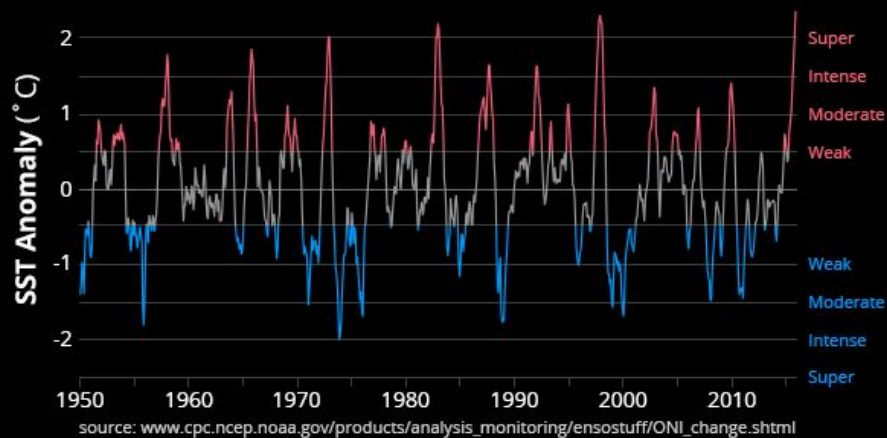
NOAA Sea Surface Temperature Anomaly (°C)
for Oceanic Niño Index Region 3.4 (5°S - 5°N, 170°W - 120°W)



removed frame

redesign

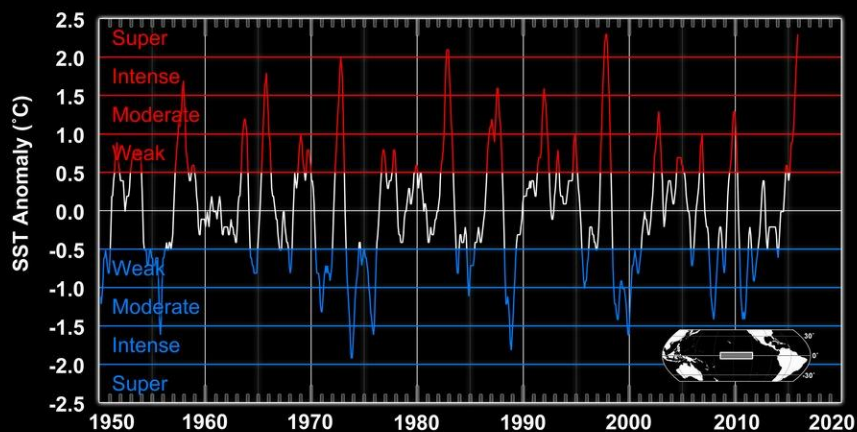
NOAA Sea Surface Temperature Anomaly (°C)
for Oceanic Niño Region 3.4 (5°S-5°N, 170°W-120°W)



original

NOAA Sea Surface Temperature Anomaly (°C)

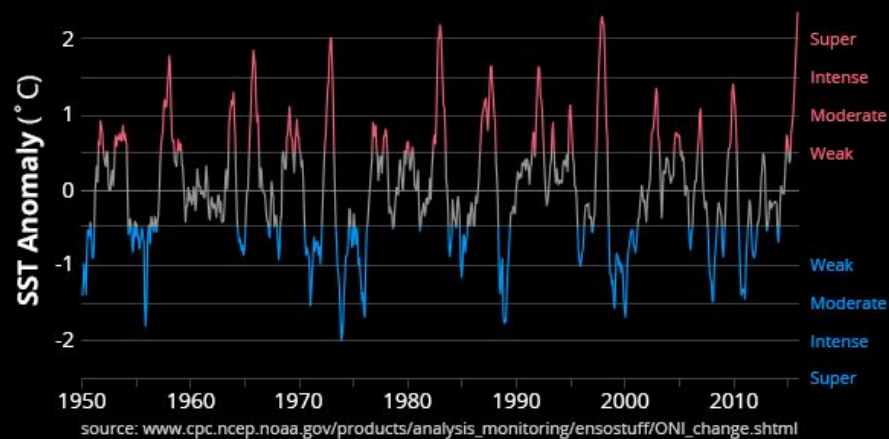
for Oceanic Niño Index Region 3.4 (5°S - 5°N, 170°W - 120°W)



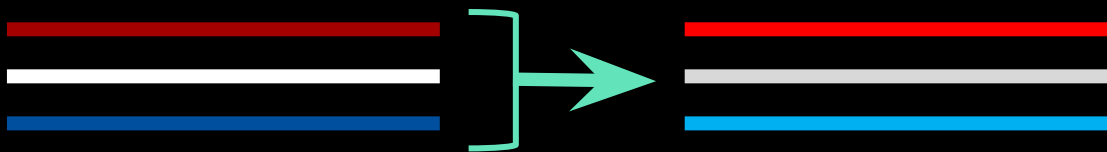
redesign

NOAA Sea Surface Temperature Anomaly (°C)

for Oceanic Niño Region 3.4 (5°S-5°N, 170°W-120°W)

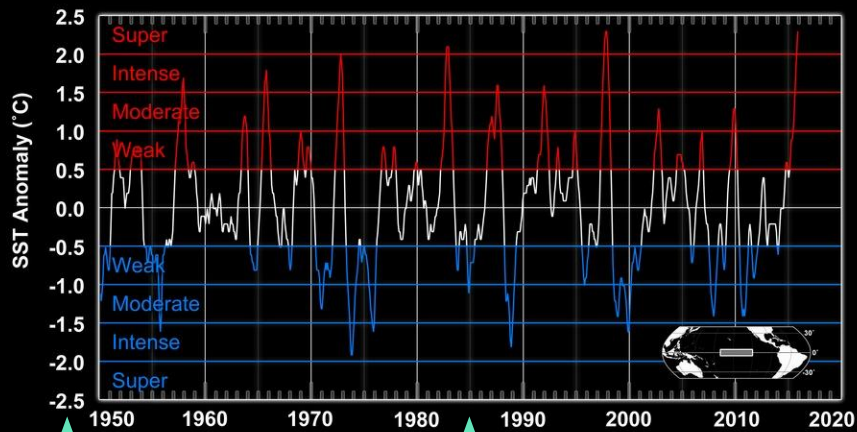


adjusted color for equal visual weight



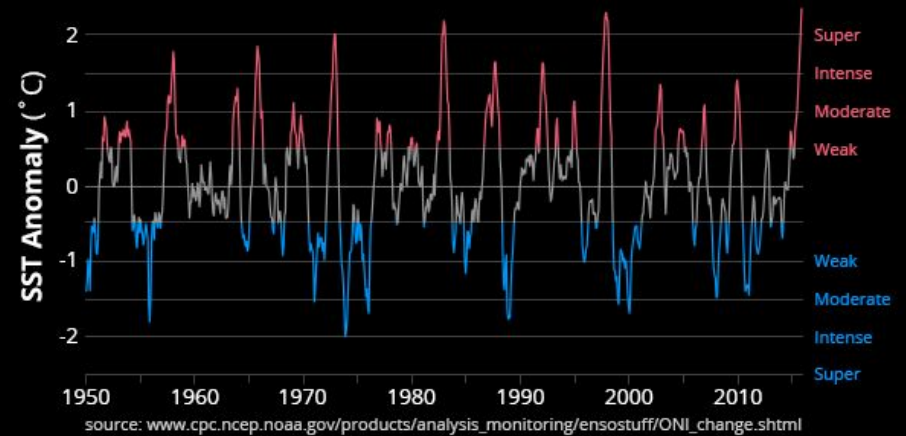
original

NOAA Sea Surface Temperature Anomaly (°C)
for Oceanic Niño Index Region 3.4 (5°S - 5°N, 170°W - 120°W)



redesign

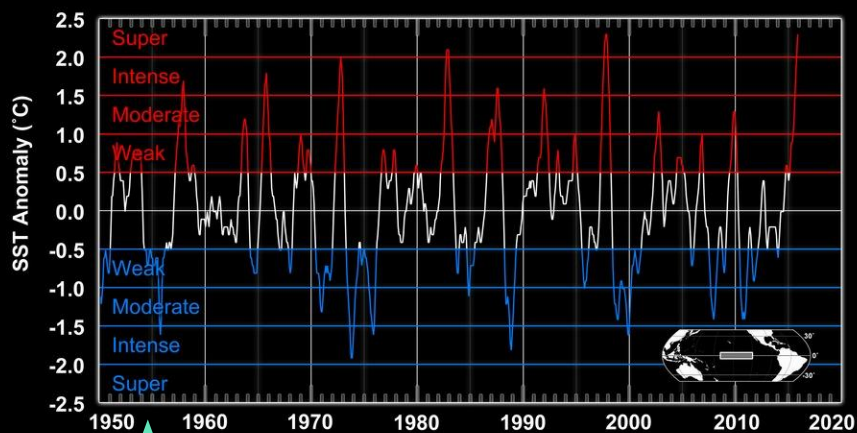
NOAA Sea Surface Temperature Anomaly (°C)
for Oceanic Niño Region 3.4 (5°S-5°N, 170°W-120°W)



removed many tick marks, and some labels

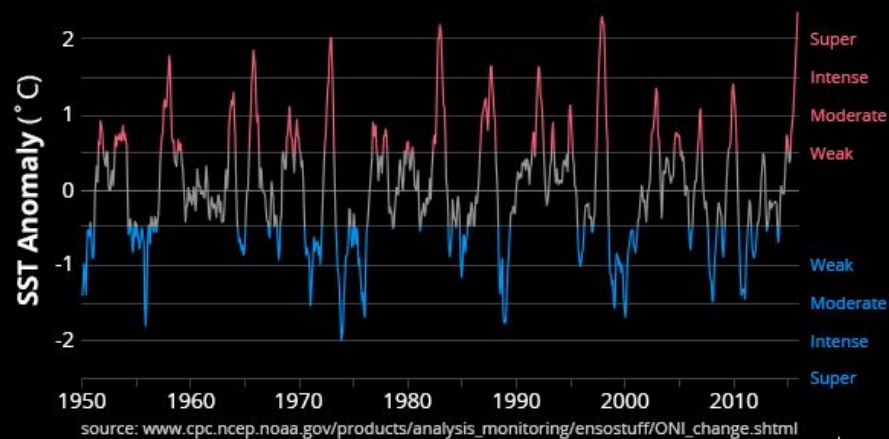
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NOAA Sea Surface Temperature Anomaly (°C)
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redesign

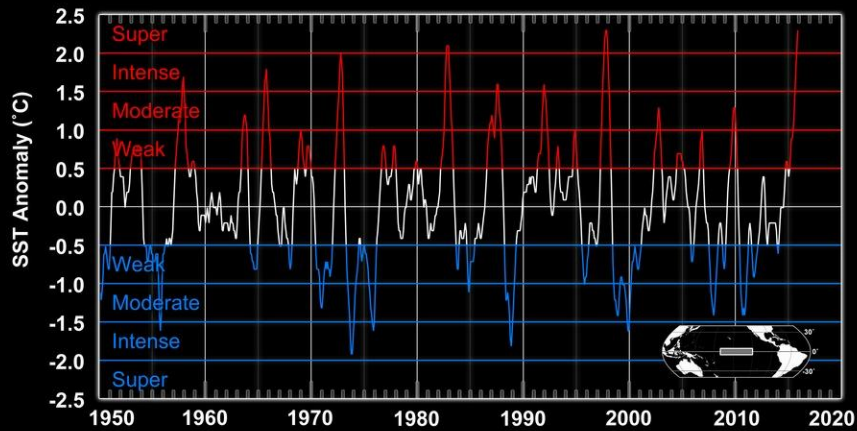
NOAA Sea Surface Temperature Anomaly (°C)
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moved labels into a more legible position

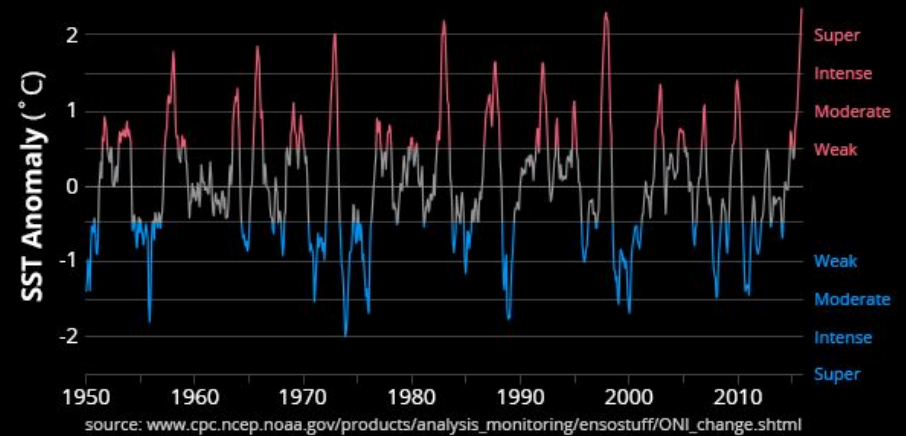
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NOAA Sea Surface Temperature Anomaly (°C)
for Oceanic Niño Index Region 3.4 (5°S - 5°N, 170°W - 120°W)



redesign

NOAA Sea Surface Temperature Anomaly (°C)
for Oceanic Niño Region 3.4 (5°S-5°N, 170°W-120°W)



http://bit.ly/SST_redesign

chart choosers

Deviation

Illustrate variation in data a fixed reference level. Typical reference points are the mean or median. Can be used to show how far an individual data point is from the mean or median.

Example FT uses
These are the most common chart types.

Outgoing bar
A simple deviation bar chart that is better for negative values than positive magnitude values.

Emerging stacked bar
A bar chart for presenting a series of data with multiple components that change over time.

Spine
Spine is a single value process chart that is used to show the variation of a single data point over time.

Scatterplot with fitted line
The relationship of two variables is shown by a scatterplot. A fitted line is drawn through the data points to show the trend.

Correlation

Show the relationship between two or more variables. Be careful of false claims. Use the correlation coefficient to measure the strength of the relationship. A positive correlation means that as one variable increases, the other tends to increase as well.

Example FT uses
Illustrate the relationship between two variables.

Scatterplot
The most common way to show the relationship between two variables is with a scatterplot. The x-axis represents the independent variable and the y-axis represents the dependent variable.

Correlation - line scatter
A scatterplot showing the relationship between two variables. A line is drawn through the data points to show the trend.

Correlation scatterplot
A scatterplot showing the relationship between two variables. A line is drawn through the data points to show the trend.

Bubble
A bubble chart is a scatterplot where the size of the bubbles represents a third variable. It is used to show the relationship between two variables and a third variable.

3D bar chart
A 3D bar chart is used to show the relationship between three variables. It is used to show the relationship between three variables.

Ranking

Use after an order of preference or priority for a series of items. Use the ranking coefficient to measure the strength of the relationship. A positive ranking means that as one variable increases, the other tends to increase as well.

Example FT uses
Ranking of items based on preference.

Order bar
A bar chart showing the ranking of items. The bars are ordered from highest to lowest value.

Order bar chart
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A bar chart showing the ranking of items. The bars are ordered from highest to lowest value.

Distribution

Show the distribution of data. Use the distribution coefficient to measure the strength of the relationship. A positive distribution means that as one variable increases, the other tends to increase as well.

Example FT uses
Distribution of data points.

Histogram
A histogram is a bar chart showing the distribution of data. The bars represent the frequency of data points in each bin.

Dot plot
A dot plot is a bar chart showing the distribution of data. The dots represent the frequency of data points in each bin.

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Change over Time

Show the change in data over time. Use the change over time coefficient to measure the strength of the relationship. A positive change over time means that as one variable increases, the other tends to increase as well.

Example FT uses
Change over time in data.

Line
A line chart is used to show the change in data over time. The line represents the trend of the data.

Column
A column chart is used to show the change in data over time. The columns represent the data points.

Column - bar
A column chart is used to show the change in data over time. The columns represent the data points.

Step
A step chart is used to show the change in data over time. The steps represent the data points.

Area chart
An area chart is used to show the change in data over time. The area represents the data points.

Confidence
A confidence interval is used to show the change in data over time. The confidence interval represents the range of data points.

Fun chart (spaghetti)
A fun chart is used to show the change in data over time. The fun chart represents the data points.

Calendar heatmap
A calendar heatmap is used to show the change in data over time. The heatmap represents the data points.

Heatmap
A heatmap is used to show the change in data over time. The heatmap represents the data points.

Circle heatmap
A circle heatmap is used to show the change in data over time. The heatmap represents the data points.

Vertical bar chart
A vertical bar chart is used to show the change in data over time. The bars represent the data points.

Scatterplot
A scatterplot is used to show the change in data over time. The scatterplot represents the data points.

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Magnitude

Show the magnitude of data. Use the magnitude coefficient to measure the strength of the relationship. A positive magnitude means that as one variable increases, the other tends to increase as well.

Example FT uses
Magnitude of data points.

Column
A column chart is used to show the magnitude of data. The columns represent the data points.

Bar
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Part-to-whole

Show the part-to-whole relationship of data. Use the part-to-whole coefficient to measure the strength of the relationship. A positive part-to-whole means that as one variable increases, the other tends to increase as well.

Example FT uses
Part-to-whole relationship of data.

Stacked column bar
A stacked column bar chart is used to show the part-to-whole relationship of data. The bars represent the data points.

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Spatial

Show the spatial relationship of data. Use the spatial coefficient to measure the strength of the relationship. A positive spatial means that as one variable increases, the other tends to increase as well.

Example FT uses
Spatial relationship of data.

Dot chart
A dot chart is used to show the spatial relationship of data. The dots represent the data points.

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Flow

Show the flow of data. Use the flow coefficient to measure the strength of the relationship. A positive flow means that as one variable increases, the other tends to increase as well.

Example FT uses
Flow of data points.

Sankey
A Sankey diagram is used to show the flow of data. The Sankey diagram represents the data points.

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Flow

Show the reader volumes or intensity of movement between two or more states or conditions. These might be logical sequences or geographical locations.

Example FT uses
Movement of funds, trade, migrants, lawsuits, information, relationship graphs.

Sankey



Shows changes in flows from one condition to at least one other; good for tracing the eventual outcome of a complex process.

Waterfall



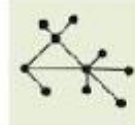
Designed to show the sequencing of data through a flow process, typically budgets. Can include +/- components.

Chord



A complex but powerful diagram which can illustrate 2-way flows (a grid net winner) in a matrix.

Network



Used for showing the strength and inter-connectedness of relationships of varying types.

Visual vocabulary

Designing with data

There are so many ways to visualise data - how do we know which one to pick? Use the categories across the top to decide which data relationship is most important in your story, then look at the different types of chart within the category to form some initial ideas about what might work best. This list is not meant to be exhaustive, nor a wizard, but is a useful starting point for making informative and meaningful data visualisations.

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ft.com/vocabulary

Financial Times
http://bit.ly/FT_chart_chooser

chart choosers

Chart Chooser

WHEN A SINGLE NUMBER IS IMPORTANT

23%

WHEN 2 OR MORE NUMBERS ARE COMPARED

WHEN WE WANT TO BETTER UNDERSTAND THAN A SINGLE MARK

WHEN A SINGLE NUMBER IS IMPORTANT

WHEN 2 OR MORE NUMBERS ARE COMPARED

WHEN WE WANT TO BETTER UNDERSTAND THAN A SINGLE MARK

Big Number

Icon Array

Pie/Donut

Bar/Column

Side by Side

Slopegraph

Back-to-Back

Dot Plot

Benchmark Line

Combo

Bullet Chart

Indicator Dots

Stacked Bar

Small Multiples

Diverging Bar

Aggregated Bar

Bar/Column

Don't Visualize

Pie/Donut

Stacked Bar

Histogram

Tree Map

Scatterplot

Draw It

Don't Visualize

Metric A

Metric B

Metric C

Effective Data Visualization

The Right Chart for the Right Data

2010	12%	17%
2011	34%	28%
2012	22%	25%
2013	17%	21%
2014	26%	34%
2015	40%	37%
2016	31%	33%

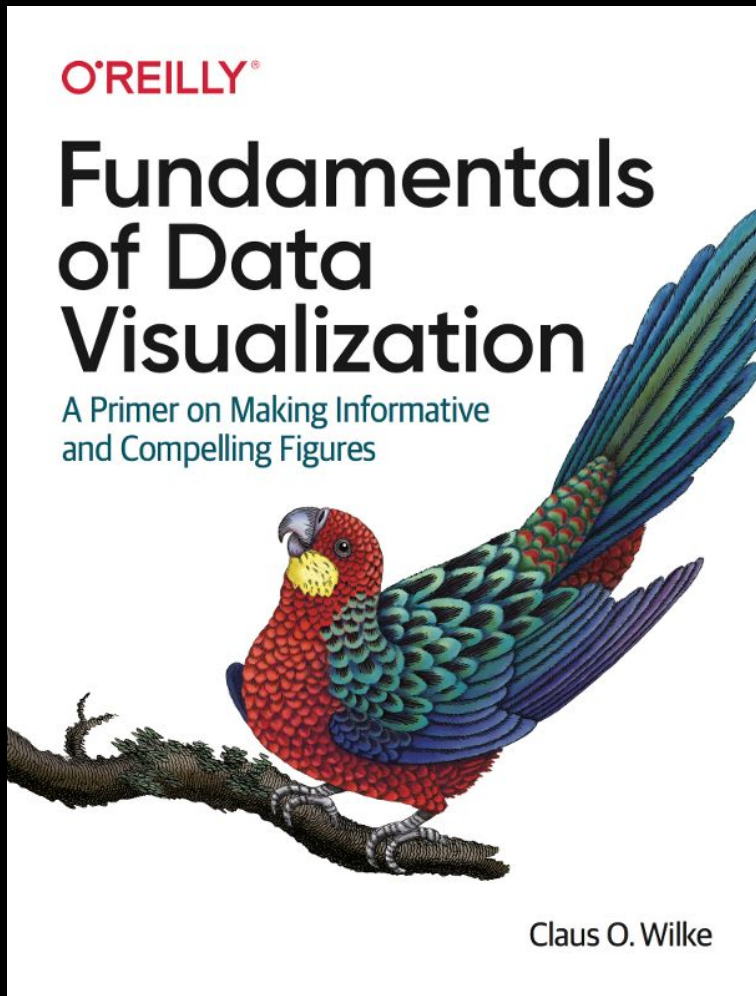
http://bit.ly/Evergreen_chart_chooser

Stephanie Evergreen

Stephanie D. H. Evergreen

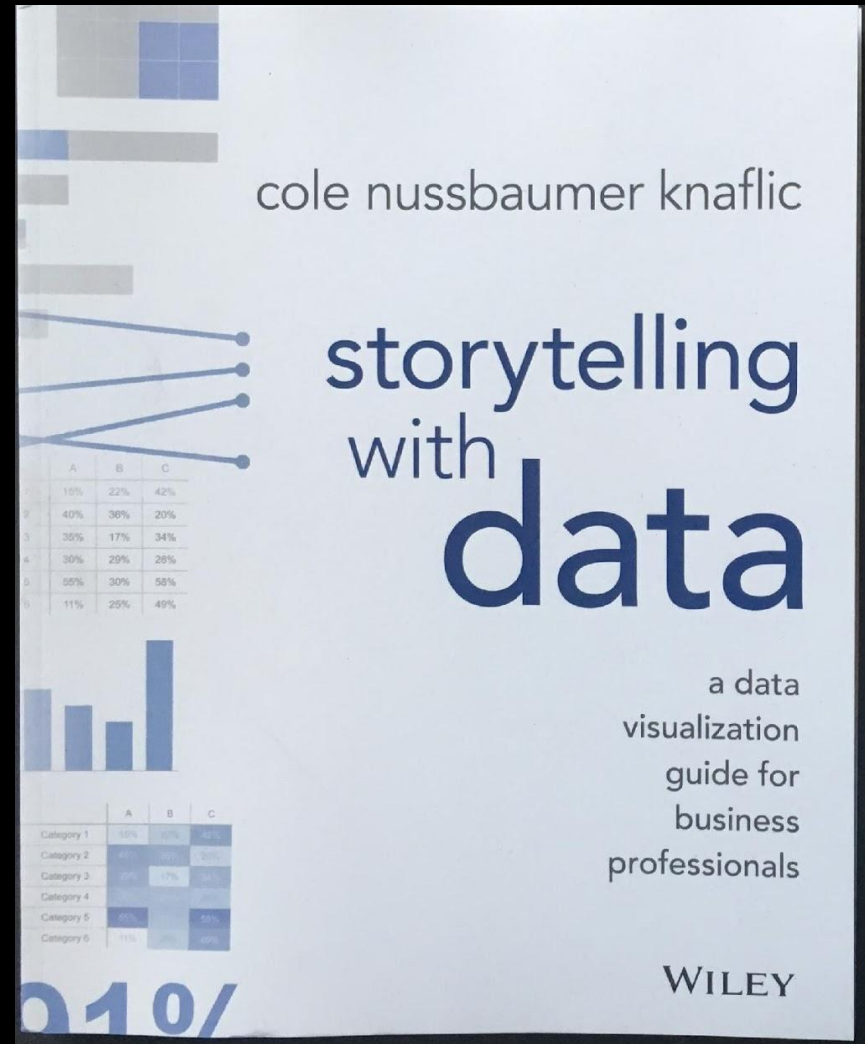


more resources



Claus O. Wilke

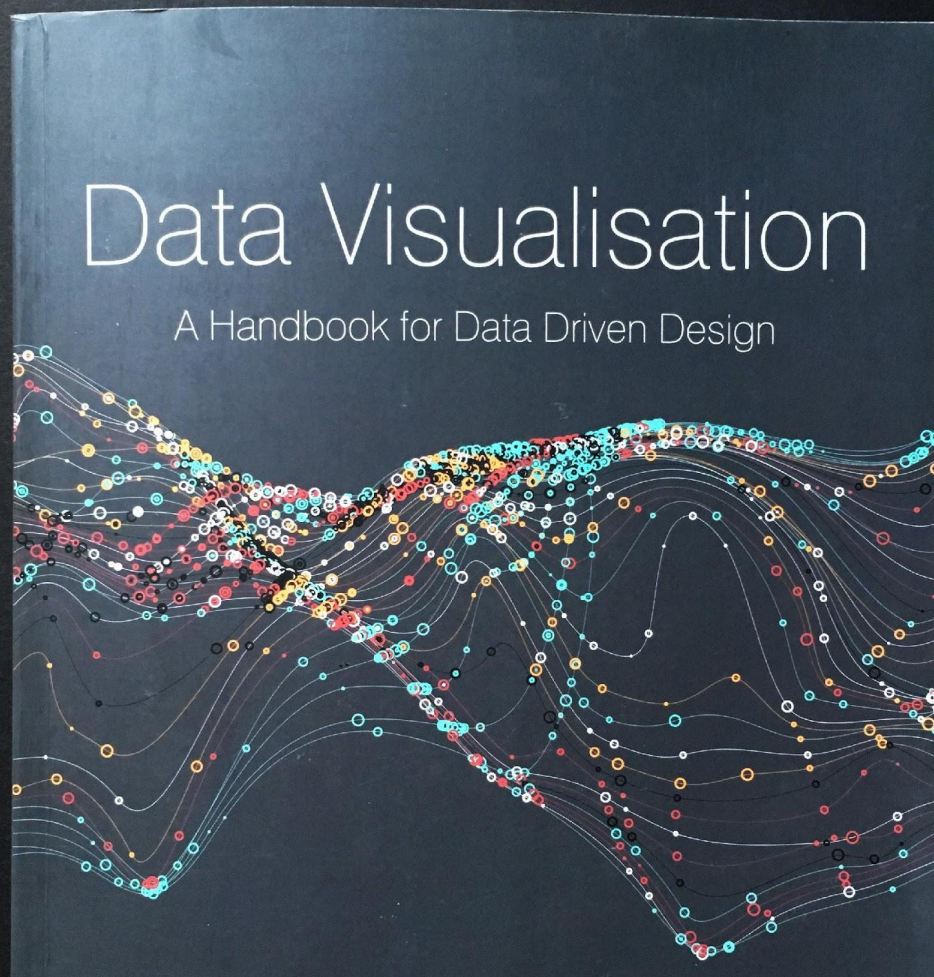
http://bit.ly/Wilke_fundamentals



Cole Nussbaumer Knaflic

http://bit.ly/Knaflic_books

more resources



Andy Kirk

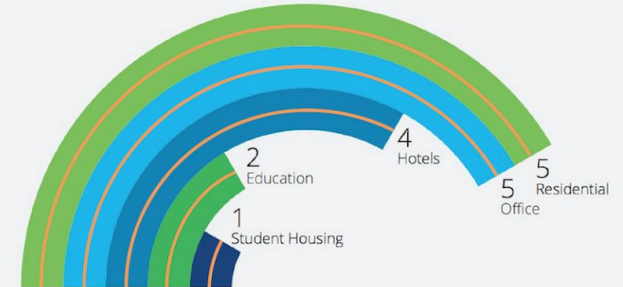
<https://www.visualisingdata.com>



01 SEP THE PROBLEMS WITH B'ARC CHARTS

ORIGINAL B'ARC CHART

Which sectors are the most active? (Number of schemes under construction)



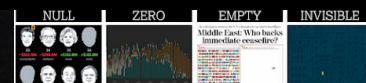
Almost one month ago I tweeted my contempt for radial bar charts, having come across a particularly egregious case. It seemed to gain a bit of traction on social media but was also met by genuine queries as to my reasoning for this disdain.



23 AUG THE LITTLE OF VISUALISATION DESIGN: PART 42



22 AUG ANOTHER UPDATE ABOUT THE CHARTMAKER DIRECTORY



WEBINAR

Andy Kirk

more resources

CHARTABLE

A blog by Datawrapper

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Weekly Chart

Changelog

Sep 4, 2020

by Lisa Charlotte
Rost

Thoughts & How To's

How to pick more beautiful colors for your data visualizations

Common color mistakes and how to avoid them



Lisa Charlotte Rost

http://bit.ly/Rost_color

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reframing

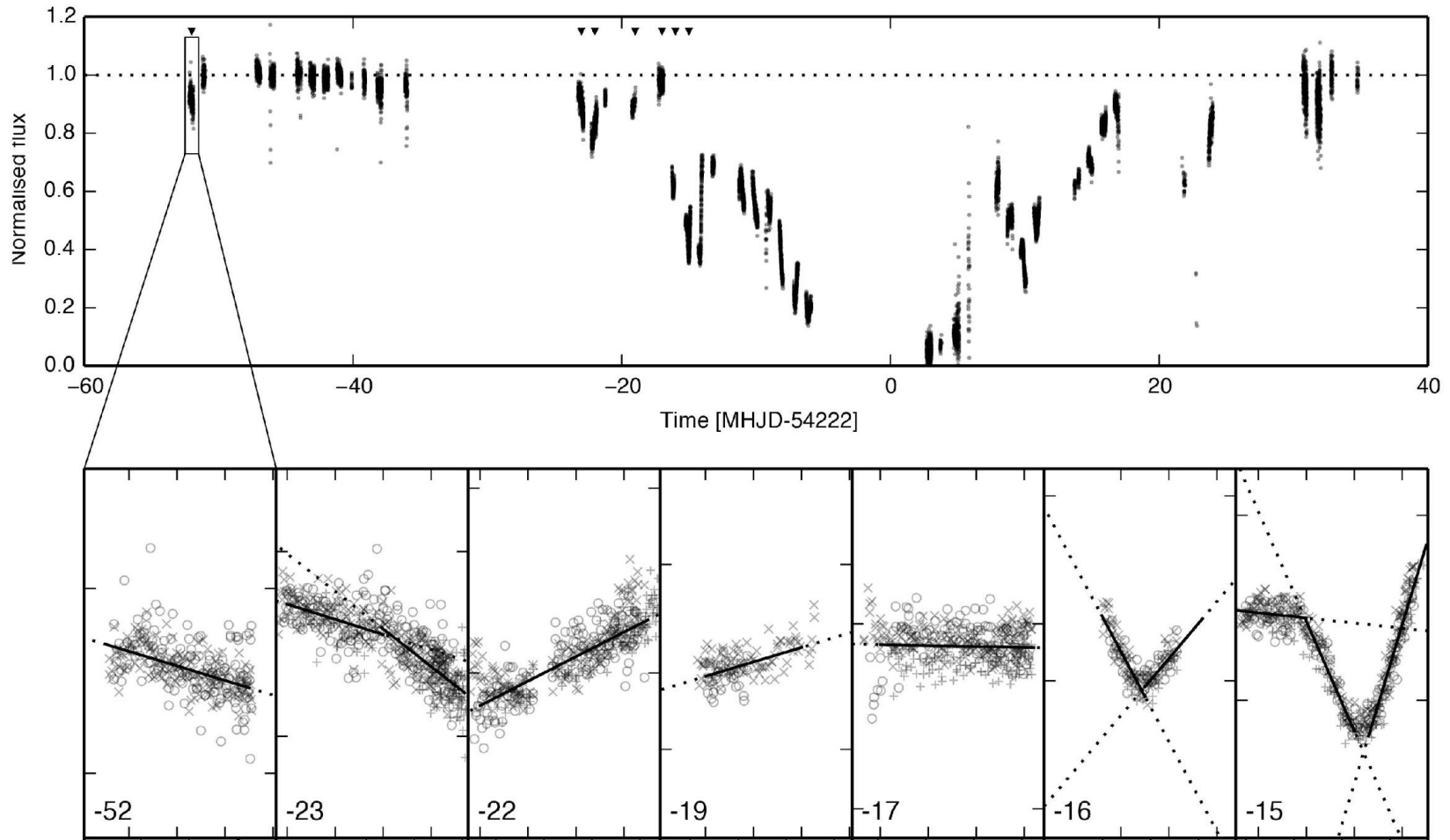


Figure 8. Detailed plot of the J1407 light curve during the eclipse. Top: overview of the light curve. Bottom: nightly light curve for 7 nights during the eclipse, indicated in the upper panel by triangles. The data from the different CCDs are plotted with different symbols, 221: \circ , 227: \times , and 228: $+$. The straight line fits are plotted over the data, solid lines are inside the window used for the fit, dotted lines are extrapolated. The y-ticks are spaced at 0.2 au (as in the top panel) and x-ticks at 0.1 d.

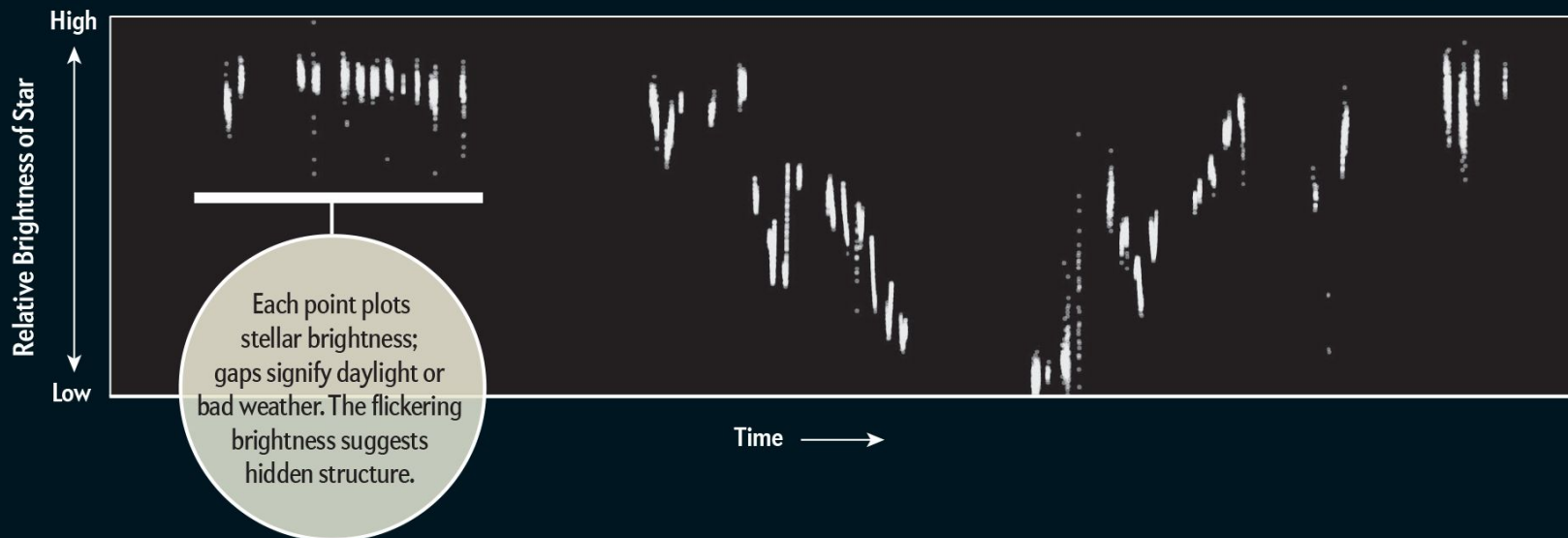
By T. I. M. van Werkhoven *et al.*, “Analysis of 1SWASP J140747.93–394542.6 eclipse fine-structure: hints of exomoons”

Perplexing Pattern

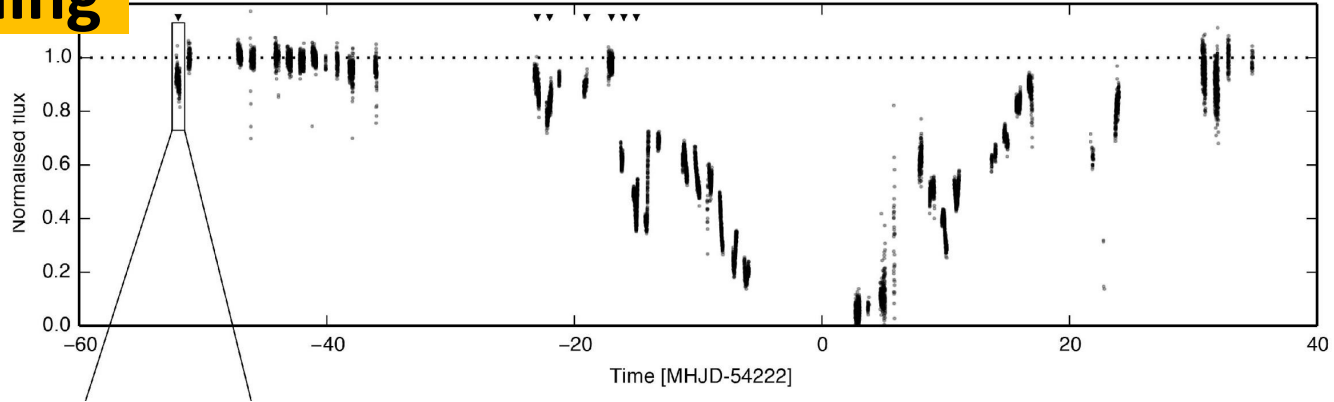
A **light curve**—an object’s variance in brightness plotted over time—is a basic tool for studying stars. A brief boost in brightness can be caused by stellar flares, whereas momentary dips can signal star spots or the shadow of an orbiting planet. But the wildly fluctuating light curve of the star J1407 in 2007 (*below*) was unlike anything astronomers had ever seen. Something strange was making the star flicker and fade for months at a time.

Between two periods of flickering, J1407’s light dimmed for 56 days, suggesting the star was eclipsed by an object 180 million kilometers wide.

J1407’S ODD LIGHT CURVE, DURING A 2007 ECLIPSE



reframing



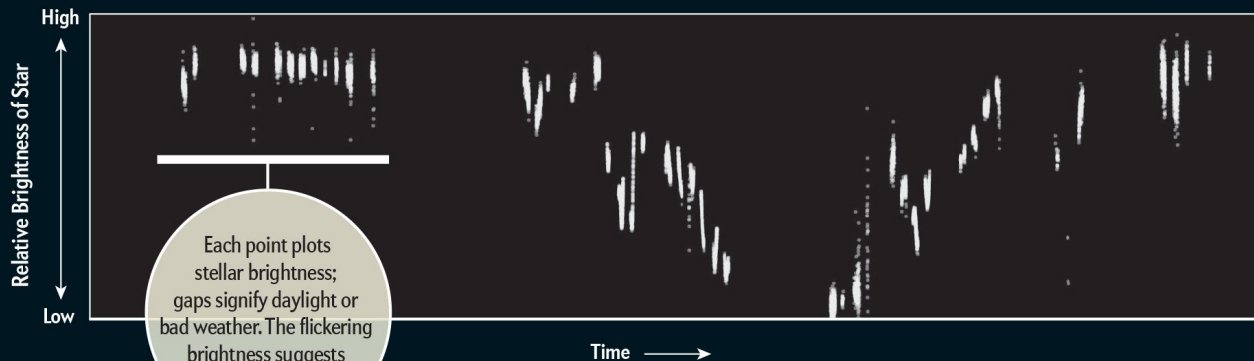
A MYSTERY OF LIGHT AND SHADOW

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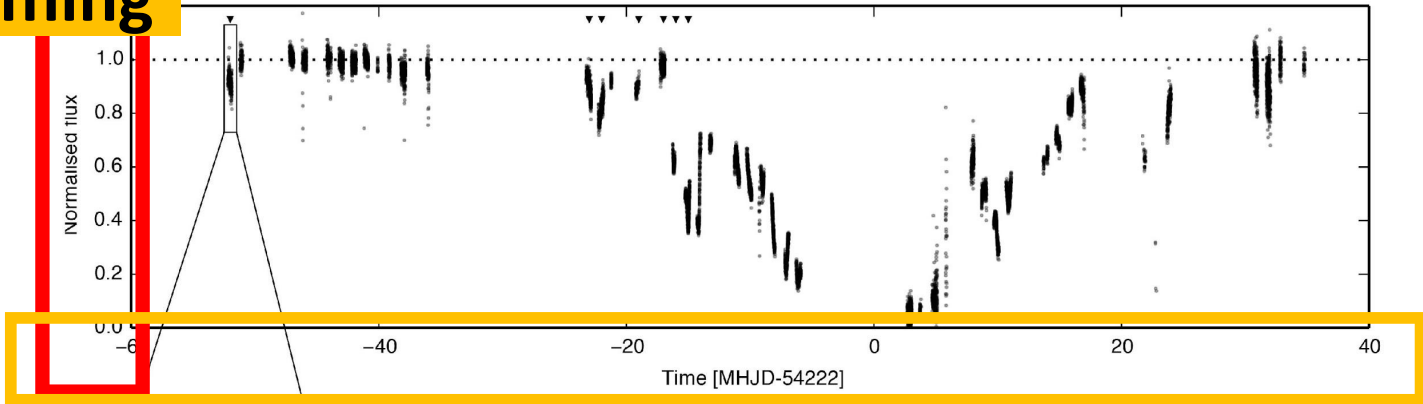
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Each point plots stellar brightness; gaps signify daylight or bad weather. The flickering brightness suggests hidden structure.

reframing



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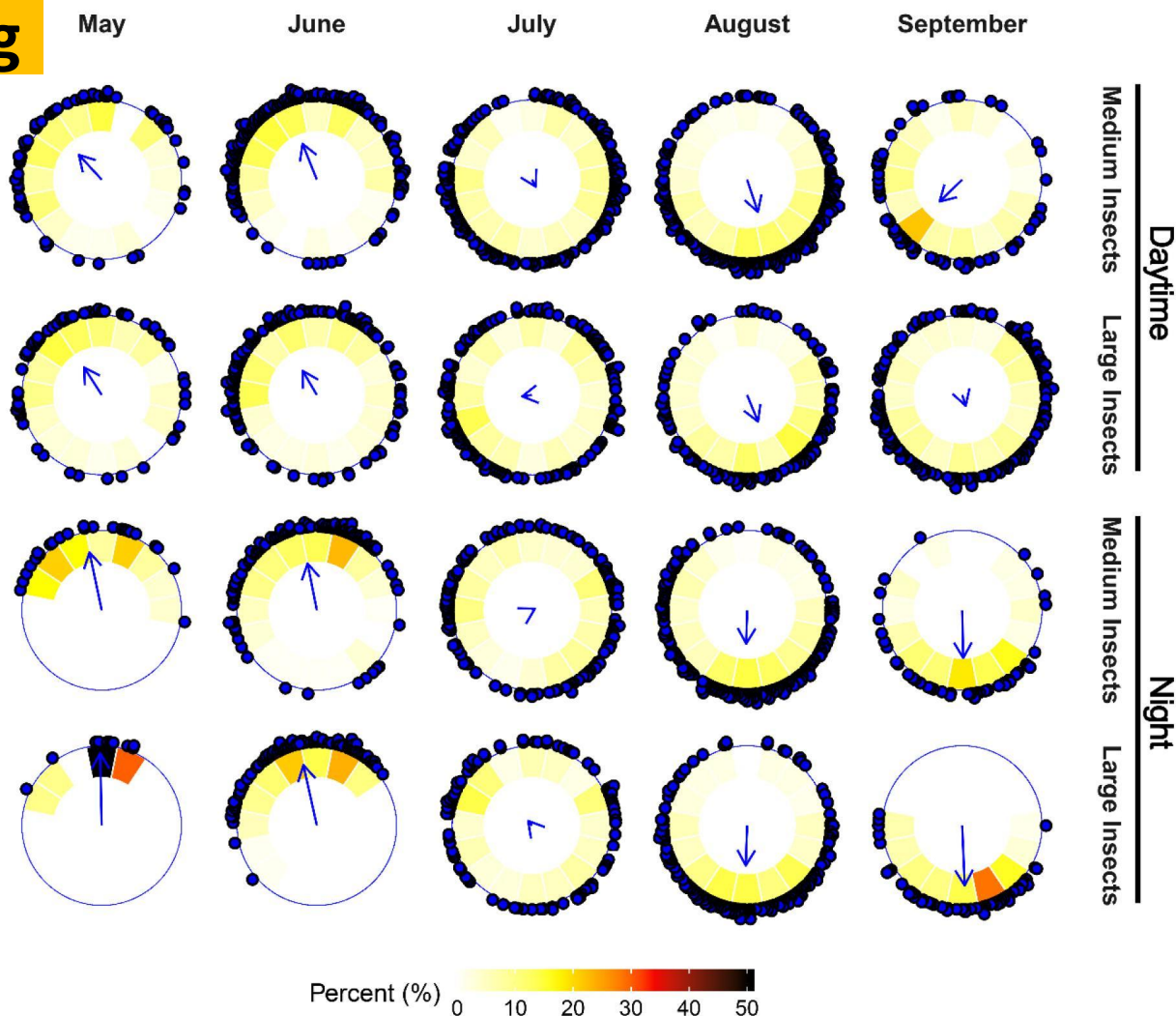


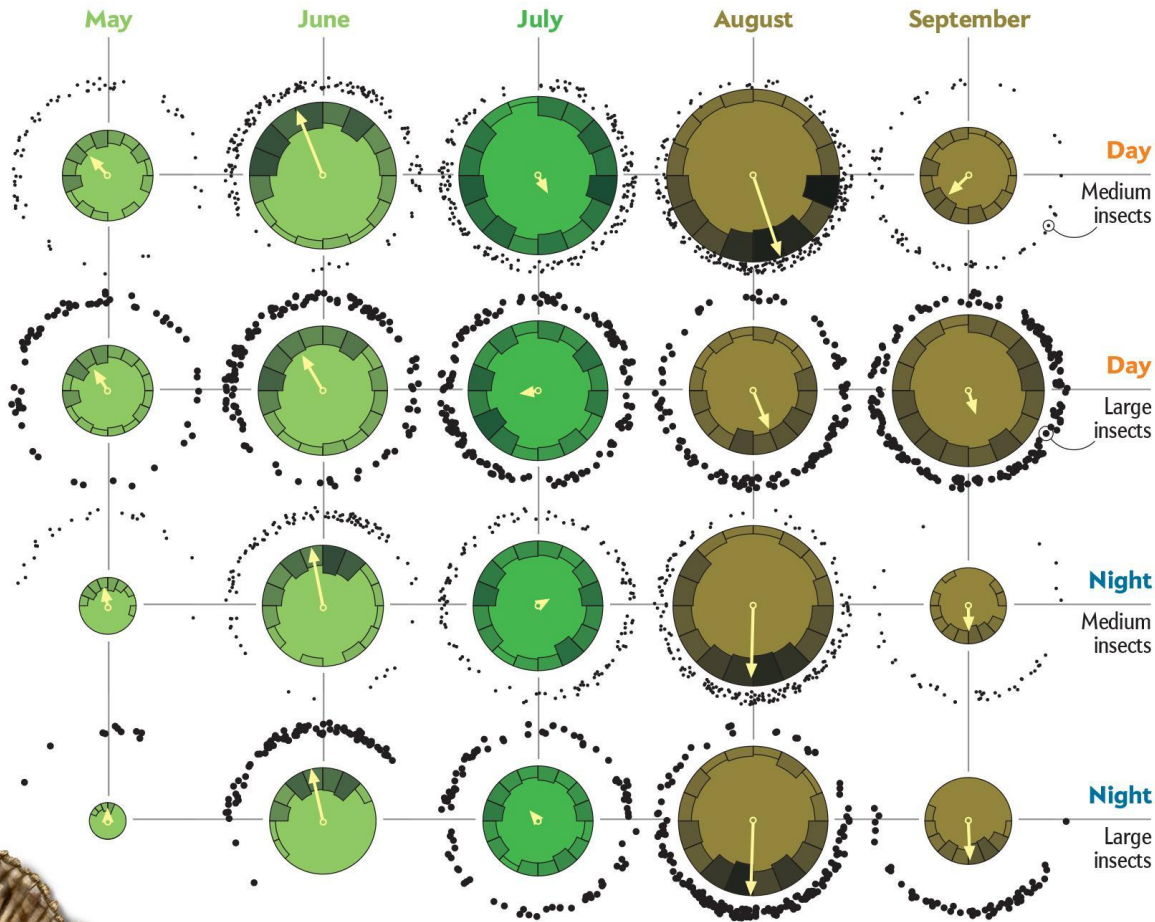
Fig. S2. Monthly track directions of larger insects migrating high above the southern United Kingdom. Migratory tracks of larger insects occurred predominantly in seasonally-beneficial directions in May and June, and in August and September, but were randomly directed in July. Small blue circles represent the direction of individual migratory tracks. The blue arrow indicates the overall mean direction of the dataset, and arrow length is proportional to the

By Gao Hu et al., "Mass seasonal bioflows of high-flying insect migrants"

reframing

Flight Patterns

Over southern Britain, the most bug movement occurs in late May and June toward the northwest and in late August and September toward the southeast (arrows). Many insects do not live long and struggle to survive the cold, so it may take up to six generations for one family, flying in slightly different directions from one breeding area to the next, to complete an annual migration.



Jan Willem Tulp (charts) and Jessica Huppi (insects)

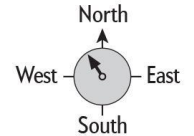


How to Read This Graphic

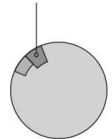
More than 70 percent of migrations occur during daytime (top two rows); fewer are at night (bottom two rows).

Migration Direction

Arrows depict the overall direction of insect flight. A longer arrow means more insects stick close to that path.



Darker, larger shapes inside a circle show the more heavily traveled directions.



Relative Number of Insects

Larger circle means more insects are airborne. Black dots indicate episodes when many insects are flying in a given direction.

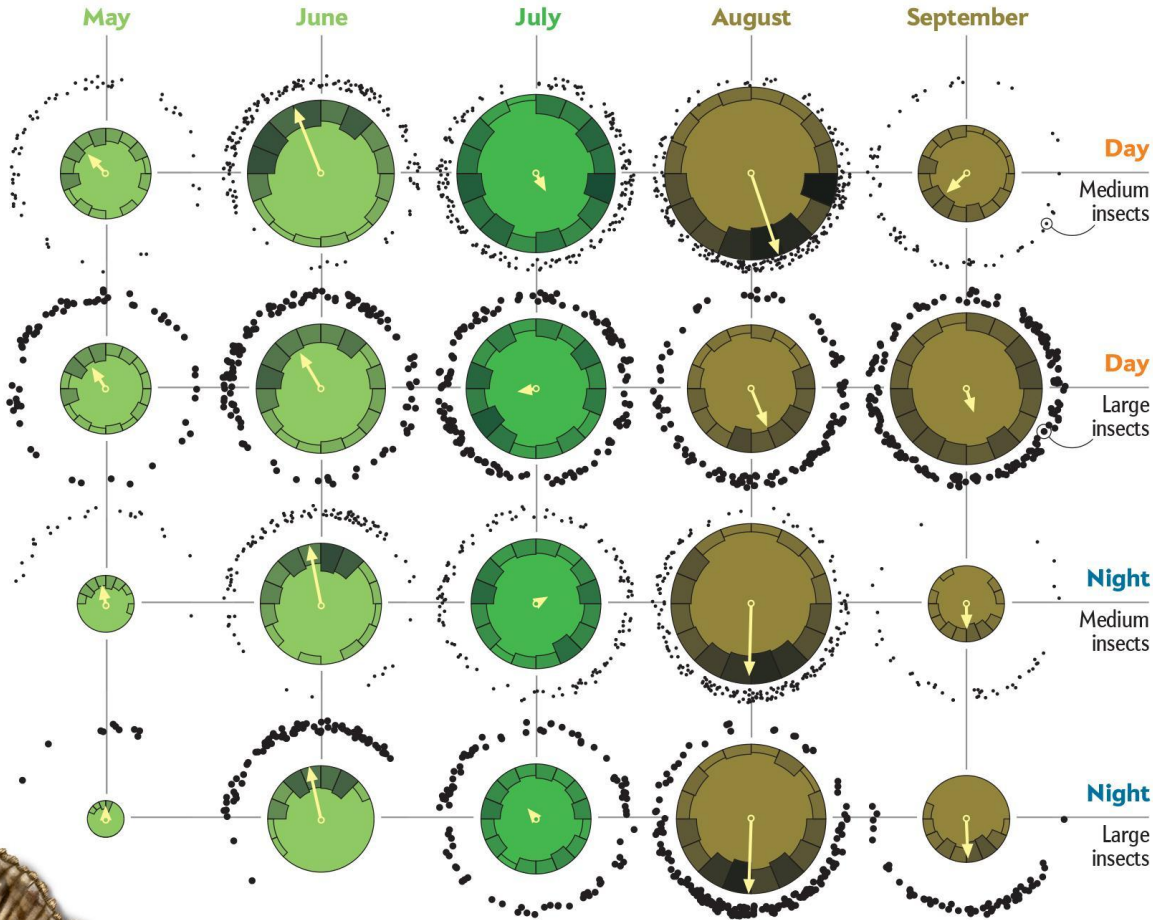
Trillions of Insects Migrate

Surprising data show many species make annual treks

reframing

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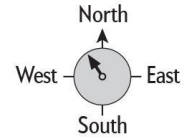


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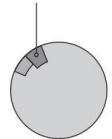
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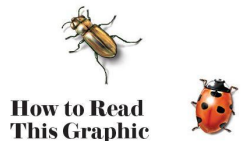
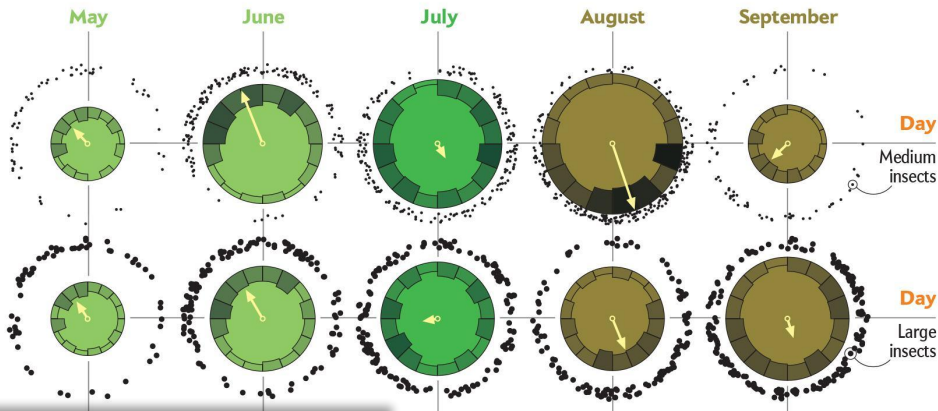
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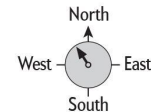
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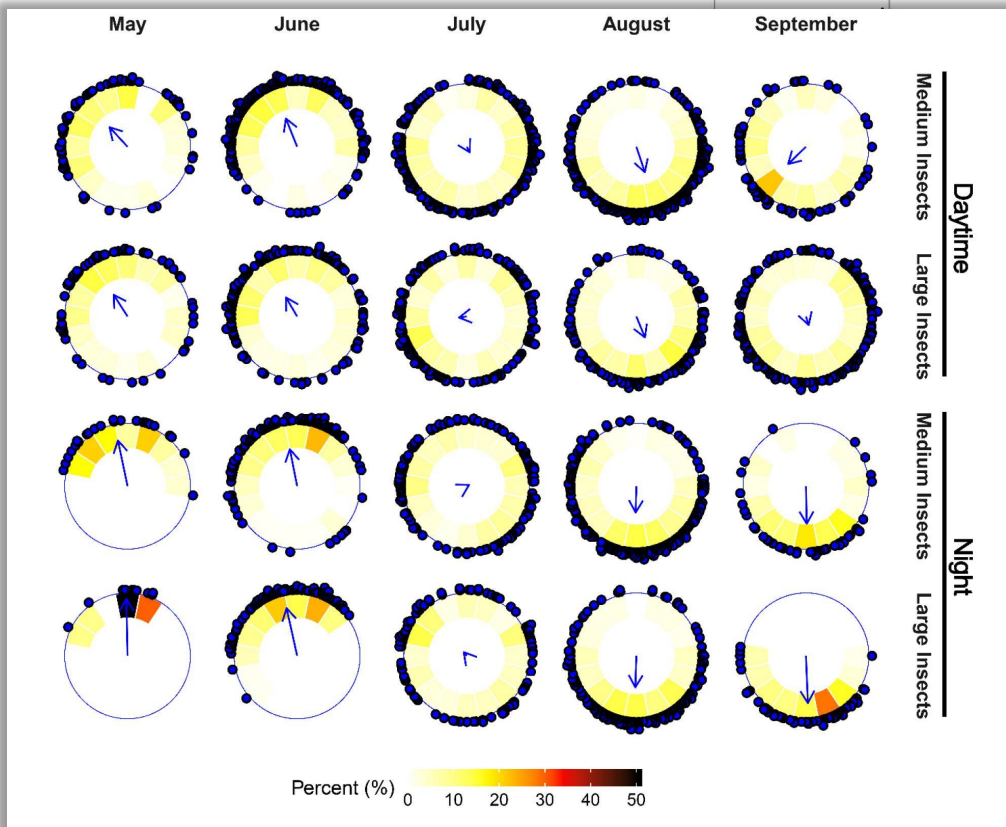
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rework

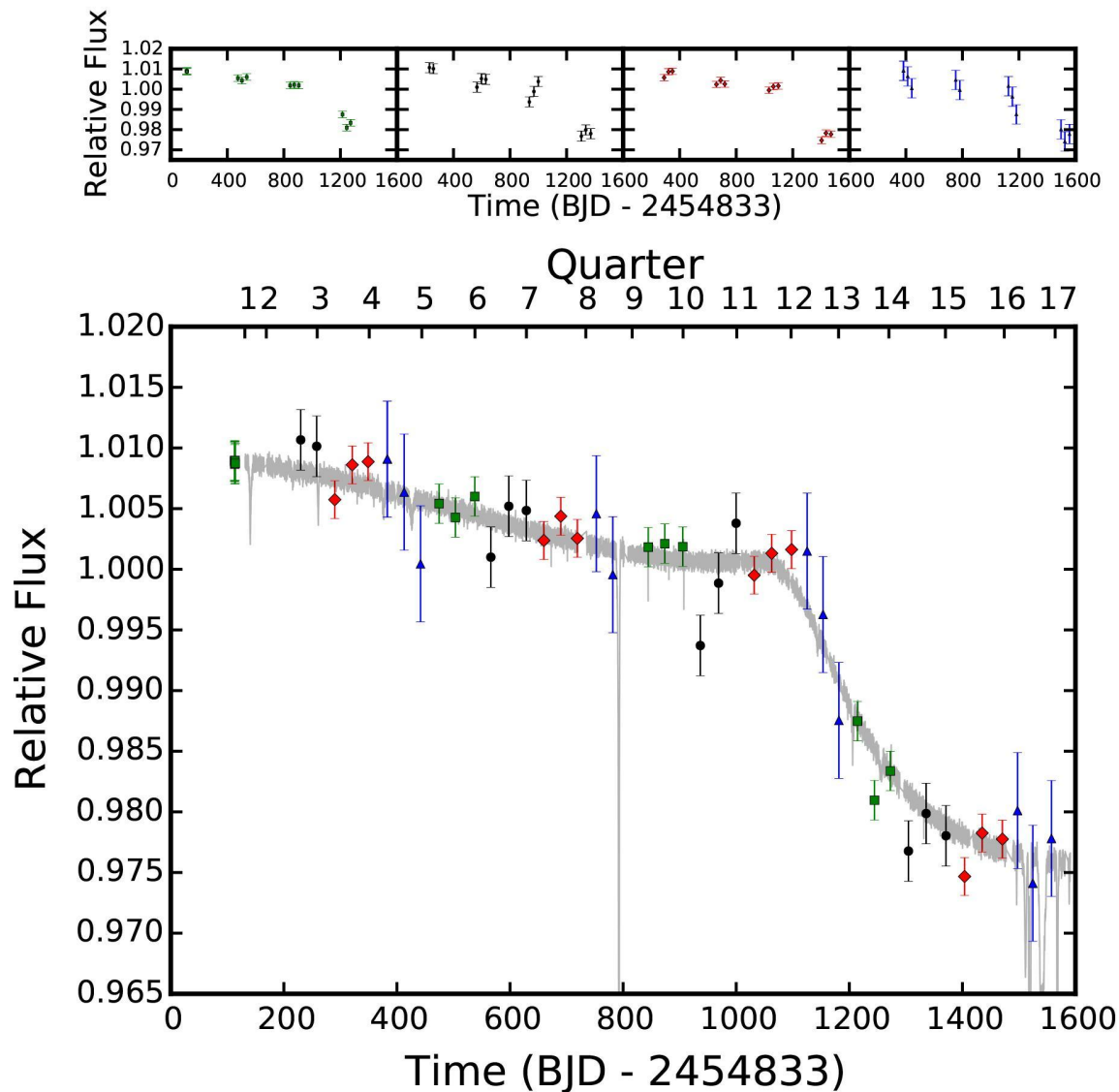


FIG. 3.— Photometry of KIC 8462852 as measured from the FFI data. The four colors and shapes (green squares, black circles, red diamonds, and blue triangles) represent measurements from the four separate channels the starlight reaches as the telescope rolls. The four subpanels show the flux measurements from each particular detector individually. The main figure combines all observations together. In the process of creating the fit, we allow a vertical offset between the data from each individual quarter to account for changes in the flat field with detector orientation. For the purposes of this figure, we plot the maximum likelihood values; the blue, green, and black points have been shifted upward by 0.6%, 0.1%, and 0.2%, respectively. In all four channels, the photometry is consistent with a rapid decrease in flux of $\approx 2.5\%$. The light gray curve represents photometry created by fitting a spline to the FFI photometry; the narrow gray lines are visible but narrow relative to the cadence of FFI observations in the online version of the journal.

By Benjamin T. Montet and Joshua D. Simon, “KIC 8462852 Faded Throughout the Kepler Mission”

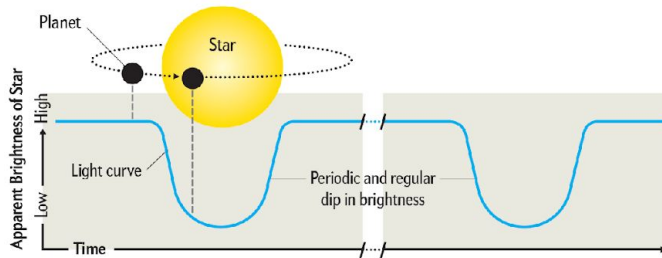
OBSERVATIONS

Enigmatic Light Patterns

To astronomers, there is usually no mystery behind a star fading in the sky. Starspots as well as the shadows of planets or debris disks routinely dim the otherwise steady light from mature stars. But none of these explanations seems to apply for one mercurial middle-aged sun known as KIC 8462852—also called Boyajian's star.

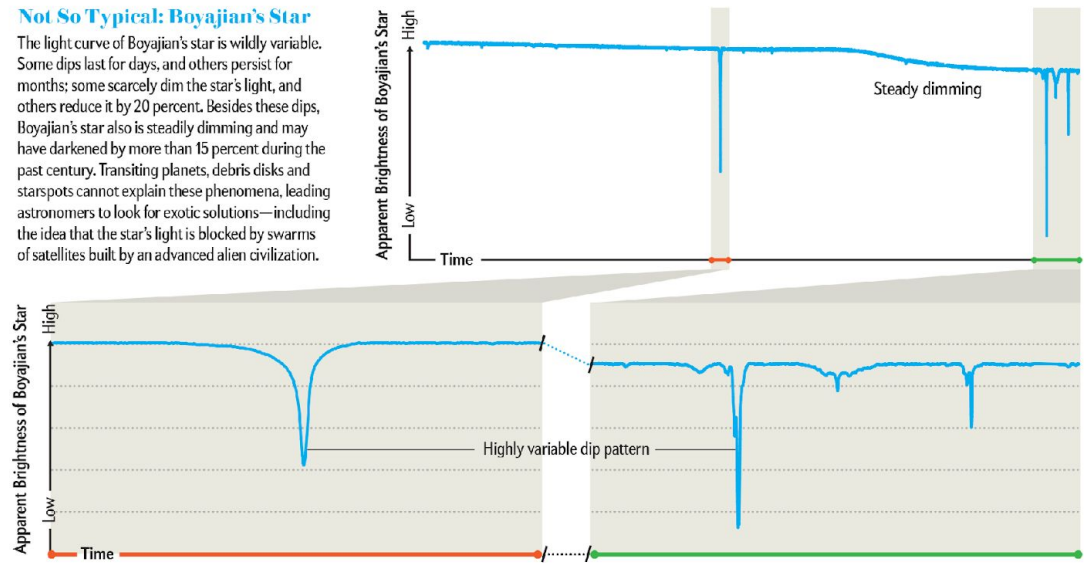
Typical Light Curve

A dimming star can be studied by its light curve—its brightness plotted over time. A planet or disk "transiting" across a star causes a dip in the curve; for planets, this dip recurs every orbital period. Starspots create patterns in light curves based on a star's rotation rate and activity cycle.



Not So Typical: Boyajian's Star

The light curve of Boyajian's star is wildly variable. Some dips last for days, and others persist for months; some scarcely dim the star's light, and others reduce it by 20 percent. Besides these dips, Boyajian's star also is steadily dimming and may have darkened by more than 15 percent during the past century. Transiting planets, debris disks and starspots cannot explain these phenomena, leading astronomers to look for exotic solutions—including the idea that the star's light is blocked by swarms of satellites built by an advanced alien civilization.

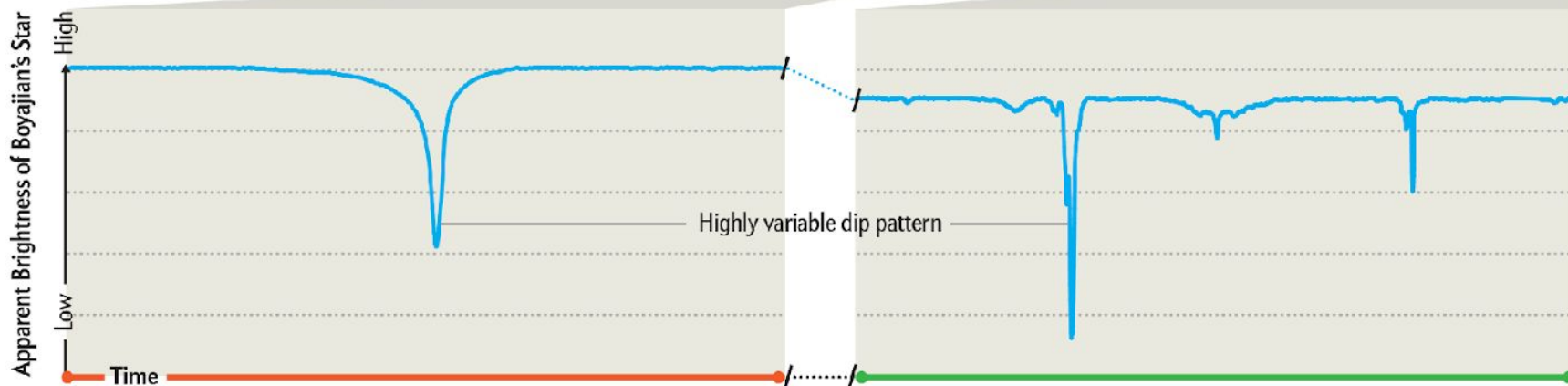
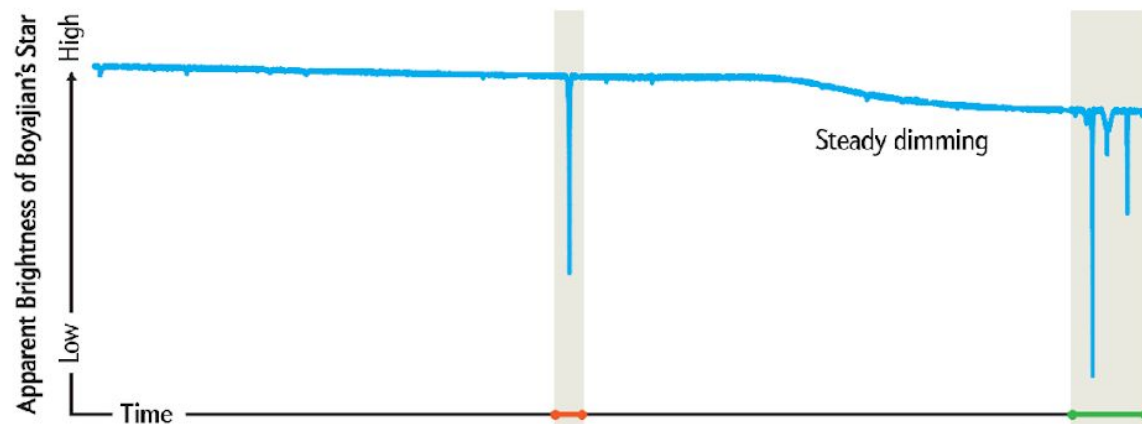


By Tiffany Farrant-Gonzalez, In "Strange News From Another Star," By Kimberly Cartier and Jason T. Wright

rework

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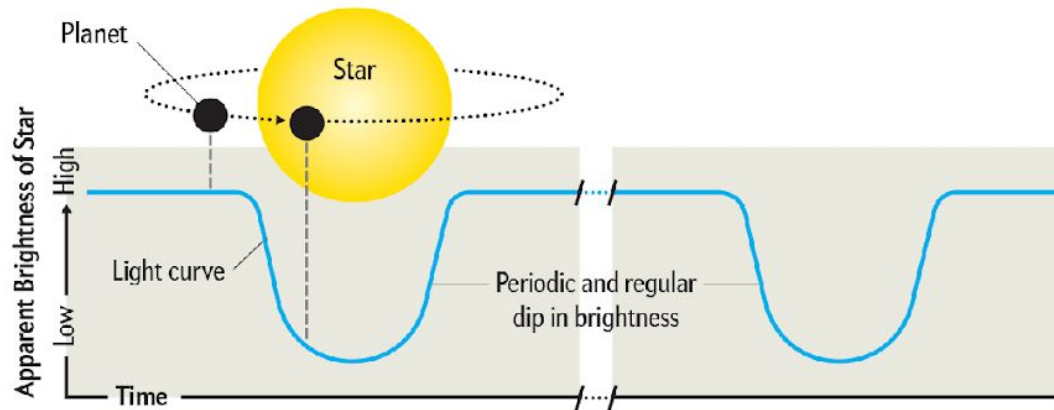
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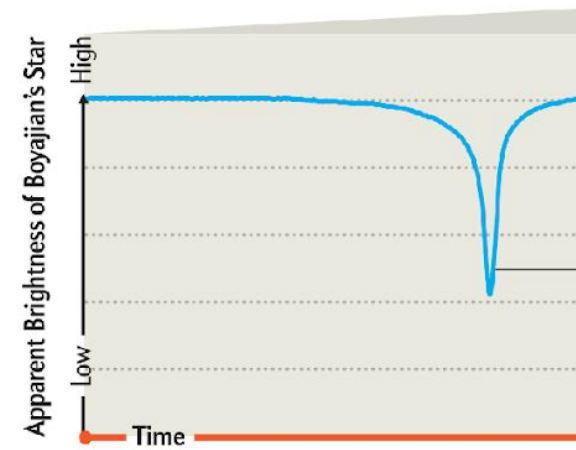
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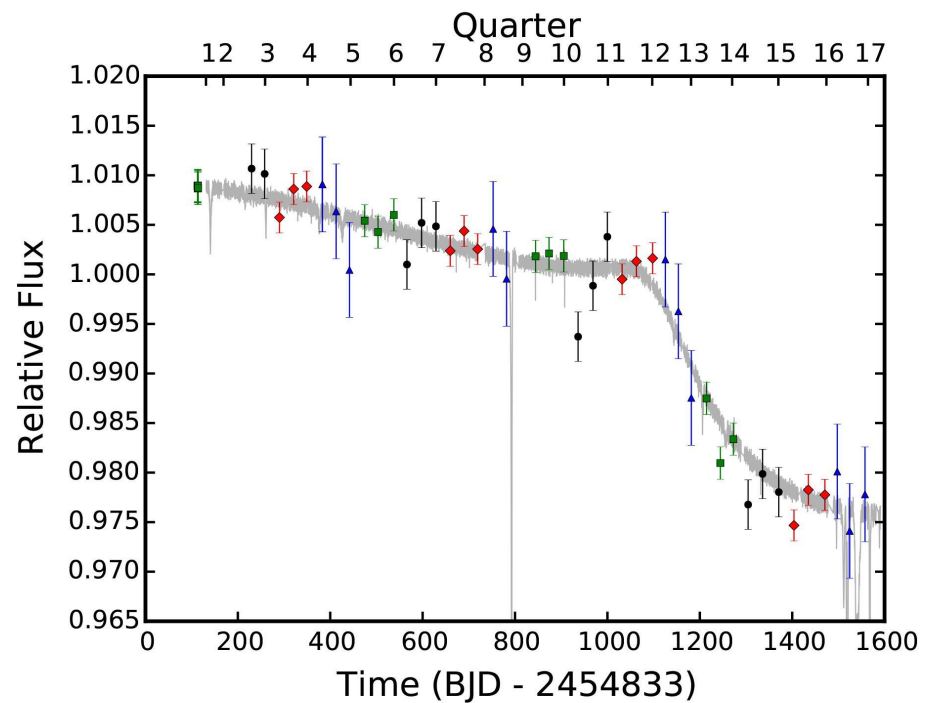
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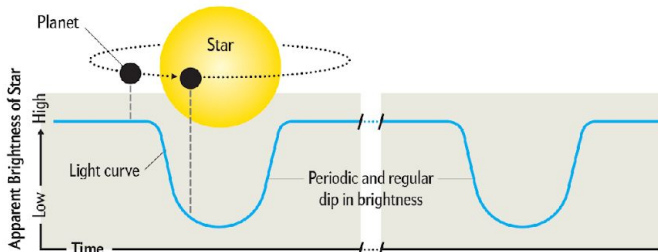
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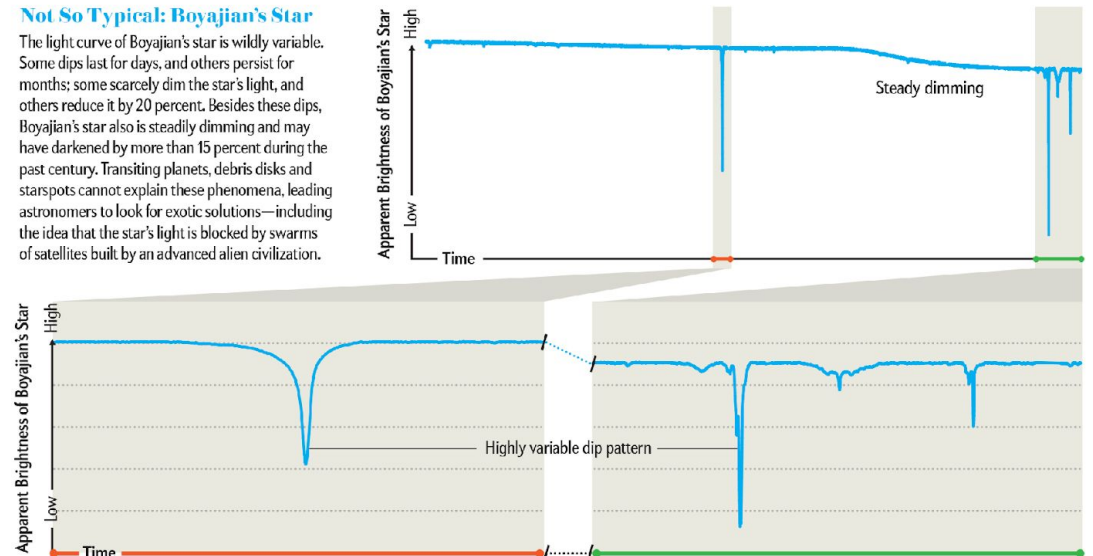
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Table 2 | Author position on rosiglitazone safety and financial conflicts of interest

	Risk of myocardial infarction with rosiglitazone				Use of rosiglitazone			
	Favourable (n=31)	Neutral (n=84)	Unfavourable (n=65)	Rate ratio (95% CI)*	Favourable (n=26)	Neutral (n=116)	Unfavourable (n=38)	Rate ratio (95% CI)*
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Rosiglitazone manufacturer†	27 (87)	25 (24)	13 (20)	4.29 (2.63 to 7.02)	21 (81)	30 (26)	9 (24)	3.60 (2.00 to 6.48)
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None	2 (6)	52 (62)	47 (72)	—	3 (12)	70 (60)	28 (74)	—

Values are numbers (percentages) unless otherwise indicated.

*Comparing favourable versus unfavourable views.

†Categories not mutually exclusive.

By Amy T Wang et al., “Association between industry affiliation and position on cardiovascular risk with rosiglitazone: cross sectional systematic review”

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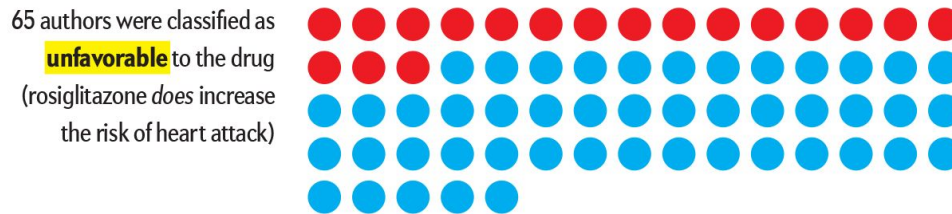
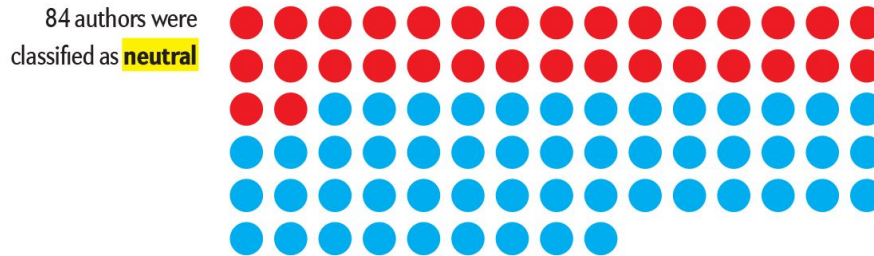
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Case Study: Conflicting Interests

To what degree do financial entanglements influence the judgment of scientists? To find out, researchers at the Mayo Clinic in Rochester, Minn., focused on the diabetes drug rosiglitazone, which a meta-analysis had linked to increased risk of heart attacks. They examined articles that cited the meta-analysis or a subsequently released report on a large trial of rosiglitazone and found that scientists with a conflict of interest were more likely to view the drug favorably. “There was a clear and strong link between the orientation of authors’ expressed views on the rosiglitazone controversy and their financial conflicts of interest with pharmaceutical companies,” the report determined.



- Author identified as having a financial conflict of interest with manufacturers of rosiglitazone and/or other antihyperglycemic agents
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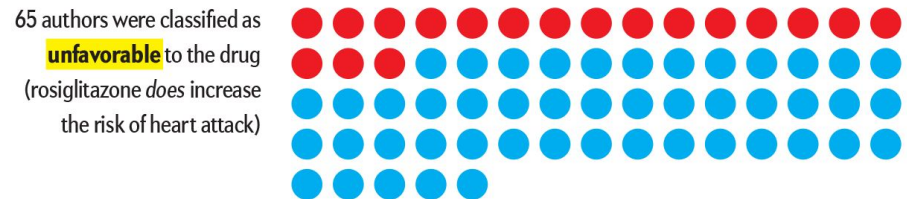
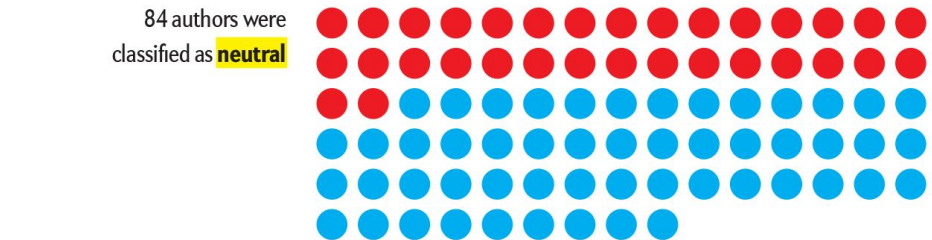
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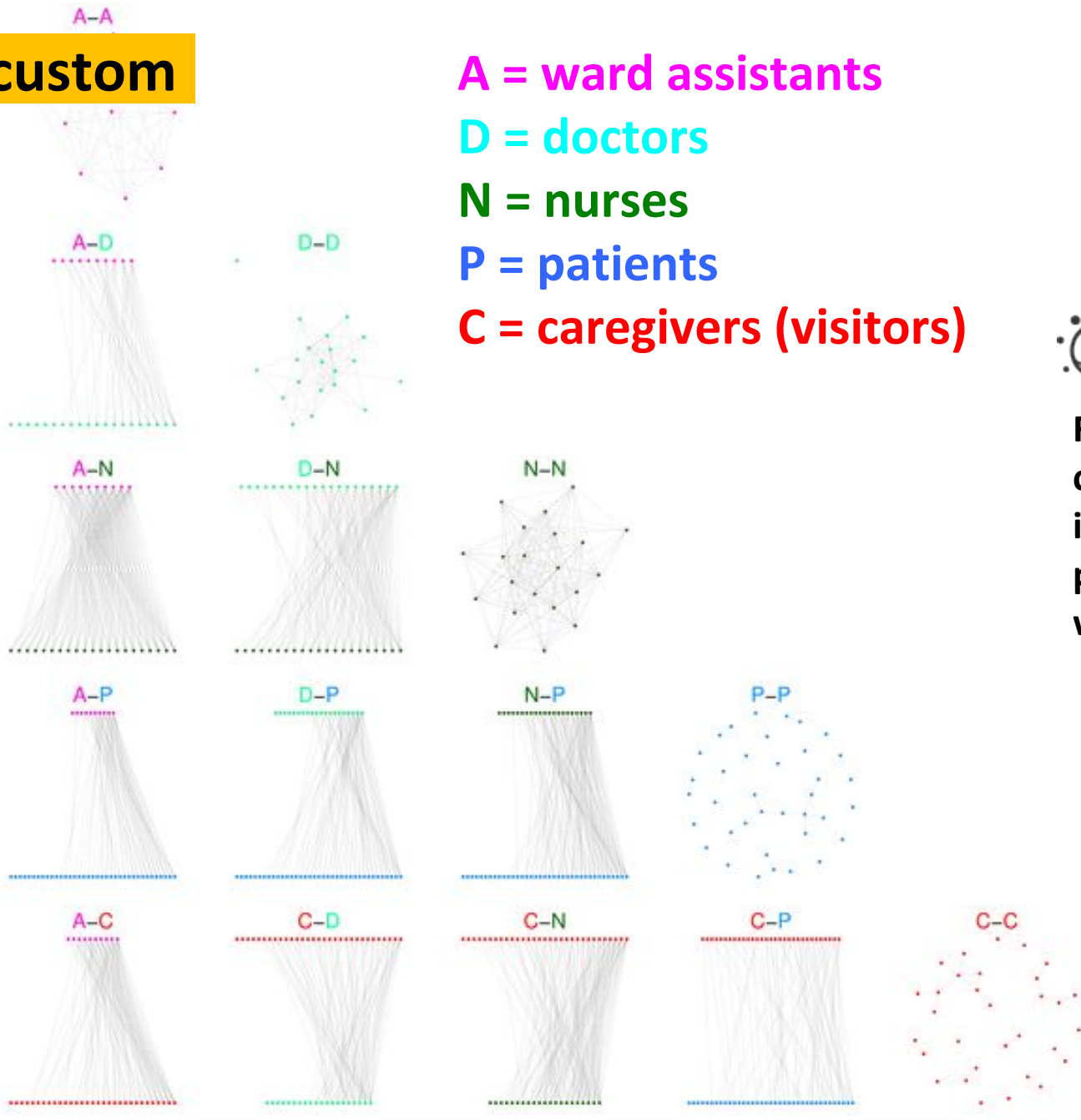
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custom

A = ward assistants
D = doctors
N = nurses
P = patients
C = caregivers (visitors)



Figure 6. Cumulative contact networks of individuals, for all pairs of classes and within each class.

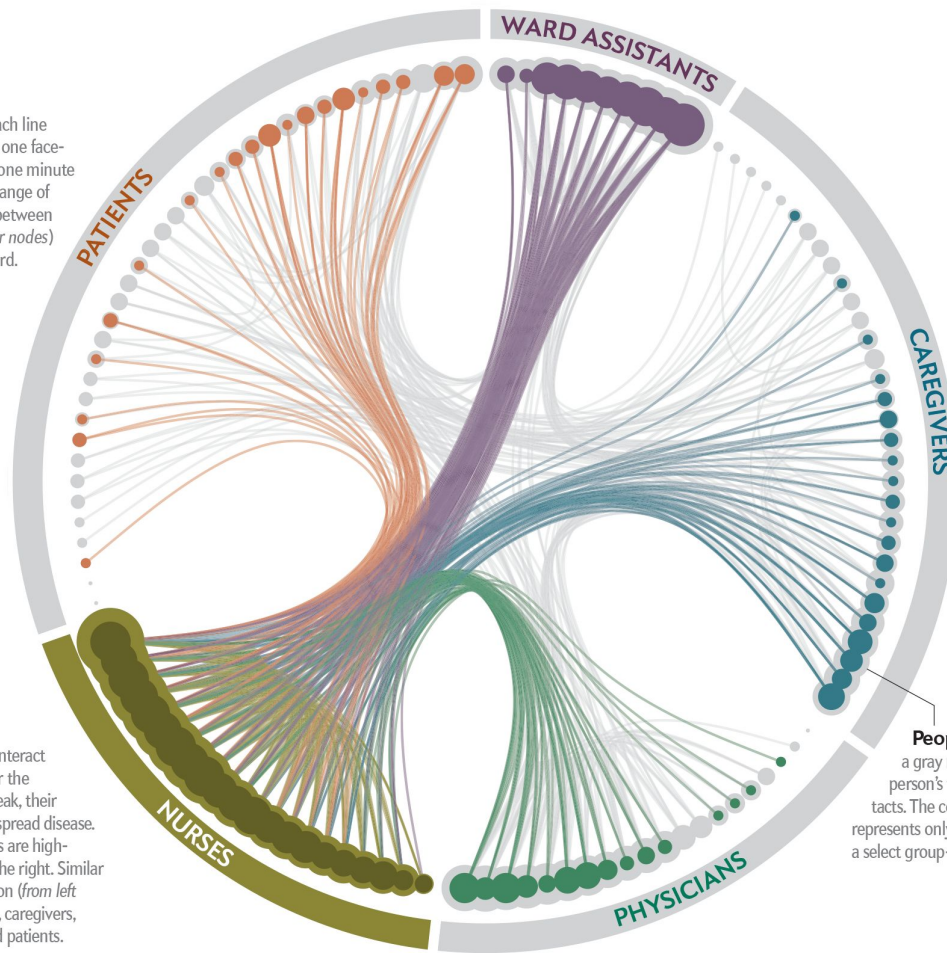


By L. Isella et al.,
“Close Encounters in
a Pediatric Ward:
Measuring
Face-to-Face
Proximity and Mixing
Patterns with
Wearable Sensors”

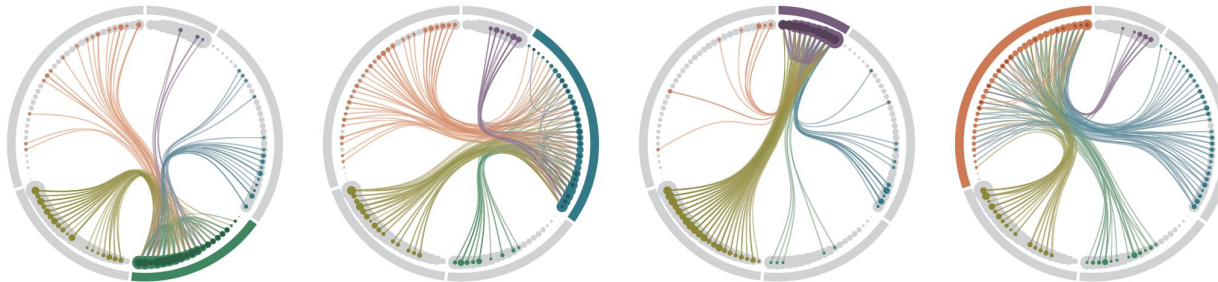
custom

Interactions Each line represents at least one face-to-face contact of one minute or more, within a range of about 1.5 meters, between individuals (*circular nodes*) in the pediatric ward.

Groups Nurses interact with people all over the ward—in an outbreak, their movements could spread disease. Nurses' interactions are highlighted in color at the right. Similar maps below focus on (from left to right) physicians, caregivers, ward assistants and patients.



People The size of a gray node reflects that person's total number of contacts. The colored inner circle represents only the contacts with a select group—nurses, in this case.



Tag—You're Sick

Patterns of personal contact in a hospital reveal true pathways of transmission

Jan Willem Tulp

custom

A-A



A-D



A-N



A-P



A-C



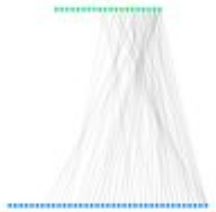
D-D



D-N



D-P



C-D



N-N



N-P



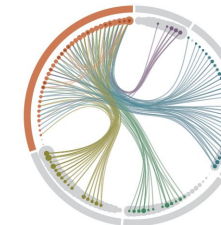
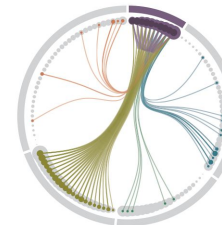
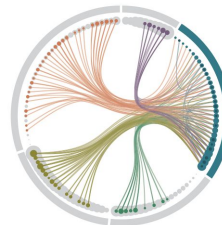
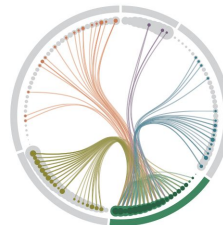
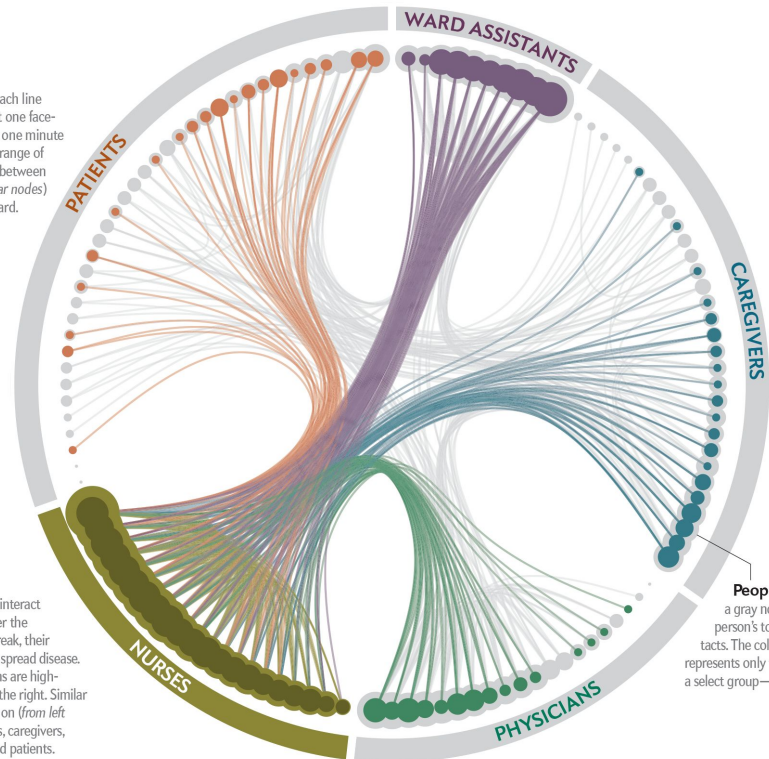
C-N



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C-P



C-C



customizing for a different **[context]**

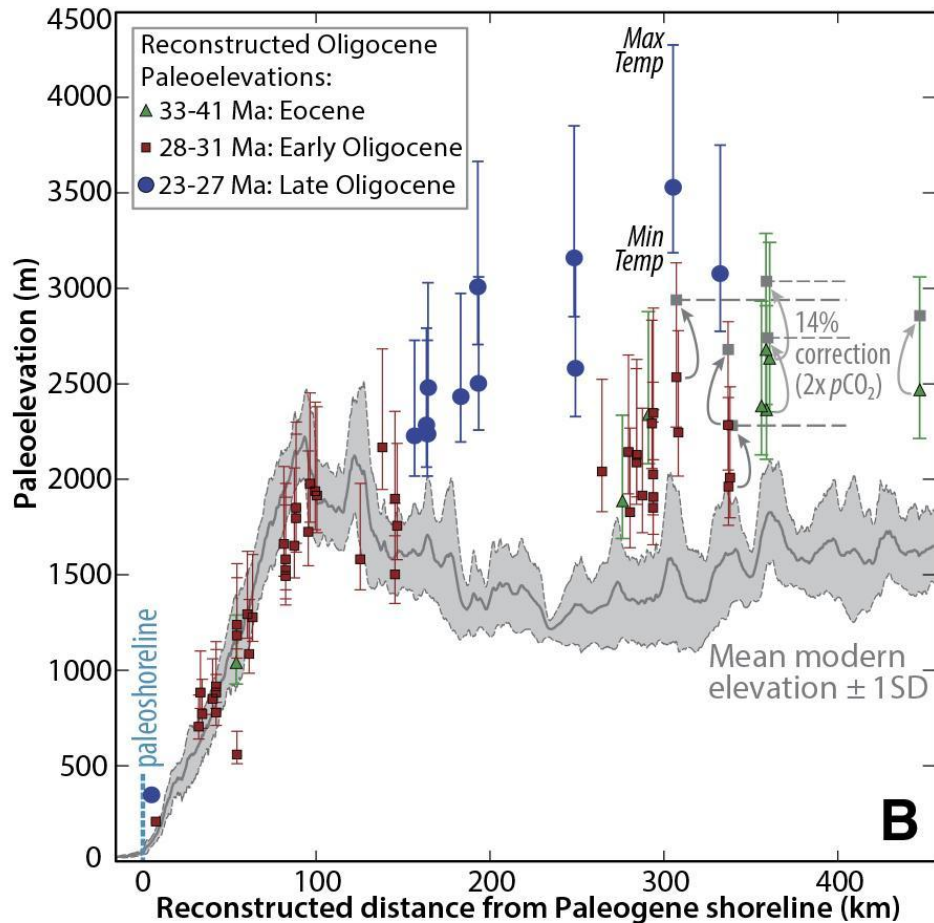
How to proceed?

customizing for a different **[context]**

How to proceed?

- build in time for many iterations

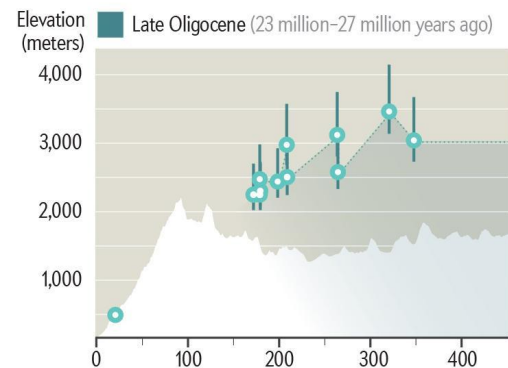
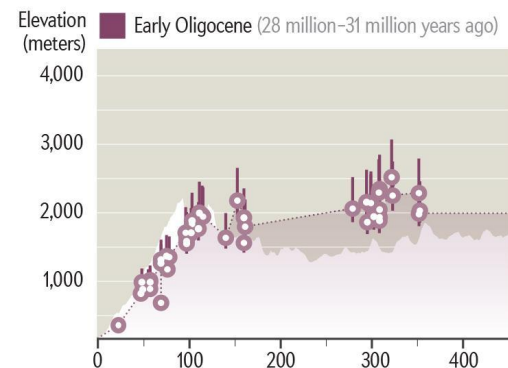
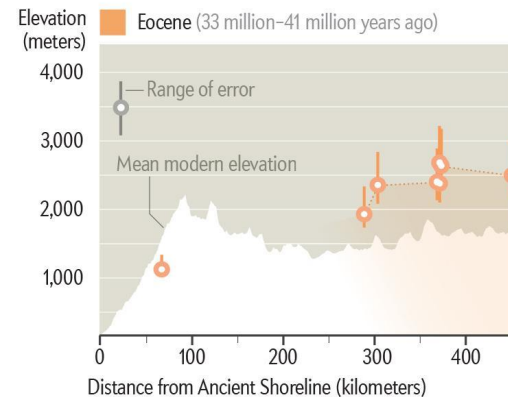
rework



By Elizabeth J. Cassel et al., "Profile of a paleo-orogen: High topography across the present-day Basin and Range from 40 to 23 Ma"

Nevada's Rocky Past

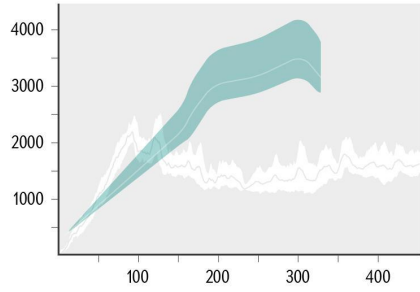
Reconstructed mountain scapes based on rainwater isotopes reveal the state's ups and downs



Tiffany Farrant-Gonzalez

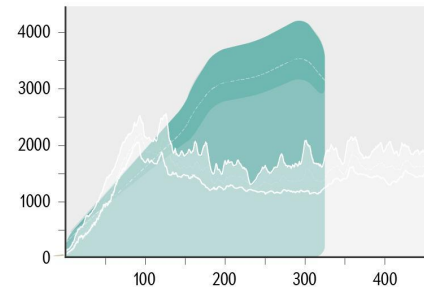
Reconstructed Paleoelevations (m)

Late Oligocene (23-27 million years ago)



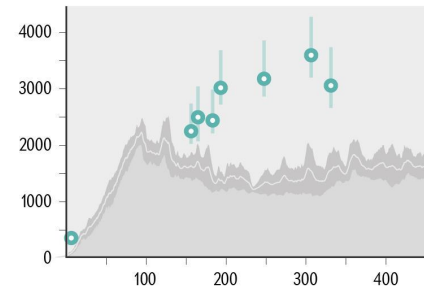
Reconstructed Paleoelevations (m)

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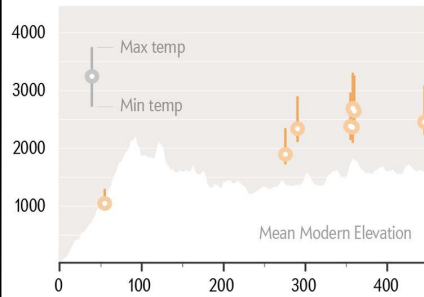
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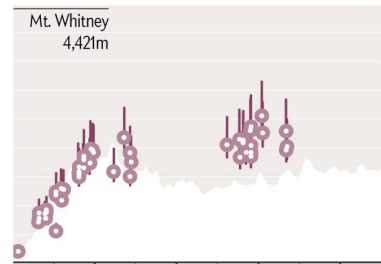


Reconstructed Paleoelevations (m)

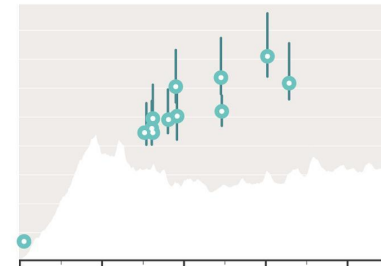
Eocene (33-41 million years ago)



Early Oligocene (28-31 million years ago)

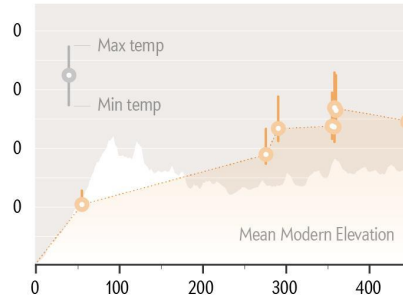


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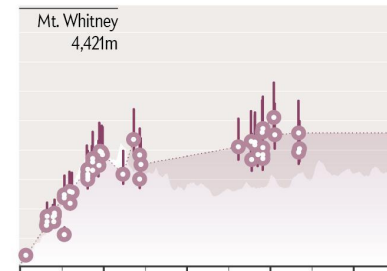


Reconstructed Paleoelevations (m)

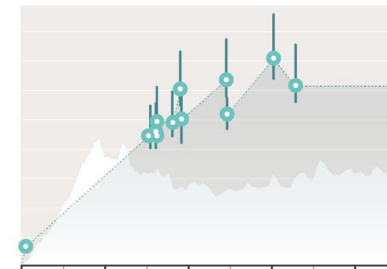
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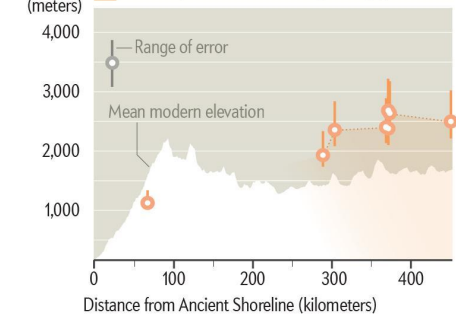
Late Oligocene (23-27 million years ago)



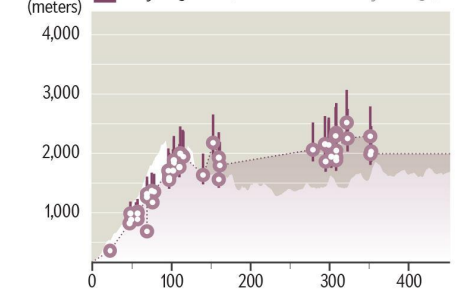
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Reconstructed mountain scapes based on rainwater isotopes reveal the state's ups and downs

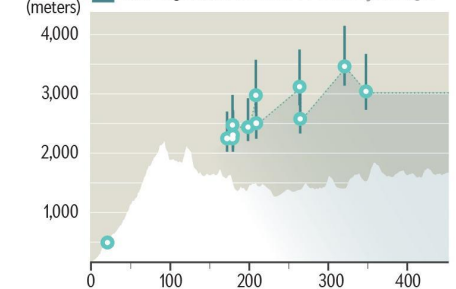
Elevation (meters) Eocene (33 million-41 million years ago)



Elevation (meters) Early Oligocene (28 million-31 million years ago)



Elevation (meters) Late Oligocene (23 million-27 million years ago)



customizing for a different [context]

How to proceed?

- build in time for many iterations
- look at your content with fresh eyes



continues. "To study a human disease, you have to start with the human body. In traditional Chinese medicine, there's never a lab animal. You never hear of a traditional Chinese doctor with 200 mice."

DR. JIA

Jia has no special affinity for cancer research. He's never lost a loved one to the disease and never thought about it more than anyone else until his research led him to believe he might be able to help create a better understanding of it.

China, he says, never had much of a cancer problem until recent decades, something he attributes to dietary, lifestyle and environmental changes.

"It's the only way to explain it," he says. "Prostate cancer was almost zero. The Chinese used to eat a lot of soybeans, which suppressed prostate cancer."

But the Westernization of the Chinese diet and lifestyle, as well as deteriorating environmental conditions, he says, have caused many cancer rates to "skyrocket."

Jia came to the States in the late 1980s to get his master's and doctoral degrees from the University of Missouri. He returned to China for 10 years and moved to North Carolina in 2008.

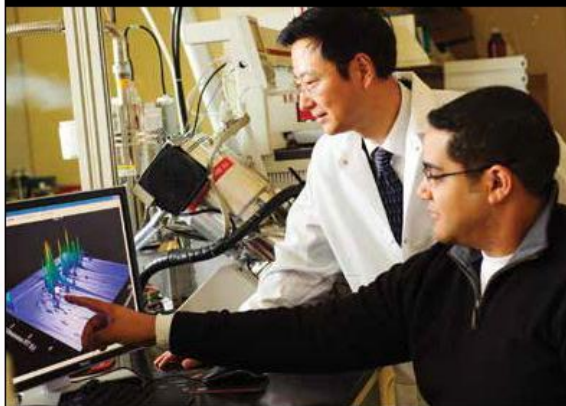
On a recent trip to his home city of Shanghai, he was struck not just by the differences between his home city, the largest in the world with 23 million people, and Kannapolis, where he now resides with about 42,000 others, but also the increasing ubiquity of the Western diet.

At a spring festival several years ago, he saw a queue nearly half a mile long outside an American fast-food restaurant.

"I was so impressed," he says. "Confused as well. There are long lines for Pizza Hut and KFC. You never see those long lines in front of a traditional Chinese restaurant."

THE CURE

Cancer affects this country like a plague. Last year, almost 1.6 million Americans were diagnosed with some form of the disease.



ABOVE, Wei Jia looks over student's research. Jia is comparing the metabolites of healthy subjects against the ones with cancer. Such an approach – starting with humans – is different from what many researchers have done over the last 50 years.

It claimed more than half a million American lives in 2011.


Jia and his team are not looking for a cure.

"Not yet," he says.

They are trying to understand cancer metabolism and what causes cancer to grow.

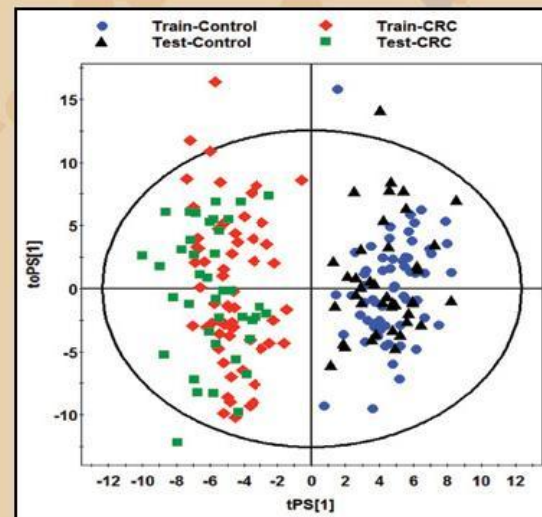
"We are looking for metabolic defects," he says. "The next step is to evaluate dietary influences, the effects of nutraceuticals and pharmaceuticals to correct these defects."

He's already identified several important biomarkers for colorectal cancer patients and filed patents for his – and, ultimately, the university's – discoveries. Breast cancer, which claimed 40,000 lives in the US last year, is in his sights.

"When we build a platform of technology, you always want to have an application. My goal is to make something usable in a clinic. I think I'm pretty close." 

BELOW, is an example of some of Jia's work on detecting colorectal cancer through a urine test. His research has found a panel of metabolite markers that make it possible to discriminate between those with colorectal cancer and those without.

DISTINCT URINARY METABOLIC PROFILE OF HUMAN COLORECTAL CANCER



Urinary metabolomic study of CRC patients (n=101, Healthy control subjects n=103)

The scores plot of the OPLS-DA prediction model of colorectal cancer (CRC). An OPLS-DA model was constructed using data from 62 healthy controls (blue dots) and 61 CRC patients (red diamonds) (the "training set"); this model was then used to predict CRC of a further 81 samples including 41 healthy controls (black triangles) and 40 CRC patients (green boxes) that were not used in the construction of the model (the "testing set").

In *UNCG Research* (research magazine from The University of North Carolina at Greensboro); Representing the work of Yu Cheng et al., from "Distinct Urinary Metabolic Profile of Human Colorectal Cancer"



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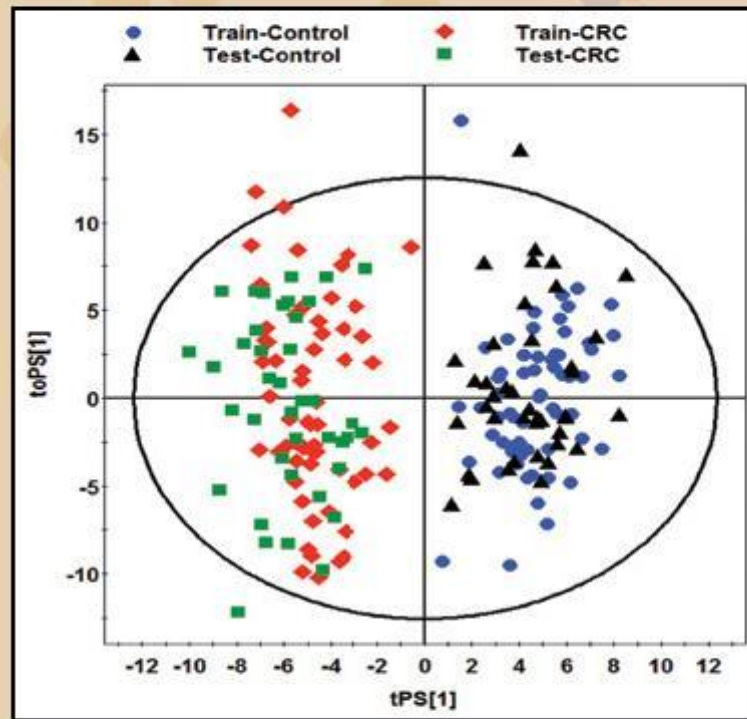
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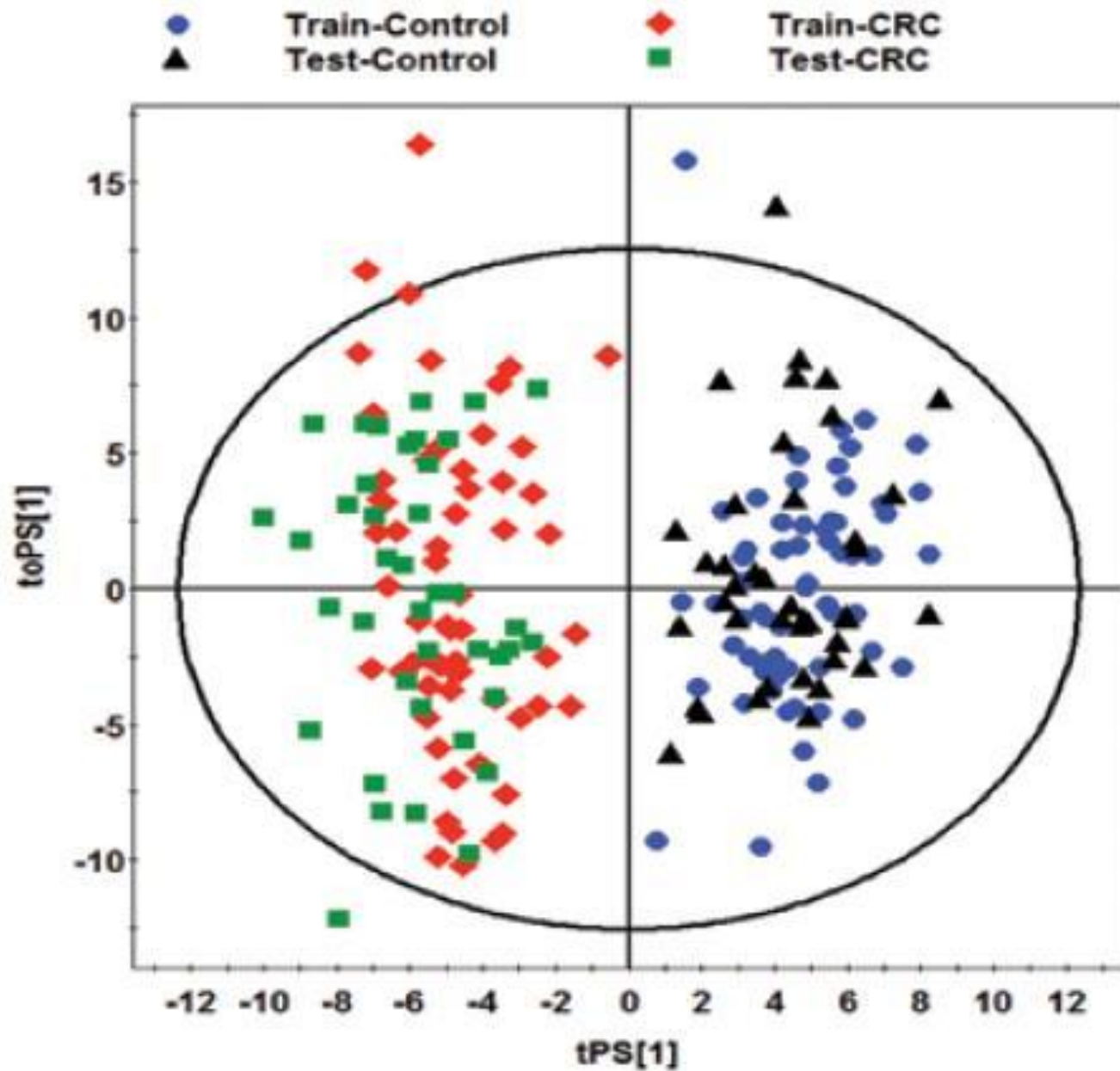
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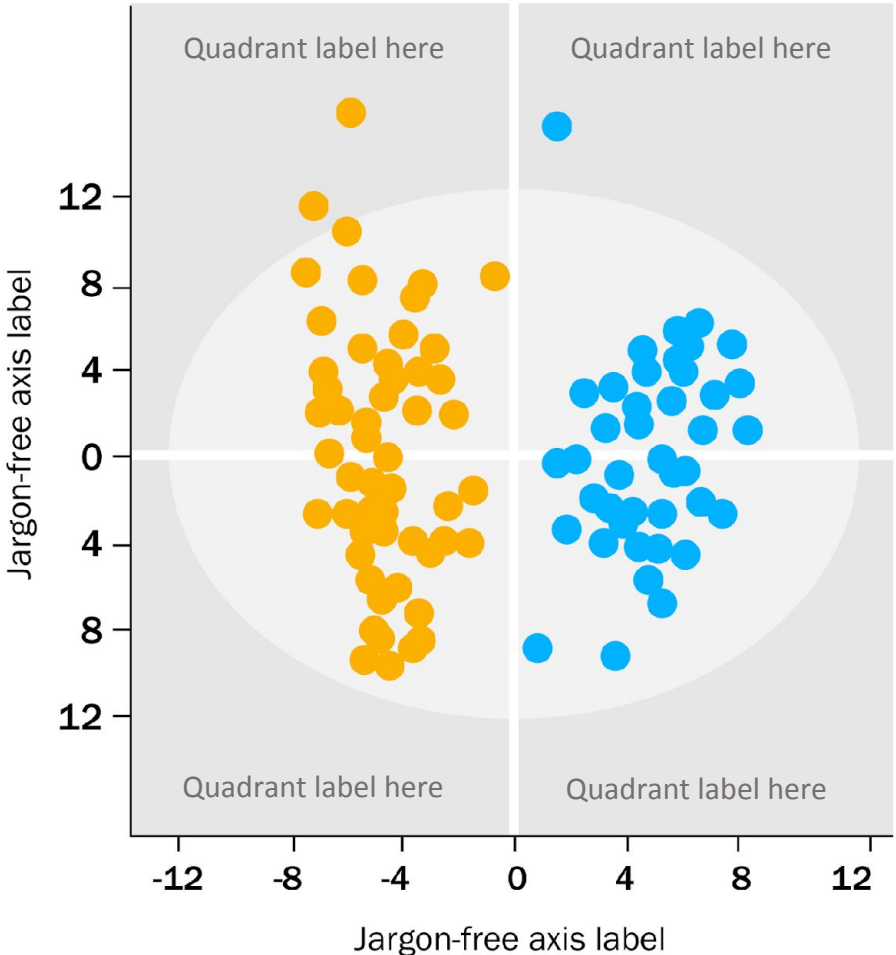
By Yu Cheng et al., "Distinct Urinary Metabolic Profile of Human Colorectal Cancer"

Detecting cancer through urine tests

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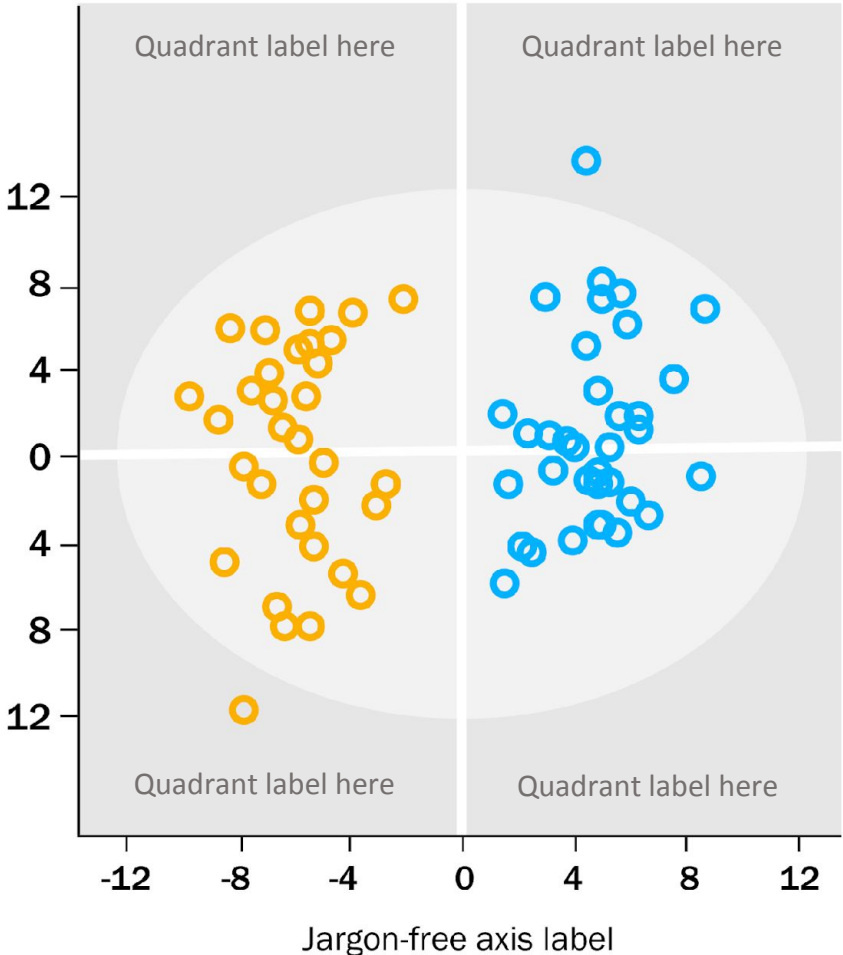
Constructing the model

- Individuals with colorectal cancer
- Healthy individuals



Testing the model

- Individuals with colorectal cancer
- Healthy individuals



customizing for a different [context]

How to proceed?

- build in time for many iterations
- look at your content with fresh eyes
- remember to ask
“for whom and why?”

<http://bit.ly/SciVizResources>

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