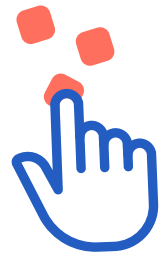




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*Koen Van den Eeckhout - Baryon*



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**13 ms**



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Comparative Study > Atten Percept Psychophys. 2014 Feb;76(2):270-9.

doi: 10.3758/s13414-013-0605-z.

## Detecting meaning in RSVP at 13 ms per picture

Mary C Potter <sup>1</sup>, Brad Wyble, Carl Erick Hagmann, Emily S McCourt

Affiliations + expand

PMID: 24374558 DOI: 10.3758/s13414-013-0605-z

### Abstract

The visual system is exquisitely adapted to the task of extracting conceptual information from visual input with every new eye fixation, three or four times a second. Here we assess the minimum viewing time needed for visual comprehension, using rapid serial visual presentation (RSVP) of a series of six or 12 pictures presented at between 13 and 80 ms per picture, with no interstimulus interval. Participants were to detect a picture specified by a name (e.g., smiling couple) that was given just before or immediately after the sequence. Detection improved with increasing duration and was better when the name was presented before the sequence, but performance was significantly above chance at all durations, whether the target was named before or only after the sequence. The results are consistent with feedforward models, in which an initial wave of neural activity through the ventral stream is sufficient to allow identification of a complex visual stimulus in a single forward pass. Although we discuss other explanations, the results suggest that neither reentrant processing from higher to lower levels nor advance information about the stimulus is necessary for the conscious detection of rapidly presented, complex visual information.

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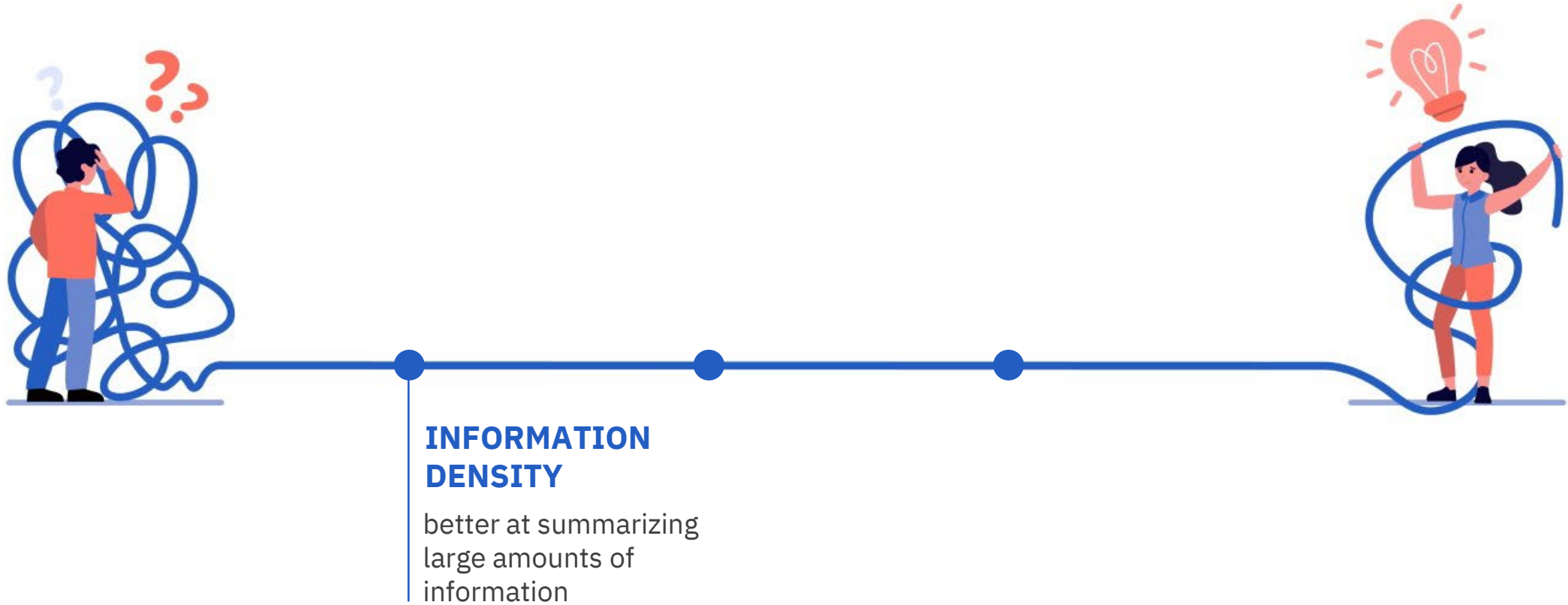
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# Why visual communication?





# Introductions

## **2004 – 15: Ghent University**

Engineering physics

PhD in physics

Post-doctoral researcher

Founded **Baryon**

## **2015 – 18: EY**

Grants & incentives consultant

## **2019 – now:**

Expanding **Baryon** as an  
information design agency

Koen Van den Eeckhout | [koen@baryon.be](mailto:koen@baryon.be)

# Introductions

What's your **research** about?

**Why** are you here today?

# Why visual communication?



## **INFORMATION DENSITY**

better at summarizing  
large amounts of  
information

## **ATTRACTIVE**

better at catching  
the reader's  
attention



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



### New Data Shows Staggering Toll of Outbreak

This article is by Ben Casselman, Patrick Cohen and Tiffany Hsu.

More than three million people filed for unemployment benefits last week, sending a collective shudder throughout the economy that is unlike anything Americans have experienced.

The alarming numbers, in a report released by the Labor Department on Thursday, provide some of the first hard data on the economic toll of the coronavirus pandemic, which has shut down whole swaths of American life faster than government statistics can keep track.

Just three weeks ago, barely 200,000 people applied for jobless benefits, a fairly steady low number. In the half-century that the government has tracked applications, the worst week ever, with 887,000 re-called initial claims, had been in 1982.

Thursday's figure of nearly 3.3 million set a grim record. "A large part of the economy just collapsed," said Ben Ferriss, executive director of HES Markit, a business data and analytics firm.

The numbers provided only the first hint of the economic calamity in progress. Even comparatively optimistic forecasters expect millions more lost jobs, and with them foreclosures, evictions and bankruptcies. Thousands of businesses have closed in response to the pandemic, and many will never reopen. Some economists say the decline in gross domestic product this year could rival the worst years of the Great Depression.

And there was fresh evidence on Thursday of the relentless course of the virus itself. Cases in the United States now exceed 80,000, the most of any nation, even China and Italy, according to a New York Times database. More than 1,000 deaths across the country have been linked to the virus. At least 160 million people nationwide are being urged to stay home.

**Labeling Regions by Risk**  
President Trump told governors to plan to slowly reopen states according to the danger of coronavirus infection. Page A11.

### You Out to the Ballgame

game between the New York Yankees and the Cleveland Guardians mattered, but it is difficult to say beyond the columns of viral and hoaxes. It mattered so much that complaints about baseball's other pastime yielded to the universal wish that this game would last forever.

"I couldn't played into the field," said the veteran Guardians left fielder Sammy Sosa, who missed part of last season after sneezing so hard that he strained a ligament in his back. "I didn't

Nearly 3.3 million unemployment claims were filed last week, a record number.



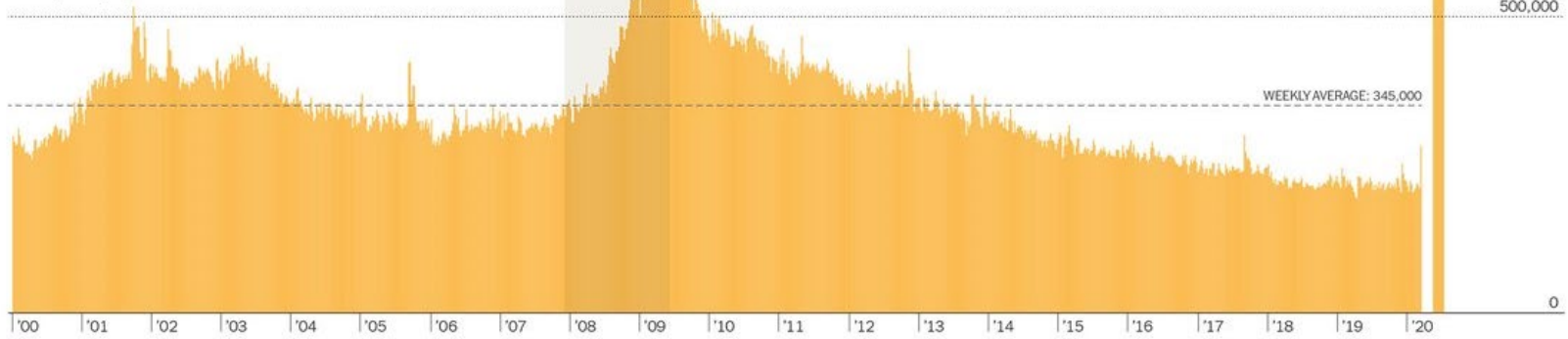
perts say the coronavirus has exposed those failings as never before.  
Continued on Page A11

school closures are uncharted territory, altering the lives and routines of millions.  
Continued on Page A16

one cared about the outcome; the distraction was reward enough.  
Don't misunderstand: This

sneezing so hard that he strained a ligament in his back. "I didn't  
Continued on Page A13

Weekly unemployment claims

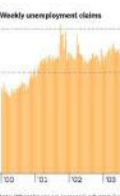


Note: Official figures are seasonally adjusted. Source: Department of Labor

order medical supplies on Amazon after its leaders, lacking experience in disaster response, failed to prepare for the onslaught of patients at its medical centers. Soon after President Trump came into office, a record high number of medical jobs have emptied offices across wide swaths of the federal bureaucracy. Now, current and former administration officials and doctors say the coronavirus has exposed those failings as never before.  
Continued on Page A11.

which have the largest school system in the country with more than 1.1 million students, began attempting to teach all students through remote learning this week because schools were closed to slow the spread of the coronavirus. Shutting the vast system, which includes 1,000 schools, was a serious challenge for the city and the largest public school district in the country, altering the lives and routines of millions.  
Continued on Page A16.

**BY DAN BARRY**  
Professional baseball greeted a new season this afternoon with an Opening Day game for the ages, an O.G.-tinged underdog that vividly unfolded on the sun-dappled field of the stadium. The crack of the bat could almost be heard, the blur of white almost seen, the communal joy nearly felt.  
Continued on Page A17.



Note: Official figures are seasonally adjusted. Source: Department of Labor

**BUSINESS B1-6**  
**Armed With Sewing Machines**  
With hospitals desperate for masks, people are pulling out their sewing machines to be the next.  
PAGE B4

**A Gusher Can't Be Contained**  
A chaotic mismatch between supply and demand for oil means the world is racing out of places to store it.  
PAGE B3



**INTERNATIONAL A18-20**  
**Maduro Is Indicted in U.S.**  
Federal prosecutors accused the Venezuelan president, whom the U.S. no longer recognizes, of participating in a human-rights conspiracy.  
PAGE C2

**Netanyahu Rival Releas**  
The Israeli prime minister was set to maintain power after his rival reversed course, citing the pandemic.  
PAGE A8

**Brushing Aside a Slaughter**  
Russia and China, which often reveal its privileges against other countries, are emphasizing selective memory to address a massacre that occurred on their border in 1989.  
PAGE A18

**NATIONAL A21-23**  
**New Focus on Health System**  
The pandemic gave added urgency to a central issue that was already a main talking point for Joseph R. Biden Jr. and other Democrats.  
PAGE C2

**Starting Over on Foster Care**  
A lawsuit led New Mexico to remake its failing system into one advocates hope will serve as a national model.  
PAGE A17

**SPORTS/FRIDAY B1-15**  
**Slow to Embrace a Delay**  
Athletes question why U.S. Olympic leaders took so long to join calls to postpone the Tokyo Games.  
PAGE B1

### A Fan Writes a Fantasy for Opening Day

From the moment the first batter tipped his bat — and a brief New set — to the walk-off home run by a batting phenom, the 15-year-old fan relived what everyone's a perfect game. He saw every pitch, every strike, every out. He saw every pitch, every strike, every out. He saw every pitch, every strike, every out.

game between the New York Yankees and the Cleveland Guardians mattered, but it is difficult to say beyond the columns of viral and hoaxes. It mattered so much that complaints about baseball's other pastime yielded to the universal wish that this game would last forever.



Note: Official figures are seasonally adjusted. Source: Department of Labor

**WEEKEND ARTS C1-16**  
**For Pint-Size Paleontologists**  
Like 'Jurassic Park' (have you?), take a peek at two pages reprinted from The New York Times for kids.  
PAGE C3

**It's Virtually Perfect**  
Donald Trump's installation, below, at the Gateway Gateway is impressive, in person or, for now, online.  
PAGE C13



**OBITUARIES A24-25**  
**Chronicler of U.S. History**  
Richard Hecht's books on Nixon, Clinton and others could be no unimpaired as the column. He was 83.  
PAGE A24

**Globetrotters' Dean of Drizzle**  
Fred 'Curly' Neal dazzled fans with his ball-bouncing wizardry in more than 6,000 games. He was 77.  
PAGE A15

**EDITORIAL, OP-ED A26-27**  
**Paul Krugman**  
PAGE A27





# Why visual communication?



## **INFORMATION DENSITY**

better at summarizing large amounts of information

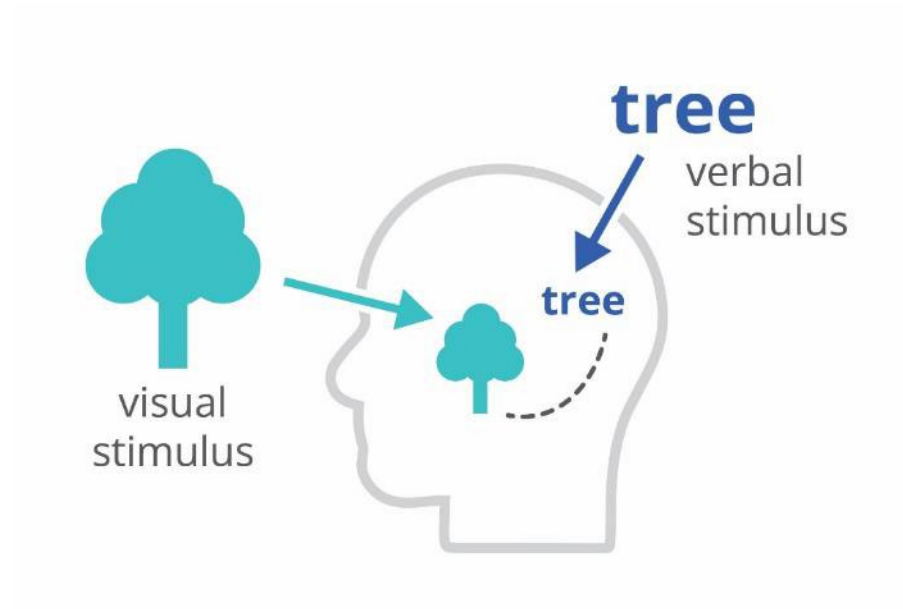
## **ATTRACTIVE**

better at catching the reader's attention

## **EASIER TO UNDERSTAND**

thanks to dual coding and better knowledge retention





## Dual-coding theory

a combination of  
**visual stimuli** (pictures) and **verbal stimuli** (words)  
stimulates the brain to make connections





## Sketchnoting

combining simple illustrations  
with small amounts of text  
= a great way of note-taking

# Why visual communication?



## **INFORMATION DENSITY**

better at summarizing large amounts of information

## **ATTRACTIVE**

better at catching the reader's attention

## **EASIER TO UNDERSTAND**

thanks to dual coding and better knowledge retention



## How should I protect myself?

There are some basic precautions you can take, which are the same as what you should be doing every day to stave off other respiratory diseases. You've seen the guidance before: Wash your hands. Cover your nose and mouth when you sneeze. And when you stay home from work or school and drink lots of fluids.

The CDC recommends washing with soap and water for at least 20 seconds after using the bathroom, before eating and after blowing your nose or sneezing. It also advises not to touch your eyes, nose, or mouth, and to clean objects and surfaces you touch often.

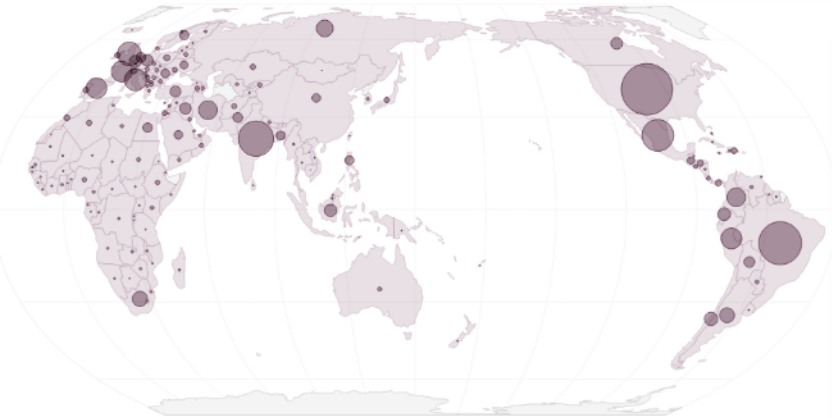
[Read more about preparing for coronavirus here.](#)

[Return to top](#)

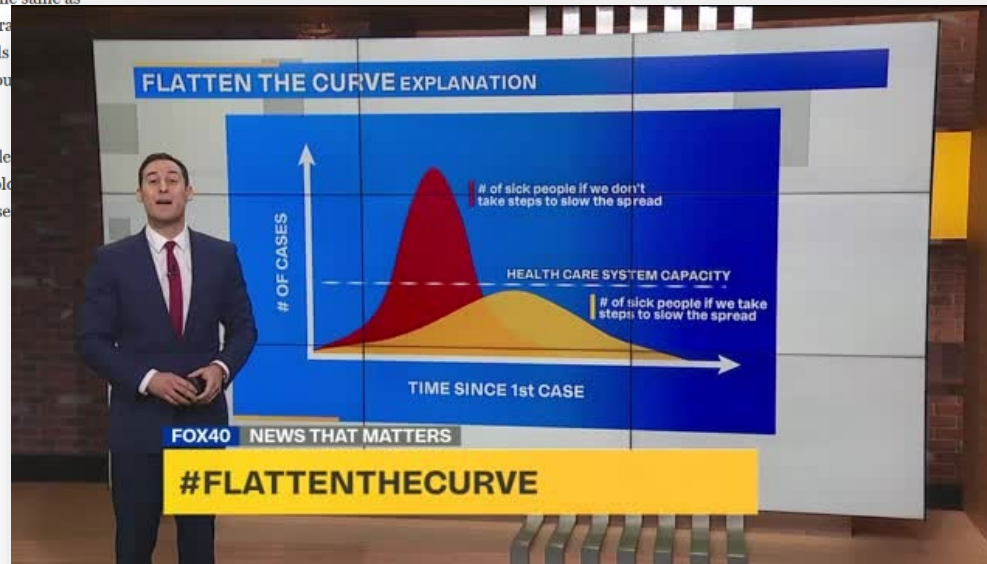
## Where has it spread in the world?

Reported deaths: 997,000  
Reported cases: 33,087,000

Deaths Cases Adjusted for population Raw numbers



Country	Change from Sept. 21			
	Reported cases ▼	Total	Pct.	Deaths
U.S.	7,082,976	▲ 272,069	+4%	204,370
India	6,074,702	▲ 587,122	+11%	95,542
Brazil	4,732,309	▲ 187,680	+4%	141,741
Russia	1,154,299	▲ 49,251	+4%	20,299
Colombia	813,056	▲ 47,980	+6%	25,488
Peru	800,142	▲ 31,247	+4%	32,142
Mexico	730,317	▲ 29,737	+4%	76,430



## Why outbreaks like coronavirus spread exponentially, and how to “flatten the curve”

By Harry Stevens March 14, 2020

### PLEASE NOTE

The Washington Post is providing this story for free so that all readers have access to this important information about the coronavirus. For more free stories, [sign up for our daily Coronavirus Updates newsletter.](#)

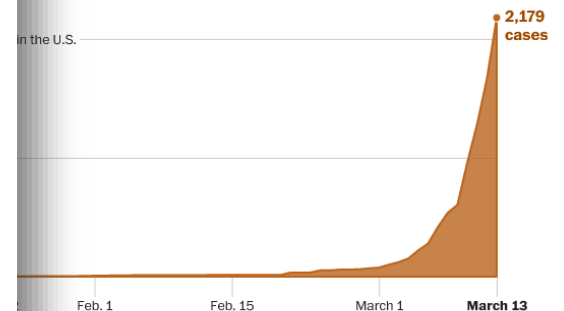
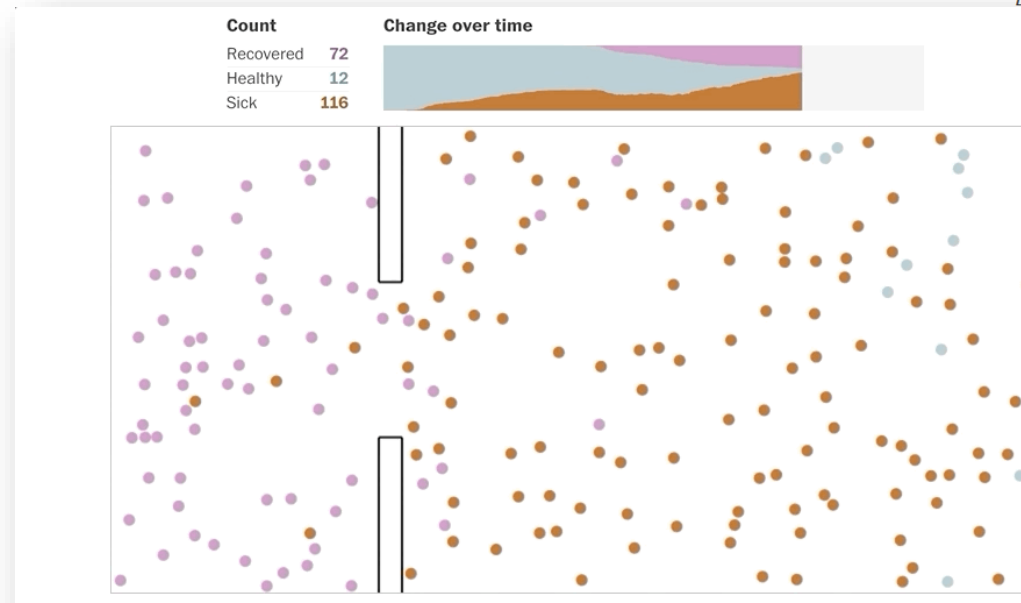
After the first case of covid-19, the disease caused by the new strain of coronavirus, was announced in the United States, reports of further infections trickled in slowly. Two months later, that trickle has turned into a steady current.

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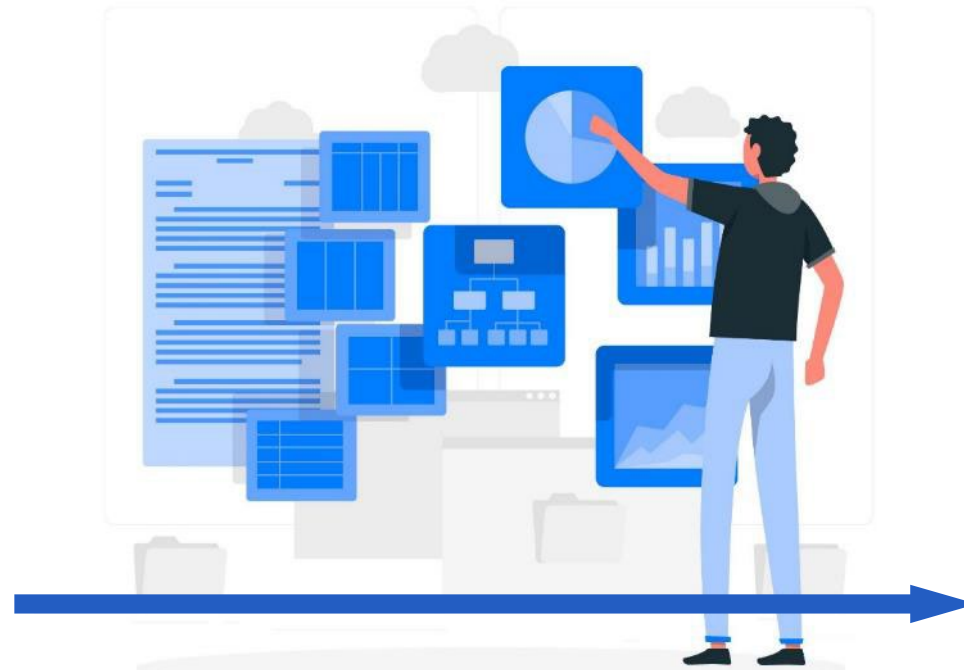
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explore the number of cases over time.

called **exponential curve** has experts worried. If the number of cases were to continue to double every three days, there would be about a hundred million cases in the United States by May.

journalists  
financial institutions  
researchers  
marketing agencies  
organisations  
governments  
technical start-ups  
food producers  
mobile health apps  
...



complex insights  
large amounts of data  
technical information

readers  
clients  
general public  
platform users  
members  
consumers  
patients  
students  
management  
...

## Cramer classes of chemicals I, II and III

- **Class I:** Substances with simple chemical structures and for which efficient modes of metabolism exist, suggesting a low order of oral toxicity.
- **Class II:** Substances which possess structures that are less innocuous than class I substances, but do not contain structural features suggestive of toxicity like those substances in class I.
- **Class III:** Substances with chemical structures that permit no strong initial presumption of safety or may even suggest significant toxicity or have reactive functional groups.





K 14 02



# Influence of rare-earth codoping on the afterglow behaviour in $\text{Ca}_2\text{Si}_2\text{N}_8:\text{Eu}^{2+}$

Koen Van den Eckhout, Philippe F. Smet, Dirk Pielman  
LumiLab, Department of Solid State Sciences, Ghent University



## Background

Phosphor afterglows are luminescent materials that continue emitting light for hours after ending the excitation "afterglow".

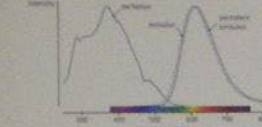
This has applications in various fields including:

- safety and emergency signage
- clock and displays
- medical imaging

Many different phosphors have been developed over the past few years. However, efficient and stable phosphor light emitting compounds in the range for red and orange are scarce.

## $\text{Ca}_2\text{Si}_2\text{N}_8:\text{Eu}^{2+}\text{RE}^{3+}$

We focused on the nitride silicate  $\text{Ca}_2\text{Si}_2\text{N}_8$  as host material with  $\text{Eu}^{2+}$  as the luminescent center, codoped with various rare earth ions ( $\text{RE}^{3+}$ ). This material has an orange emission peaking around 610 nm. During the afterglow, the emission is shifted approximately 10 nm towards longer wavelengths.



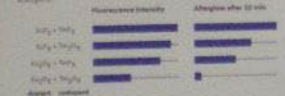
The excitation spectrum peaks at 370 nm but extends far into the visible region of the spectrum. This makes  $\text{Ca}_2\text{Si}_2\text{N}_8:\text{Eu}^{2+}$  suitable for visible applications, where UV light is often present.

## Preparation

Samples were prepared starting from:

- $\text{Ca}_3\text{N}_2$  and  $\text{Si}_3\text{N}_4$  for the host crystal
- $\text{Eu}_2\text{O}_3$  or  $\text{Eu}_2\text{O}_3$  for the dopant
- $\text{RE}_2\text{O}_3$  or  $\text{RE}_2\text{O}_3$  for the codopant
- temperature: 1300-1400°C
- duration: 1-3 hours
- fluxing atmosphere of 90%  $\text{N}_2$  and 10%  $\text{H}_2$

The rare earth dopants and codopants are preferentially reduced in their metallic form, not in their oxide form. This enhances both the fluorescence and the afterglow.



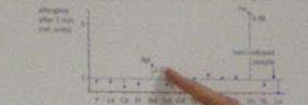
## Acknowledgement

Many thanks to Philip Brochez, Adrie Bies and Erik van der Kolk from Vrije Universiteit of Technology for assistance in TL measurements.

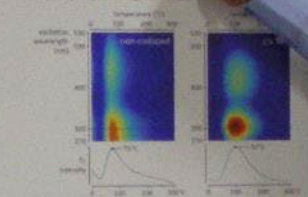
## Influence of rare earth codoping

Codoping with rare earth ions is believed to influence or even enhance the long afterglow by creating a material that greatly enhances the afterglow.

Of all rare earth codopants, we found that cerium yields the highest afterglow. Cerium also enhances the afterglow, compared to the rare earth  $\text{Ca}_2\text{Si}_2\text{N}_8:\text{Eu}^{2+}$ . Introducing cerium or lanthanum into the afterglow.

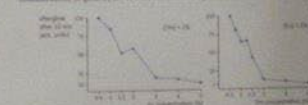


Thermoluminescence (TL) measurements show that the material can be charged with visible light. Upon codoping with  $\text{Ce}^{3+}$ , the main TL peak shifts, indicating a deepening of the charge center traps.



## Dopant and codopant concentration

The brightness of the afterglow is strongly influenced by the dopant and codopant concentrations. In general, lower concentrations are preferable.



## Conclusions

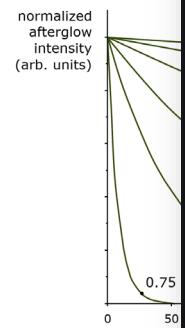
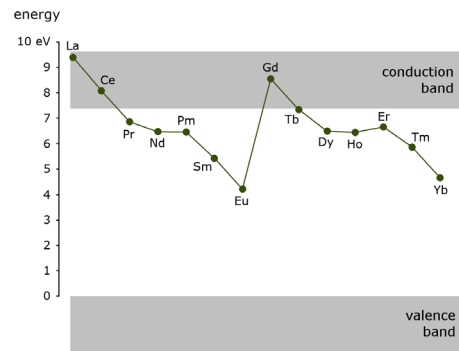
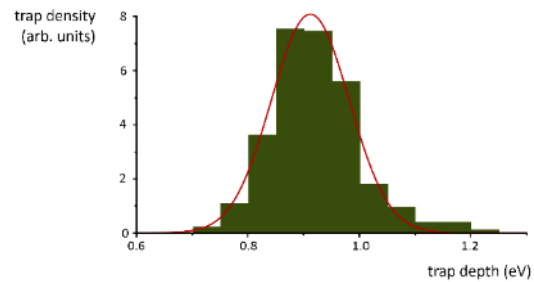
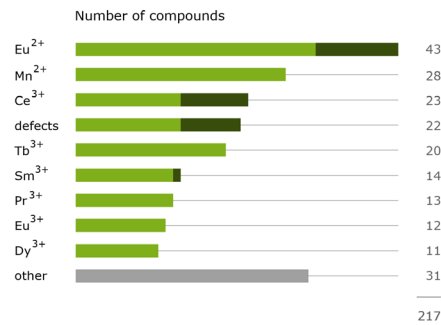
Rare earth codoped  $\text{Ca}_2\text{Si}_2\text{N}_8:\text{Eu}^{2+}$  is an orange phosphor that can be excited with both UV and visible light. Codoping with cerium greatly enhances the afterglow by shifting the main trap levels.

To obtain a bright afterglow, the dopant and codopant are preferably added in the molten mixture in their metallic form, and an atmosphere of 90%  $\text{N}_2$  and 10%  $\text{H}_2$ .

K 14 03

K 14 01





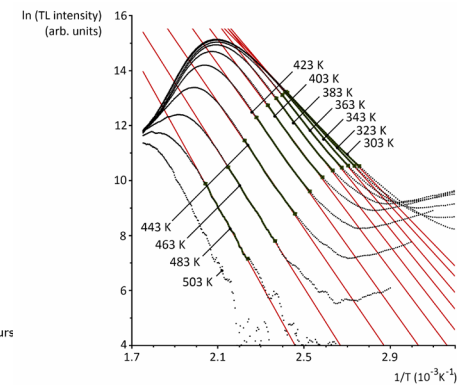
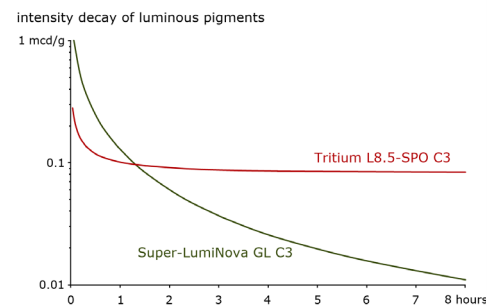
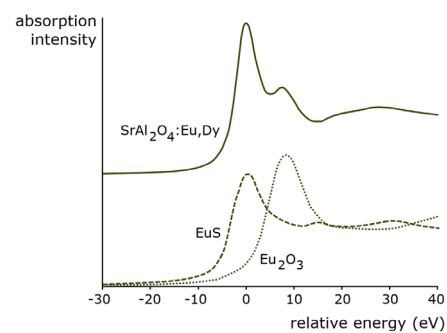
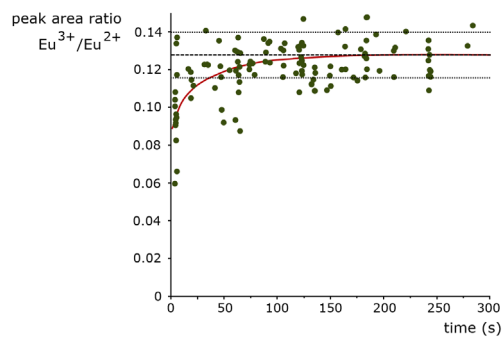
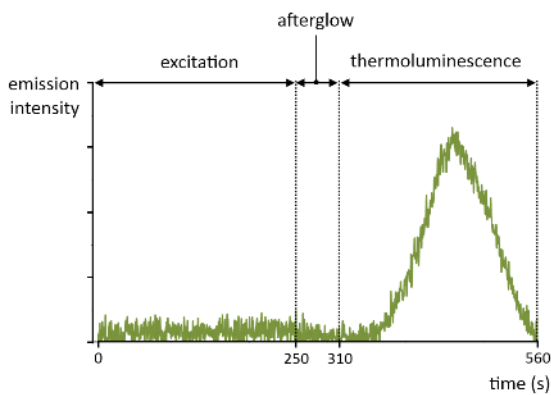
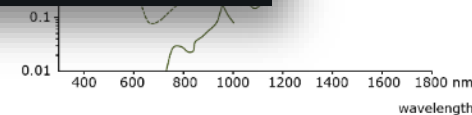
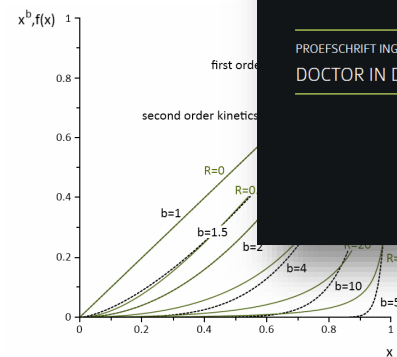
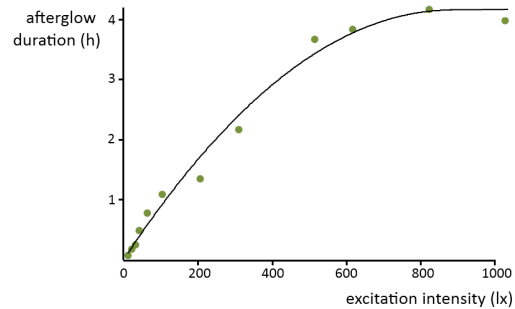
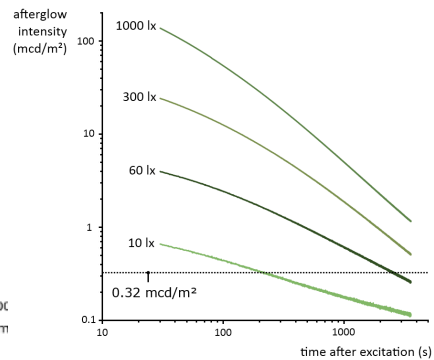
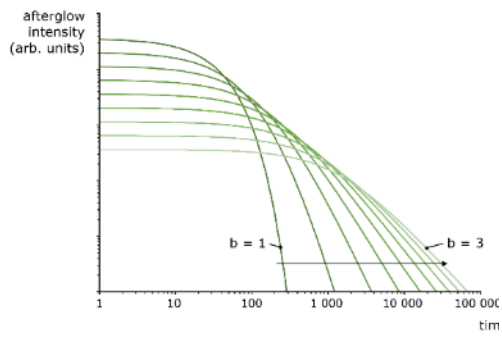
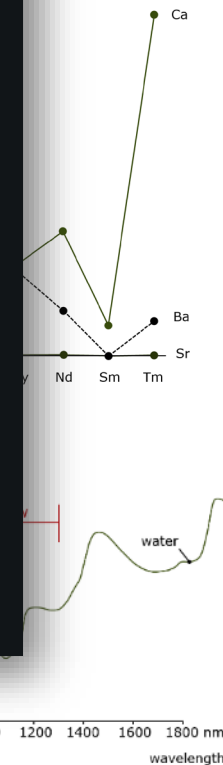
## PERSISTENT LUMINESCENCE: KINETICS AND COMPOUNDS

Koen Van den Eeckhout

PROMOTOREN  
prof. dr. Dirk Poelman  
prof. dr. Philippe Smet

PROEFSCHRIFT INGEDIEND TOT HET BEHALLEN VAN DE ACADEMISCHE GRAAD VAN  
DOCTOR IN DE WETENSCHAPPEN: FYSICA

Vakgroep Vastestofwetenschappen  
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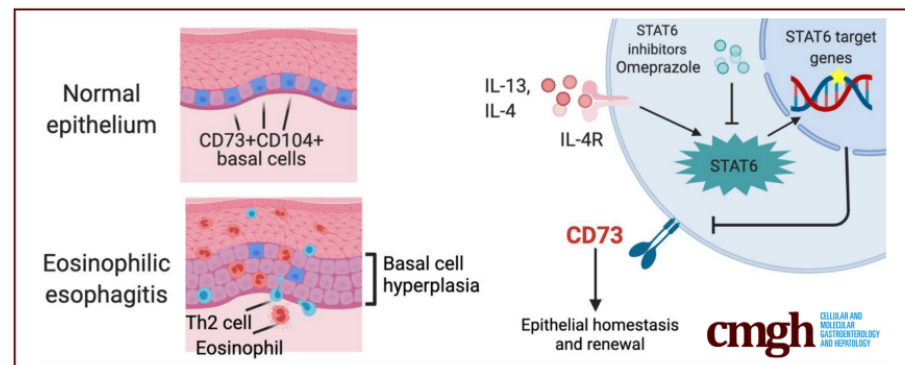


## ORIGINAL RESEARCH

CD73<sup>+</sup> Epithelial Progenitor Cells That Contribute to Homeostasis and Renewal Are Depleted in Eosinophilic Esophagitis

Takeo Hara,<sup>1</sup> Yuta Kasagi,<sup>1,2</sup> Joshua Wang,<sup>1</sup> Masaru Sasaki,<sup>1</sup> Bailey Aaron,<sup>1</sup> Adam Karami,<sup>3,4</sup> Masataka Shimonosono,<sup>5,6</sup> Rieko Shimonosono,<sup>5,6</sup> Hisatsugu Maekawa,<sup>5,6</sup> Lauren Dolinsky,<sup>1</sup> Benjamin Wilkins,<sup>1</sup> Jeremy Klein,<sup>1</sup> Jane Wei,<sup>1</sup> Kathryn Nunes,<sup>1</sup> Kristle Lynch,<sup>7</sup> Jonathan M. Spergel,<sup>8,9</sup> Kathryn E. Hamilton,<sup>1,9</sup> Melanie A. Ruffner,<sup>8,9</sup> Tatiana A. Karakasheva,<sup>1</sup> Kelly A. Whelan,<sup>3,4</sup> Hiroshi Nakagawa,<sup>5,6</sup> and Amanda B. Muir<sup>1,9</sup>

<sup>1</sup>Division of Pediatric Gastroenterology, Hepatology, and Nutrition, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania; <sup>2</sup>Department of Surgery, National Hospital Organization, Fukuoka Higashi Medical Center, Koga, Fukuoka, Japan; <sup>3</sup>Department of Pathology and Laboratory Medicine, <sup>4</sup>Fels Institute for Cancer Research and Molecular Biology, Lewis Katz School of Medicine, Temple University, Philadelphia, Pennsylvania; <sup>5</sup>Division of Digestive and Liver Diseases, Department of Medicine, Vagelos College of Physicians and Surgeons, <sup>6</sup>Herbert Irving Comprehensive Cancer Center, Columbia University, New York, New York; <sup>7</sup>Division of Gastroenterology, Department of Medicine, Philadelphia, University of Pennsylvania, Pennsylvania; <sup>8</sup>Division of Allergy and Immunology, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania; <sup>9</sup>Department of Pediatrics, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania



## SUMMARY

We show that the CD73<sup>+</sup>CD104<sup>+</sup> progenitor population regulates epithelial renewal and homeostasis in the basal zone of esophageal epithelium. T helper 2 cytokines, interleukins 4 and 13 deplete this CD73<sup>+</sup>CD104<sup>+</sup> self-renewing population via the signal transducer and activator of transcription 6 pathway, which may be perpetuating epithelial injury in the context of eosinophilic esophagitis.

**BACKGROUND & AIMS:** Although basal cell hyperplasia is a histologic hallmark of eosinophilic esophagitis (EoE), little is known about the capabilities of epithelial renewal and differentiation in the EoE inflammatory milieu. In murine esophageal epithelium, there are self-renewing and slowly

proliferating basal stem-like cells characterized by concurrent expression of CD73 (5'-nucleotidase ecto) and CD104 (integrin  $\beta 4$ ). Here, we investigated CD73<sup>+</sup>CD104<sup>+</sup> cells within the basal population of human esophageal epithelium and clarified the biological significance of these cells in the EoE epithelium.

**METHODS:** We performed flow cytometry on esophageal biopsy samples from EoE and non-EoE patients to determine the quantity of CD73<sup>+</sup>CD104<sup>+</sup> cells in the epithelium. Simulating the EoE milieu we stimulated primary patient-derived and immortalized cell line-derived esophageal organoids with interleukin (IL)4 and IL13 and analyzed by flow cytometry, immunohistochemistry, and quantitative reverse-transcription polymerase chain reaction. We performed single-cell RNA sequencing on primary organoids in the setting of IL13 stimulation and evaluated the CD73<sup>+</sup>CD104<sup>+</sup> population. We performed fluorescent-activated cell sorting to purify

CD73<sup>+</sup>CD104<sup>+</sup> and CD73<sup>+</sup>CD104<sup>+</sup> populations and seeded these groups in organoid culture to evaluate the organoid formation rate and organoid size. We used RNA interference to knock down CD73 in esophageal organoids to evaluate organoid formation rates and size. We evaluated the effects of signal transducer and activator of transcription 6 (STAT6) signaling inhibition by RNA interference, a STAT6 inhibitor, AS1517499, as well as the proton pump inhibitor omeprazole.

**RESULTS:** EoE patients showed decreased epithelial CD73<sup>+</sup>CD104<sup>+</sup> cell content. IL4 and IL13 stimulation depleted this population in 3-dimensional organoids with a recapitulation of basal cell hyperplasia as corroborated by single-cell RNA sequencing of the organoids, which suggests depletion of CD73<sup>+</sup>CD104<sup>+</sup> cells. The CD73<sup>+</sup>CD104<sup>+</sup> population had enhanced organoid formation compared with the CD73<sup>+</sup>CD104<sup>+</sup> population. Similarly, knock-down of CD73 resulted in decreased organoid formation rate. Genetic and pharmacologic inhibition of STAT6 prevented T helper 2 cytokine-induced depletion of CD73<sup>+</sup>CD104<sup>+</sup> cells. Lastly, omeprazole treatment prevented the effects of IL4 and IL13 on the CD73<sup>+</sup>CD104<sup>+</sup> population.

**CONCLUSIONS:** This study addressed the role of CD73<sup>+</sup>CD104<sup>+</sup> cells in epithelial renewal and homeostasis in the context of EoE. The depletion of the CD73<sup>+</sup>CD104<sup>+</sup> self-renewal population by helper T cell 2 cytokines in EoE milieu may be perpetuating epithelial injury. Future therapies targeting epithelial restitution in EoE could decrease the need for immune modulation and steroid therapy. (*Cell Mol Gastroenterol Hepatol* 2022;13:1449–1467; <https://doi.org/10.1016/j.jcmgh.2022.01.018>)

**Keywords:** Eosinophilic Esophagitis; Epithelium; Organoids; CD73; CD104.

The stratified squamous epithelium of the esophagus comprises basal, parabasal, and suprabasal cell layers that display an exquisite proliferation–differentiation gradient. The basal/parabasal cell layers contain proliferative basal cells (keratinocytes) that undergo postmitotic terminal differentiation within the suprabasal cell layer. Differentiated keratinocytes form intercellular bridges (desmosomes, tight junctions, and so forth) to provide the first line of defense against the chemical and biological milieu of luminal contents. Although exposure to acid, carcinogens, and allergens perturbs squamous cell differentiation, it is unknown how these insults affect epithelial renewal and proliferation. Disruption of this homeostatic differentiation gradient or barrier function is linked to multiple human pathologies including gastroesophageal reflux disease and eosinophilic esophagitis (EoE).

EoE is an allergen-induced chronic inflammatory disease of the esophagus, characterized by dysphagia, food impactions, and fibrotic strictures.<sup>2</sup> Histologically, the most conspicuous finding in EoE, in addition to the eosinophilic infiltrate, is basal cell hyperplasia (BCH).<sup>3,4</sup> BCH is induced by injury or inflammation and involves an expansion of basal cells (>20% of epithelial height) with limited formation of intercellular bridges, a hallmark of squamous cell differentiation. The EoE transcriptome suggests stalled differentiation of the esophageal epithelium, leading to

epithelial barrier defects and ongoing antigen exposure.<sup>5–7</sup> Multiple EoE-relevant cytokines such as interleukin (IL)5 and IL13 induce BCH in murine models of EoE.<sup>8,9</sup> These cytokines mediate the functional interplay between basal cells and fibroblasts to facilitate lamina propria fibrosis.<sup>3,9–12</sup> Detailing the populations that exist within the basal epithelium and how these are perturbed in the EoE epithelium would allow for broader understanding of epithelial responses to inflammation. Similarly, therapies aiming to re-establish epithelial homeostasis represent an unexplored area that potentially could spare immune suppression or steroid exposure in EoE.

Basal cells are heterogeneous with variable expression of markers such as CD104 (integrin  $\beta 4$ ) and CD73 (5'-nucleotidase ecto), as well as variable proliferation and differentiation capabilities.<sup>13–16</sup> DeWard et al<sup>14</sup> described heterogeneity within the murine esophageal basal epithelium, identifying CD73<sup>+</sup>CD104<sup>+</sup> basal cells as a distinct stem cell-like population with self-renewal and epithelial formation capabilities. However, CD73<sup>+</sup>CD104<sup>+</sup> cells remain uncharacterized in the human esophageal epithelium, and the effect of inflammation on homeostatic epithelial renewal remains unknown.

Herein, we observed alterations in the heterogeneity within proliferative and undifferentiated basal or basoidal (defined as proliferative and undifferentiated basal-like cells present in the suprabasal cell layers population<sup>17</sup>) of the human esophageal epithelium and assessed perturbations that occur with allergic inflammation. Using patient biopsy specimens and single-cell-derived esophageal 3-dimensional (3D) organoids, a novel modeling platform in esophageal epithelial homeostasis, pathobiology, and personalized medicine,<sup>7,18</sup> we show that the stem-like CD73<sup>+</sup>CD104<sup>+</sup> population is diminished markedly in EoE, implicating helper T cell (Th)2 cytokines and signal transducer and activator of transcription 6 (STAT6) signaling as the effector and a promising target for therapy.

## Results

CD73<sup>+</sup> Cells Are Under-Represented in Active EoE Epithelium

To assess the proliferation of the basal cells in the esophageal epithelium biopsy specimens, we performed

**Abbreviations used in this paper:** BCH, basal cell hyperplasia; DAPI, 4',6-diamidino-2-phenylindole; DEG, differentially expressed gene; EdU, ethynyldeoxyuridine; EGD, esophagogastroduodenoscopy; EoE, eosinophilic esophagitis; eos/hpf, esophageal mucosal eosinophils per high-power field; FACS, fluorescence-activated cell sorting; GO, Gene Ontology; IHC, immunohistochemistry; IL, interleukin; mRNA, messenger RNA; OFR, organoid formation rate; OVA, ova-albumin; PCA, principal component analysis; PDO, patient-derived organoid; PPI, proton pump inhibitor; qRT-PCR, quantitative reverse-transcription polymerase chain reaction; siRNA, small interfering RNA; STAT6, signal transducer and activator of transcription 6; 3D, 3-dimensional; Th, helper T cell.

Most current article

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2352-345X  
<https://doi.org/10.1016/j.jcmgh.2022.01.018>

# Creating visuals about your research

## Elements of powerful visuals

Visual communication  
principles

Editing vector images

lunch break

---

Graphical abstracts/posters

Design principles

Bitmap images

Graphs

Legal and ethical aspects

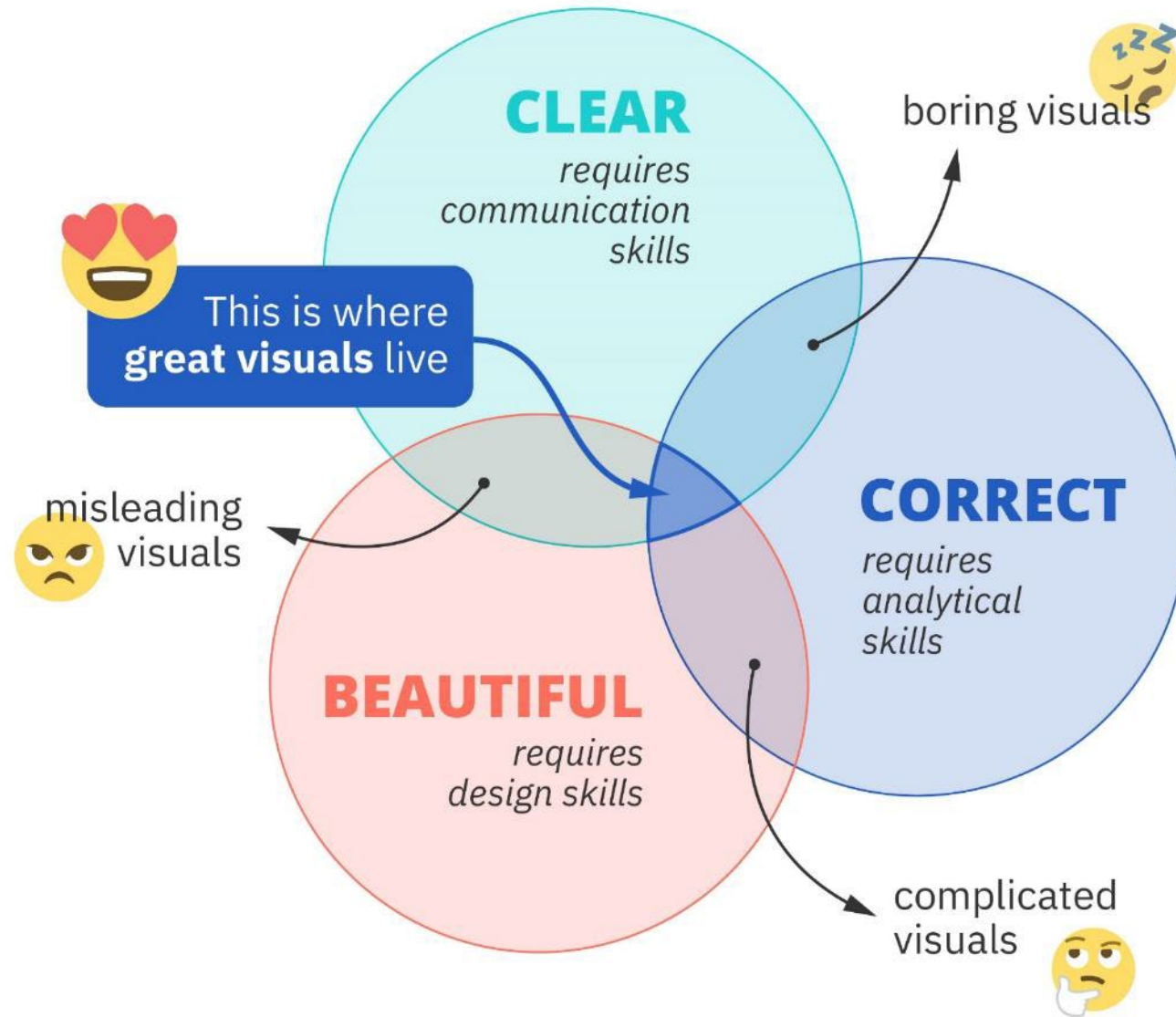
# What is a good visual?

## Group exercise

Each group receives **a set of visuals to discuss.**

As a group, choose your **most** and **least favorite visual** and explain why.







# Break

**All the slides and all the links:**

[baryon.be/visuals-resources](https://baryon.be/visuals-resources)

# Creating visuals about your research

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The background is a teal-colored overlay on a blurred image of a newspaper. The newspaper features a world map at the top and a headline that reads "The Nobel Prize" followed by "114 years, 108 prizes". Below the headline are several small, dark rectangular images, possibly portraits of Nobel laureates. The text "Communication principles" is centered in a large, white, sans-serif font.

# Communication principles



## Communication principles

1. Identify your \_\_\_\_\_
2. Adapt to your \_\_\_\_\_
3. Improve the \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ ratio

# The basic model of communication



# Communication principles

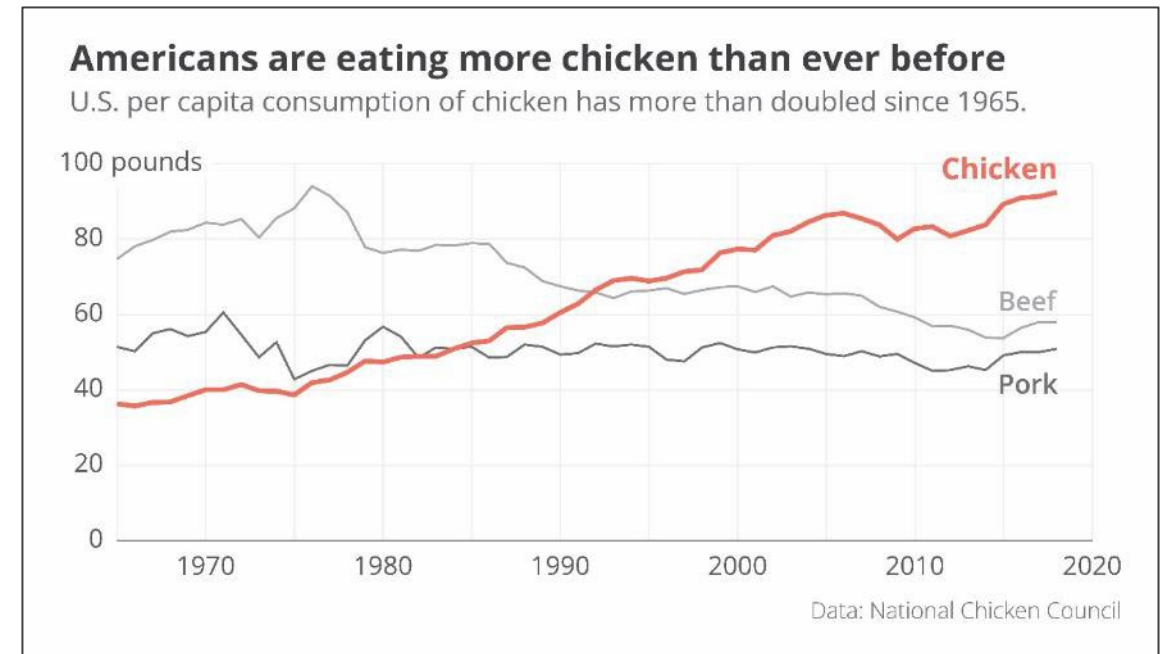
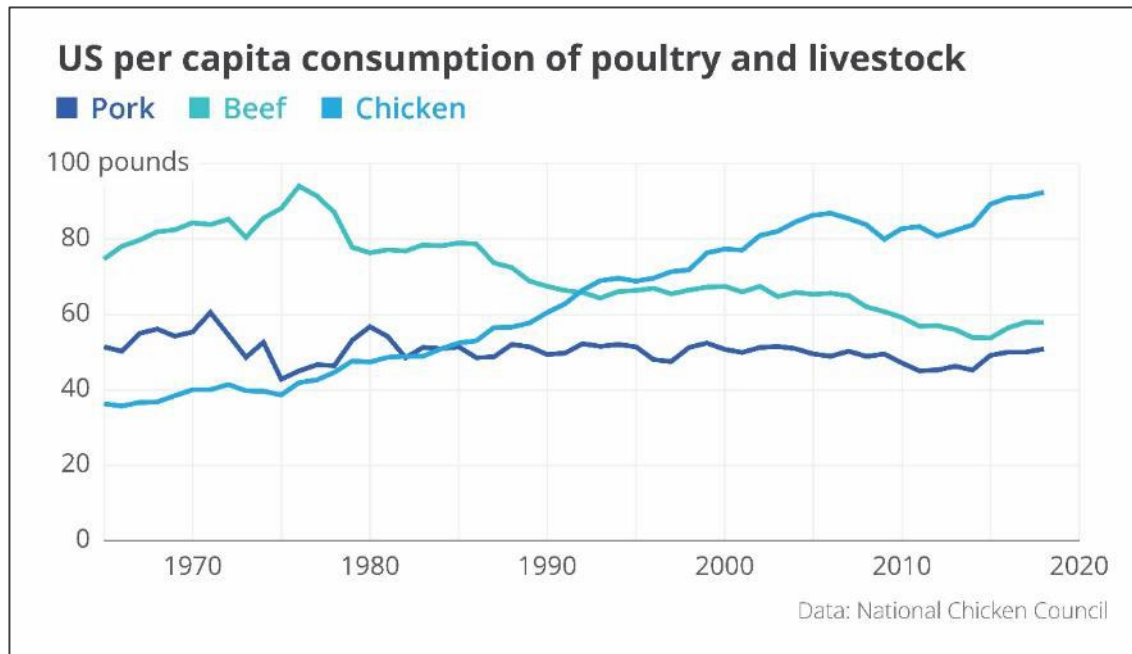
1. Identify your **message**
2. Adapt to your \_ \_ \_ \_ \_
3. Improve the \_ \_ \_ \_ \_ - \_ \_ - \_ \_ \_ \_ \_ ratio

A good visual shows the data,  
**a great visual tells a story.**

~~data~~



story



~~data~~



**story**

~~what~~



**so what**

Keep it simple  
**1 visual = 1 message**



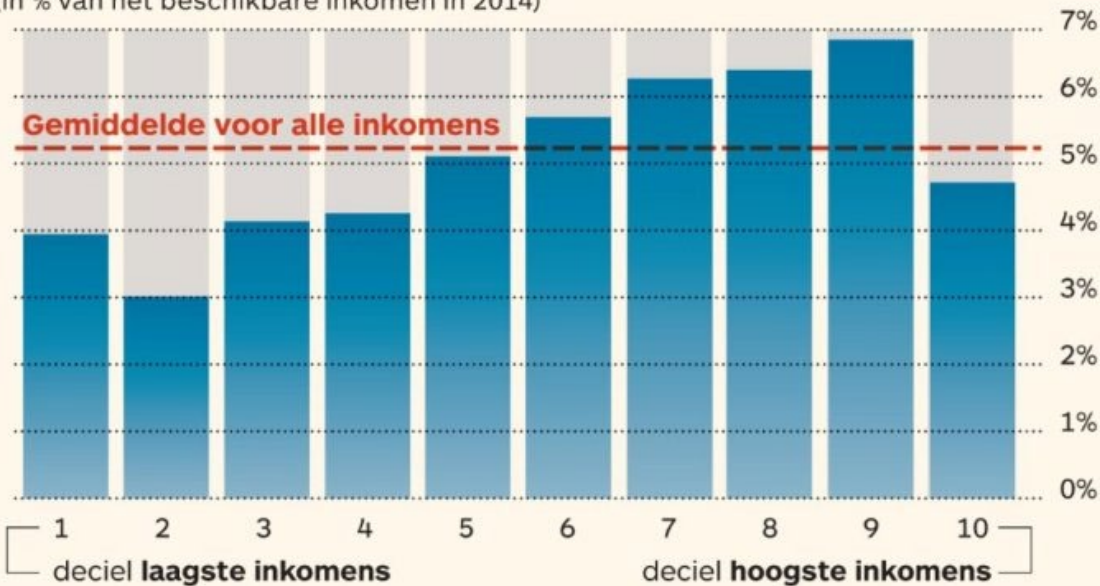
# Keep it simple

One visual = one message

GRAPHIQUE 24 - Dette des administrations publiques  
en pour cent du PIB

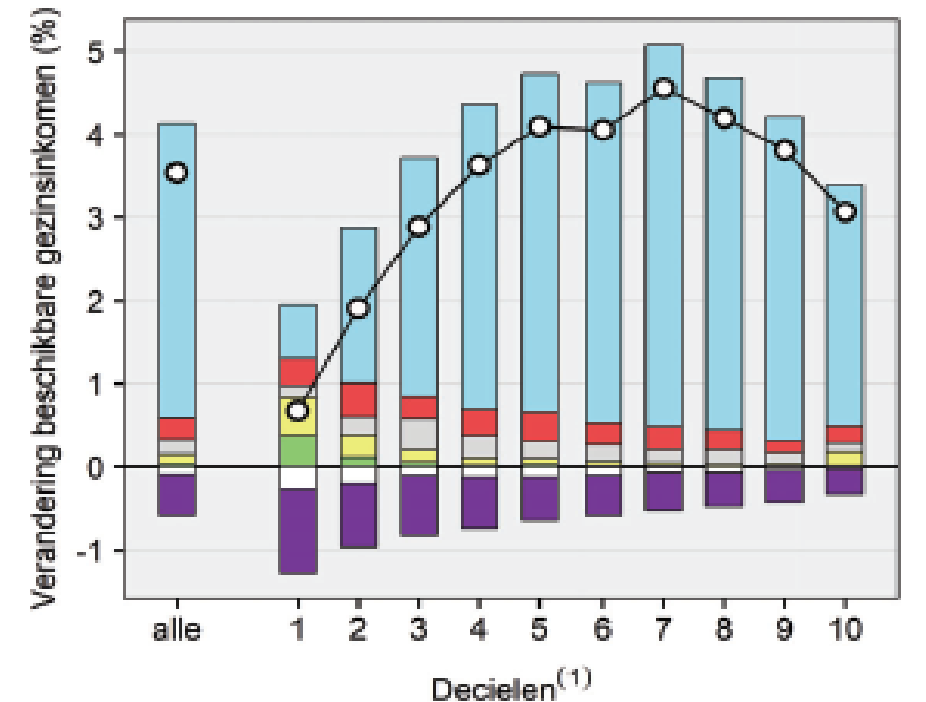


Veranderingen in koopkracht, 2014-2020  
(in % van het beschikbare inkomen in 2014)



Bronnen: KU Leuven en Planbureau

Figuur 2: Veranderingen in koopkracht, 2014-2020 (in %  
van het beschikbare inkomen in 2014)



○ Netto-groei

Personenbelasting

Soc. zekerheidsbijdragen

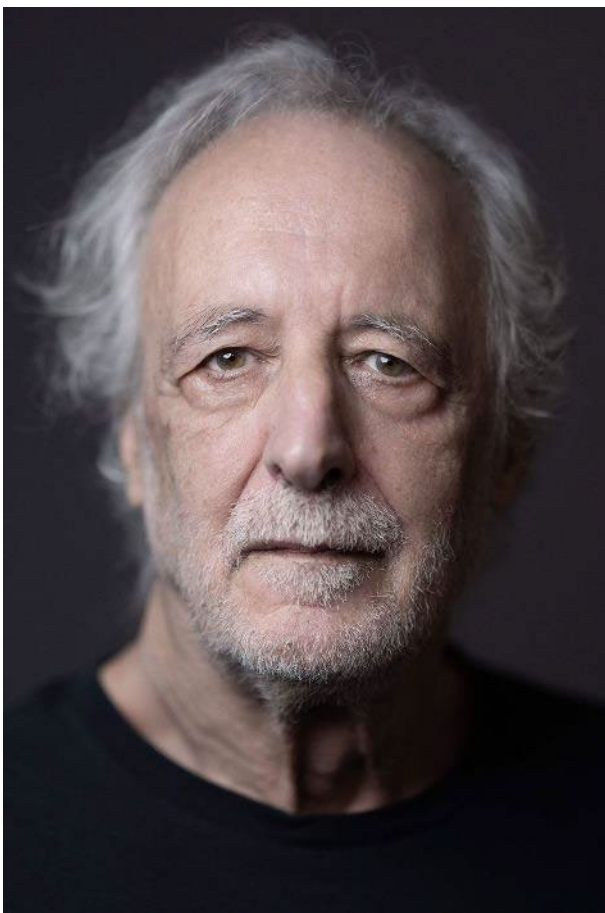
BTW en accijnzen

Pensioenen

Werkloosheidsuitkering

Kinderbijslag

Leefloon en IGO



Pierre Agostini



Ferenc Krausz



Anne L'Huillier

# Cecil Powell

## Facts



Photo from the Nobel  
Foundation archive.

Cecil Frank Powell

The Nobel Prize in Physics 1950

Born: 5 December 1903 Tonbridge, United Kingdom

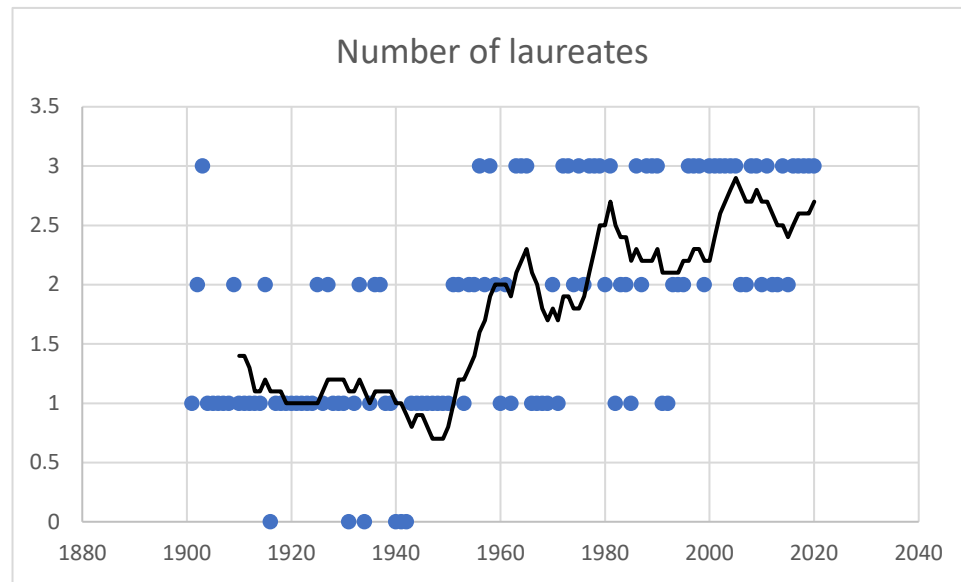
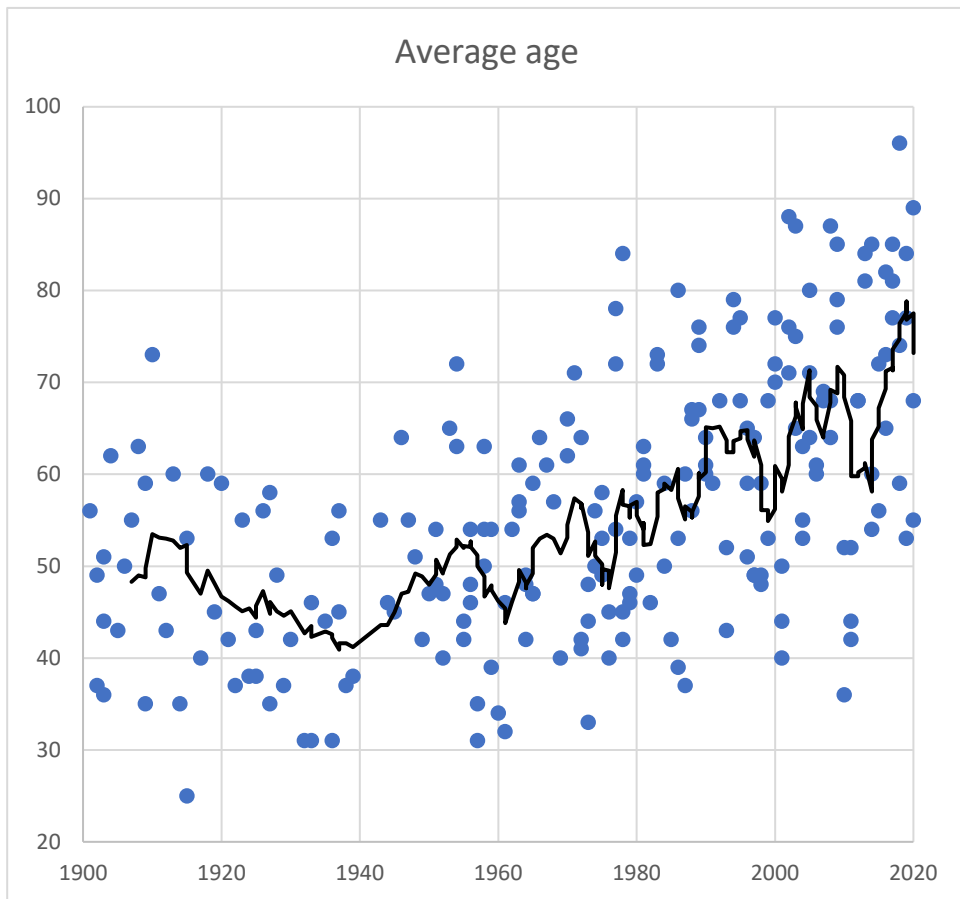
Died: 9 August 1969 Italy

Affiliation at the time of the award: Bristol University, Bristol,  
United Kingdom

Prize motivation: "for his development of the photographic  
method of studying nuclear processes and his discoveries  
regarding mesons made with this method."

Prize share: 1/1

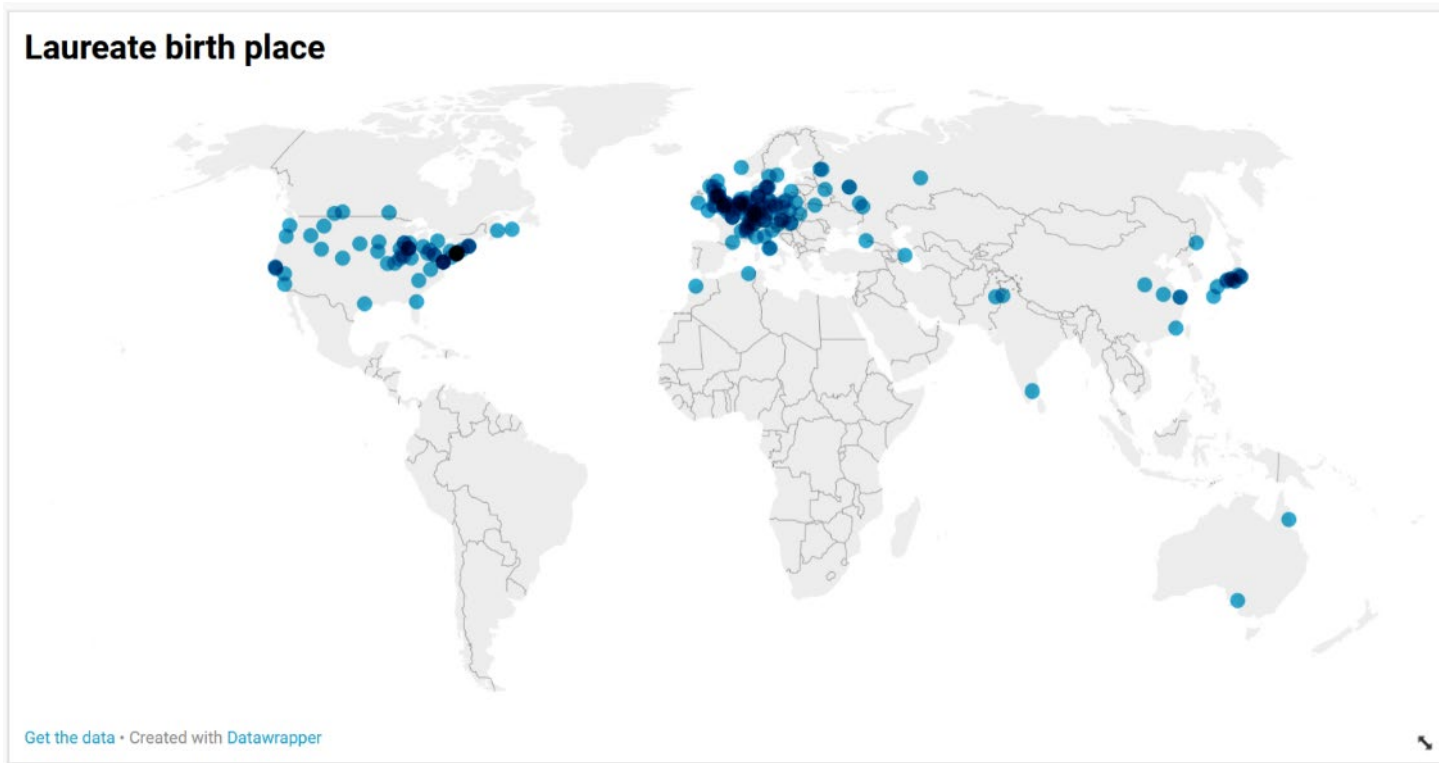
full name  
year of award  
date of birth  
place of birth  
date of death  
prize share  
picture  
--  
gender



gender balance

Men: 218

Women: 4





# The Nobel Prize in Physics

114 years, 108 prizes, 198 laureates



25 YOUNGEST  
LAUREATE



William Lawrence Bragg  
1915

88 OLDEST  
LAUREATE



Raymond Davis Jr.  
2002

2 HIGHEST NUMBER  
OF PRIZES WON

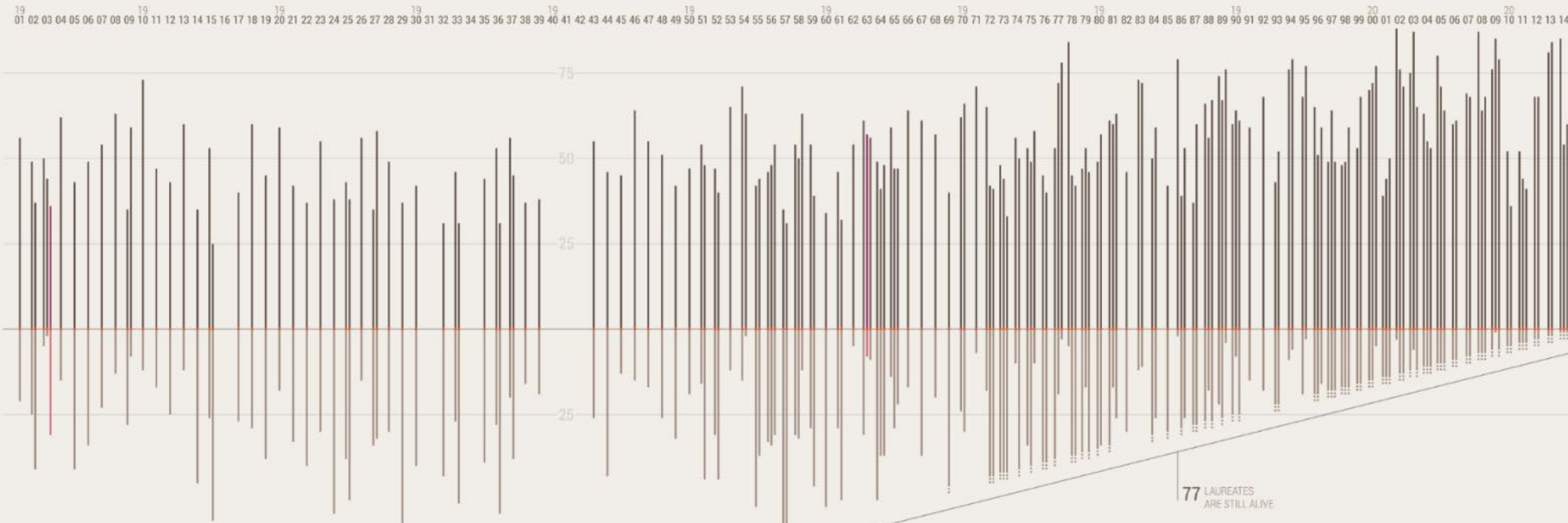
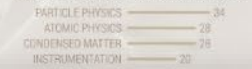


John Bardeen  
1956, 1972

Laureates' gender



Most successful research domains



DATA & IMAGES: nobelprize.org  
VISUALIZATION & DESIGN: baryon.be



1947  
Gerty Cori  
prize share: 1/4

2015  
Tu Youyou  
prize share: 1/2



### Medicine

213 men, 12 women (5.3%)



1903  
Marie Skłodowska-Curie  
prize share: 1/4

2020  
Andrea Ghez  
prize share: 1/4



### Physics

218 men, 4 women (1.8%)



1911  
Marie Skłodowska-Curie  
prize share: 1/1

2022  
Carolyn Bertozzi  
prize share: 1/1



### Chemistry

183 men, 8 women (4.2%)



1909  
Selma Lagerlöf  
prize share: 1/1

2022  
Annie Ernaux  
prize share: 1/1



### Literature

102 men, 17 women (14.3%)



1905  
Bertha von Suttner  
prize share: 1/1

2022  
Maria Reiche  
prize share: 1/1



### Peace

92 men, 30 organisations, 18 women (12.9%)



2009  
Elinor Ostrom  
prize share: 1/2

2019  
Esther Duflo  
prize share: 1/3



### Economics

90 men, 2 women (2.2%)

## Women of the Nobel Prize

The Nobel Prize exists since 1901. In those 122 years, the Prize was awarded 898 times to a man, but only 61 times to a woman. 2009 was a record year, with 5 women winning a Prize.

In 2022, only 2 women received the Prize: Annie Ernaux won the Literature Prize, and Carolyn Bertozzi won the Chemistry Prize together with Morten Meldal and K. Barry Sharpless, for their groundbreaking work on click chemistry and bioorthogonal chemistry - chemical reactions that can occur inside of living systems.

Source: nobelprize.org  
Infographic design: Koen Van den Eeckhout (@koen\_vde | www.baryon.be)



1903  
Marie Skłodowska-Curie  
prize share: 1/4

1901



### Physics

220 men, 5 women (2.2%)



2023  
Anne L'Huillier  
prize share: 1/3

2023



## Women of the Nobel Prize

Infographic design: Koen Van den Eeckhout (@koen\_vde | www.baryon.be)

Source: nobelprize.org

# Communication principles

1. Identify your **message**
2. Adapt to your \_ \_ \_ \_ \_
3. Improve the \_ \_ \_ \_ \_ - \_ \_ - \_ \_ \_ \_ \_ ratio

DARK"



DE 5  
OND

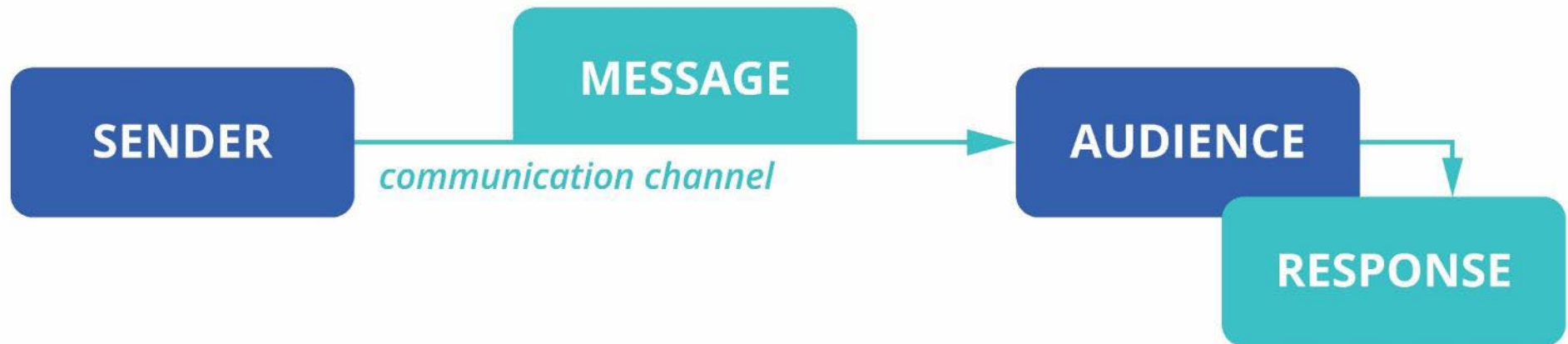


my most challenging  
presentation ever





# The basic model of communication



Who is my audience?

What do they want to know?

What do they need to do?

How much time do they have?

How far away are they?

How frequently will they look at this?





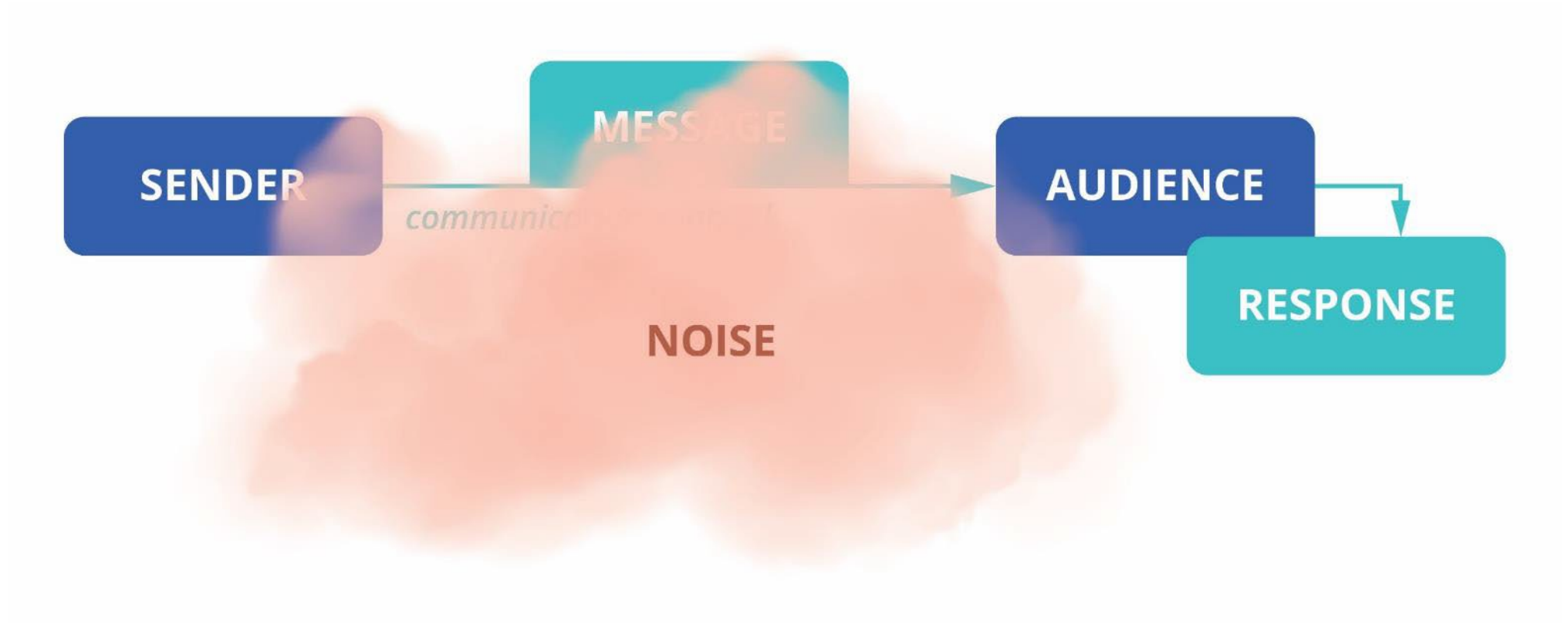
when you don't adapt  
to your audience...

# Communication principles

1. Identify your **message**
2. Adapt to your **audience**
3. Improve the            -    -            ratio



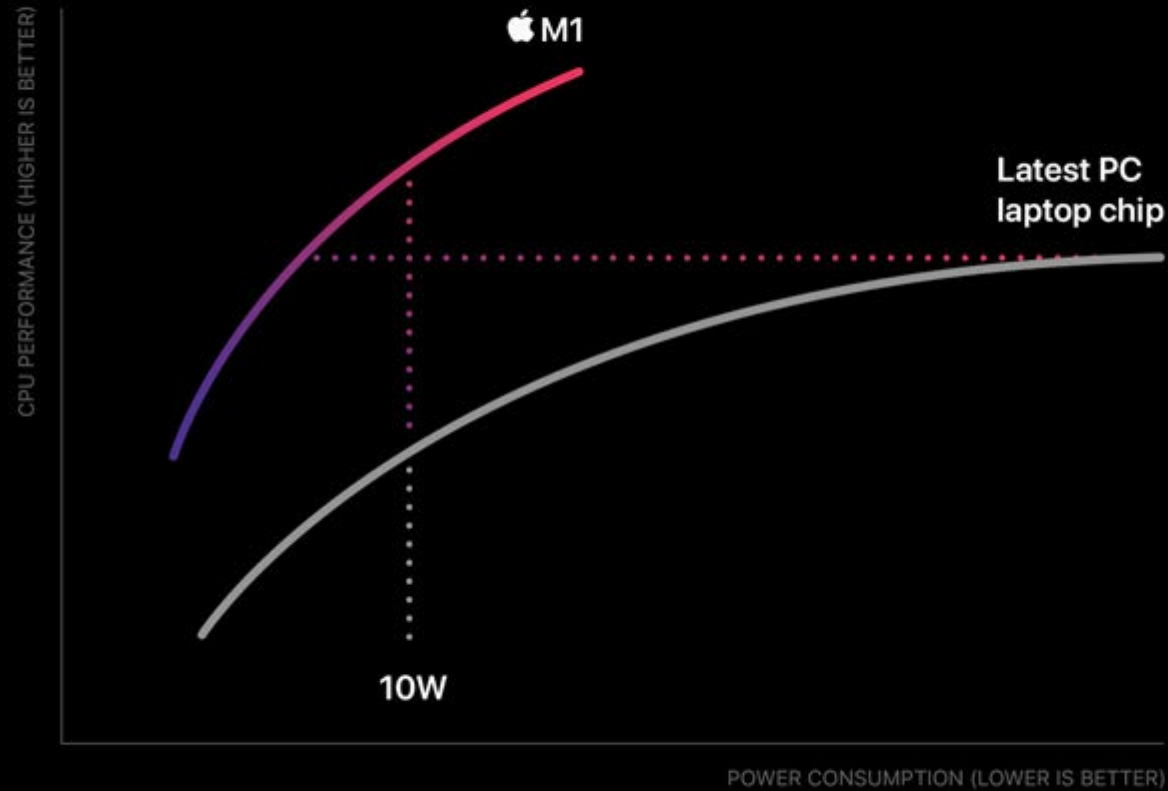
# The basic model of communication





GPS

## CPU performance vs. power



Up to

**2x**

faster CPU  
performance<sup>1</sup>

Matches peak PC  
performance using

**25%**

of the power<sup>1</sup>



# Communication principles

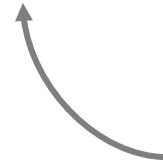
1. Identify your **message**
2. Adapt to your **audience**
3. Improve the **signal-to-noise** ratio

# Maximize the **signal-to-noise ratio**

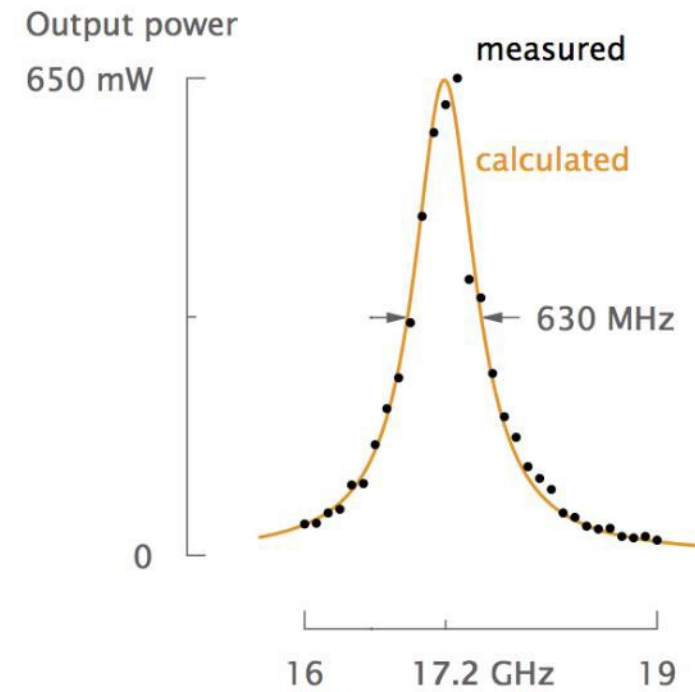
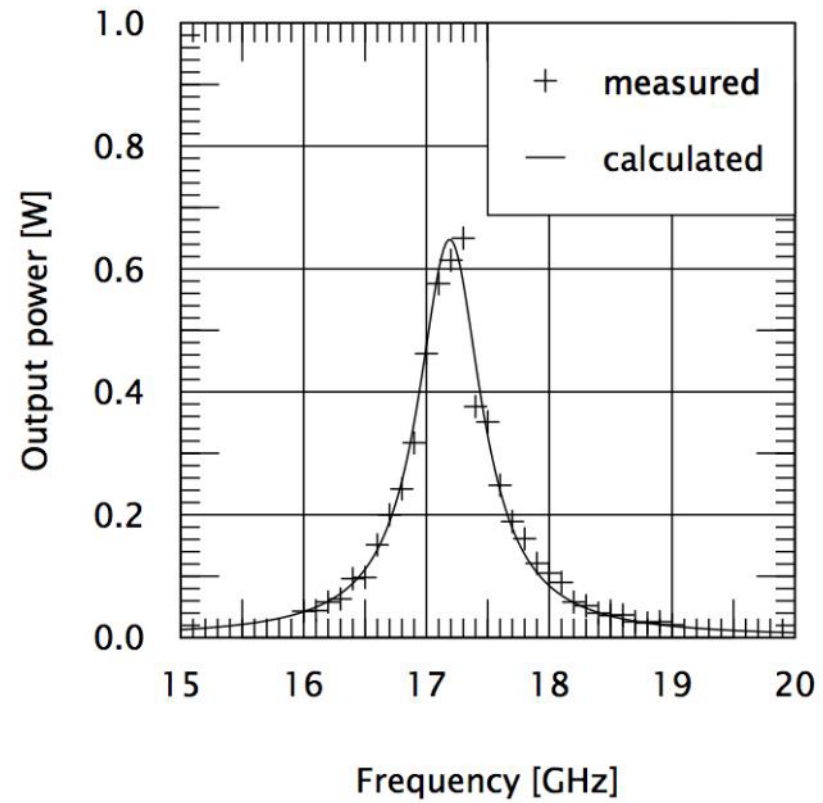
*your message*



*everything that can  
distract your audience  
from your message*







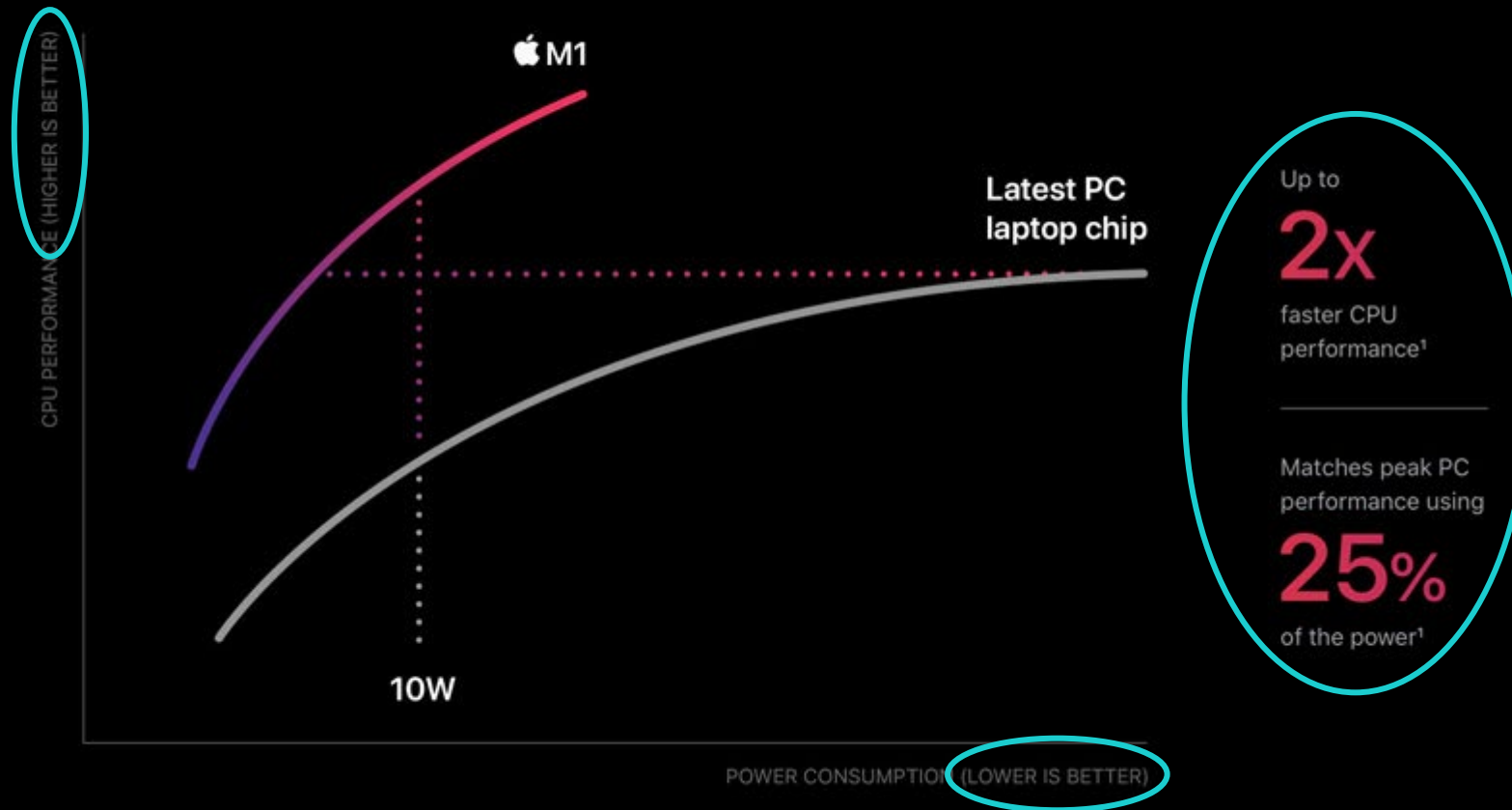
**Noise = physical noise**

elements which are on the visual  
but are not helpful

**+ mental noise**

thinking work required  
from your audience

## CPU performance vs. power



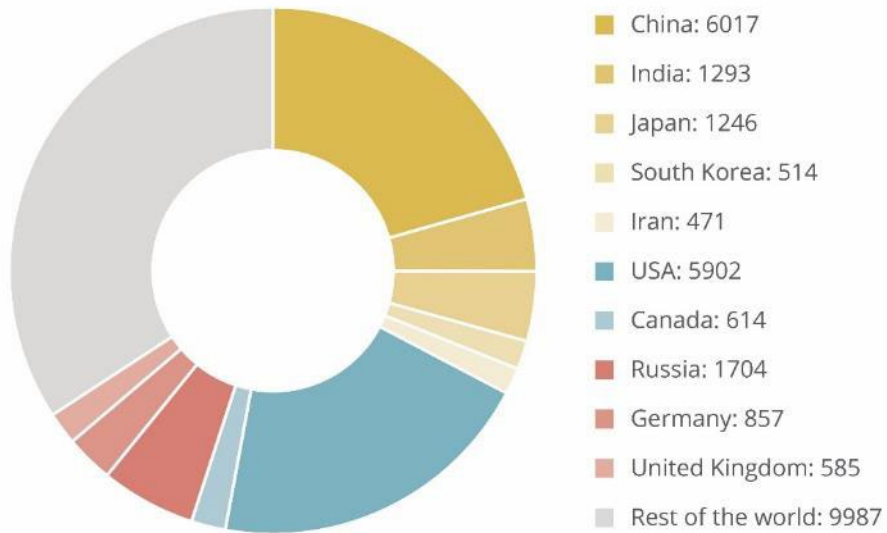


# Quick tip

## Direct labeling

### World carbon dioxide emissions from the consumption and flaring of fossil fuels

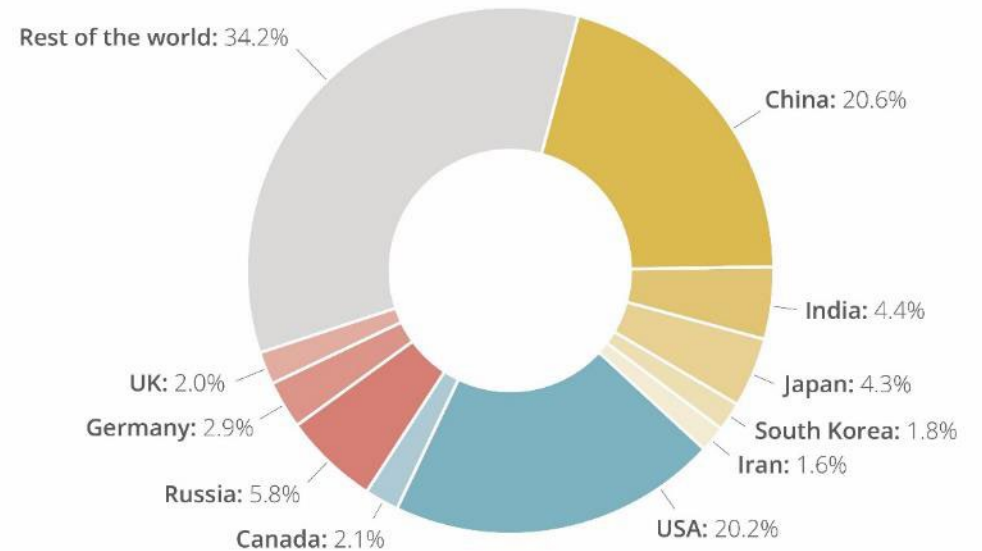
Million metric tons of carbon dioxide, in 2006



Source: Energy Emission Administration

### Global share of CO<sub>2</sub> emissions (2006)

Carbon dioxide emissions are dominated by China and the USA



Source: Energy Emission Administration

# Communication principles

1. Identify your **message**
2. Adapt to your **audience**
3. Improve the **signal-to-noise** ratio

# Creating visuals about your research

Elements of powerful visuals

Visual communication  
principles

**Editing vector images**

lunch break

---

Graphical abstracts/posters

Design principles

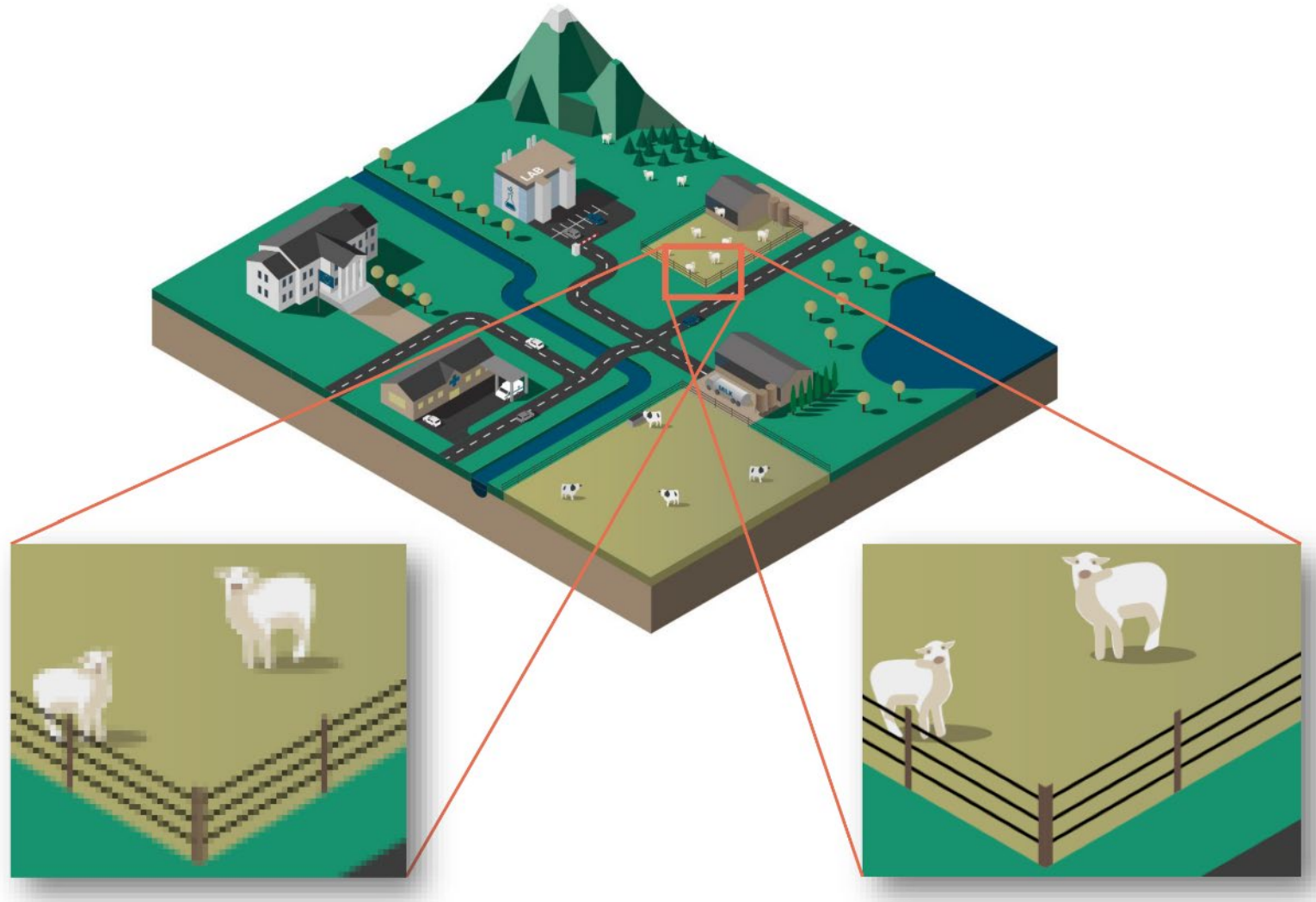
Bitmap images

Graphs

Legal and ethical aspects

The background is a blurred, high-angle shot of a newspaper page. At the top, a world map is visible. Below it, there's a section titled "The Nobel Prize" followed by "114 years, 108 prizes". Several small black and white portraits of men are arranged in a grid. The rest of the page is filled with columns of text, which are out of focus. A semi-transparent red overlay covers the entire image.

# Editing vector images

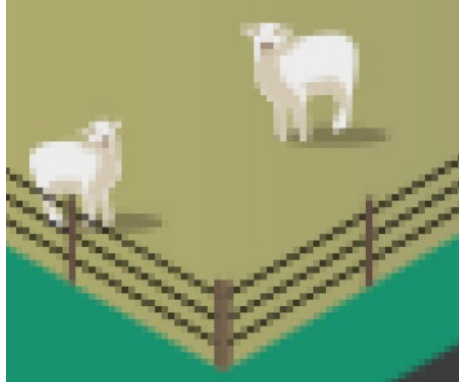


### **bitmap image**

jpg, png, bmp, tiff, gif, psd,...

### **vector image**

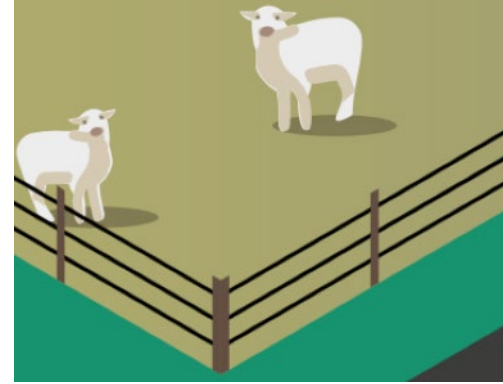
svg, pdf, eps, ai,...



### bitmap image

jpg, png, bmp, tiff, gif, psd,...

- built from **pixels**
- photographs
- illustrated made by hand
- illustrations with lots of textures, brush strokes,...
- tools: Photoshop, GIMP, Paint.NET,...



### vector image

svg, pdf, eps, ai,...

- built from **shapes**
- illustrations made digitally
- (large-scale) printing
- easier to edit, recolor,...
- tools: Illustrator, Inkscape,...





## Adobe Illustrator

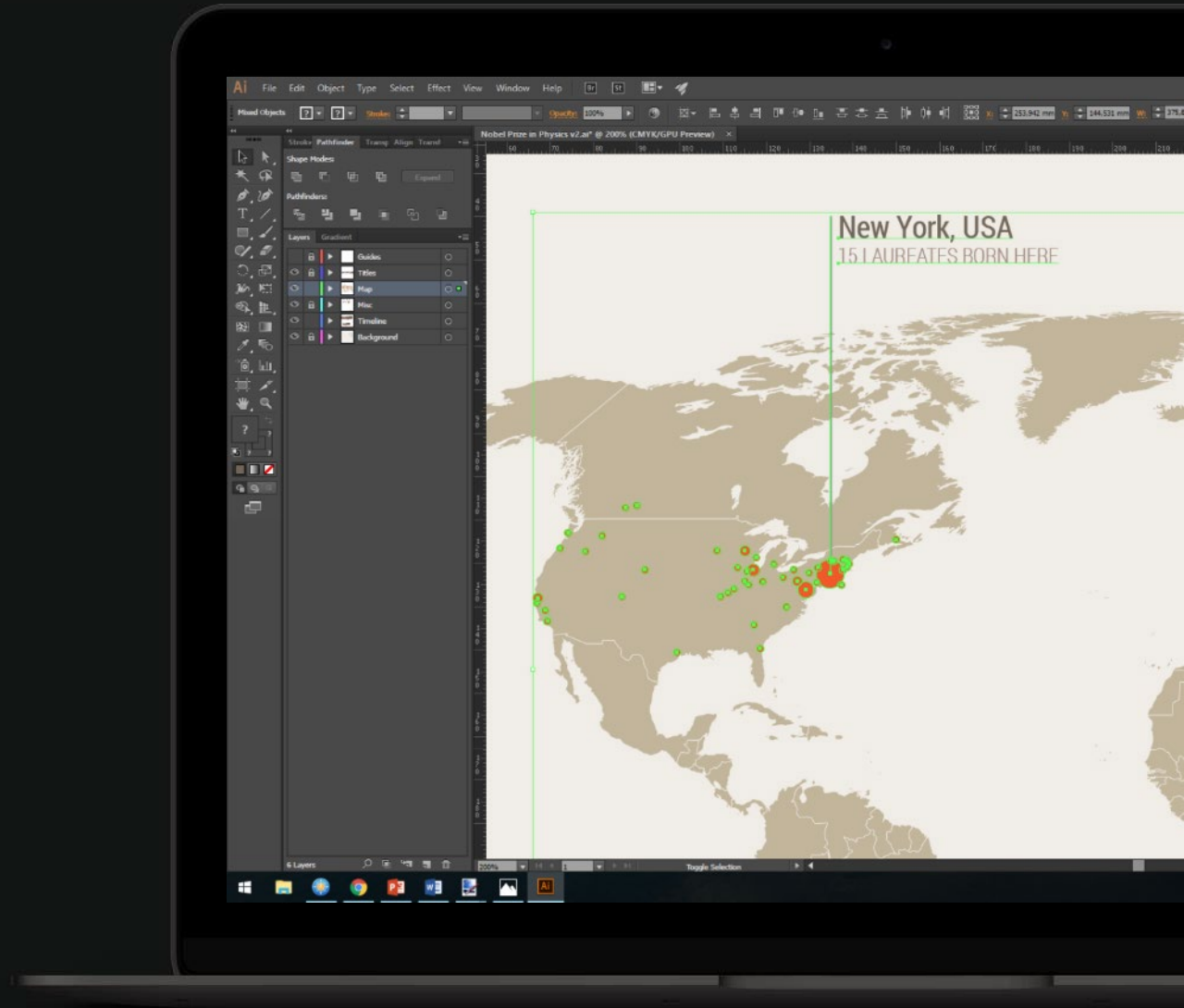
“industry standard”

very powerful

steep learning curve

expensive subscription

[adobe.com/illustrator](https://adobe.com/illustrator)





## Affinity Designer

nearly as powerful  
as Adobe Illustrator

still a steep learning curve

one-off payment  
(currently € 75)

[affinity.serif.com](https://affinity.serif.com)





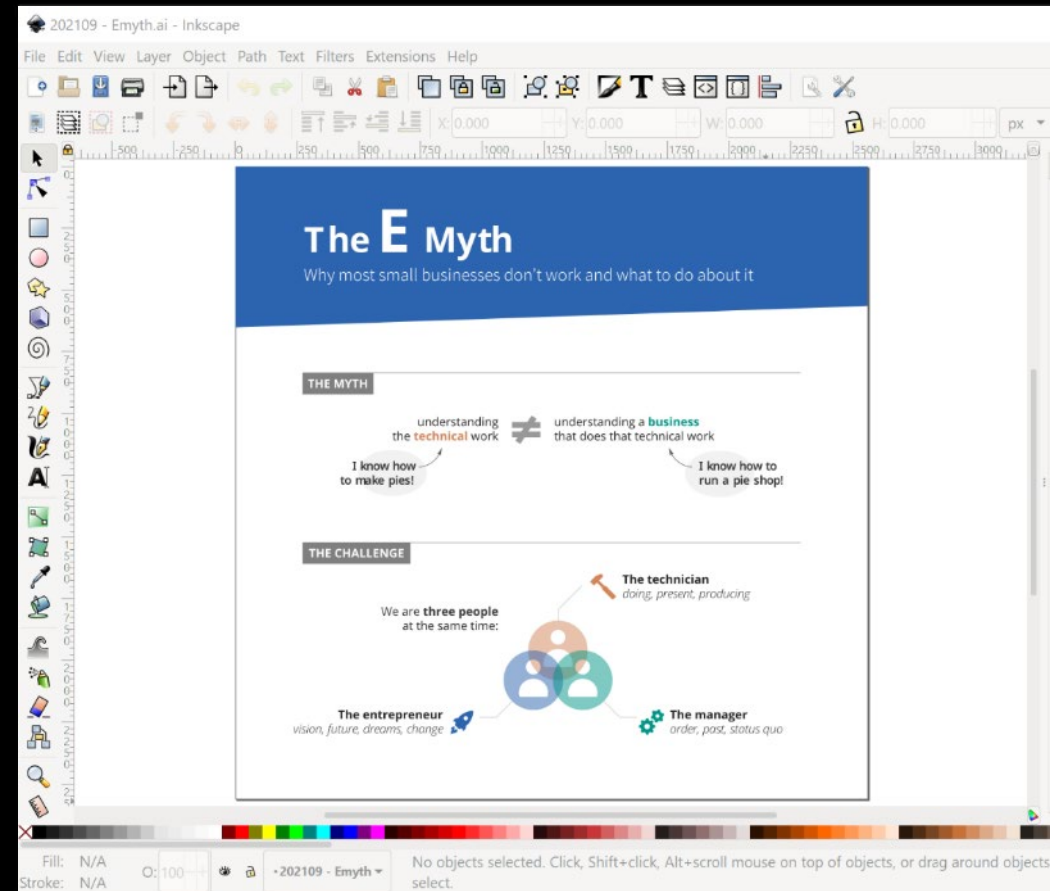
## Inkscape

free alternative

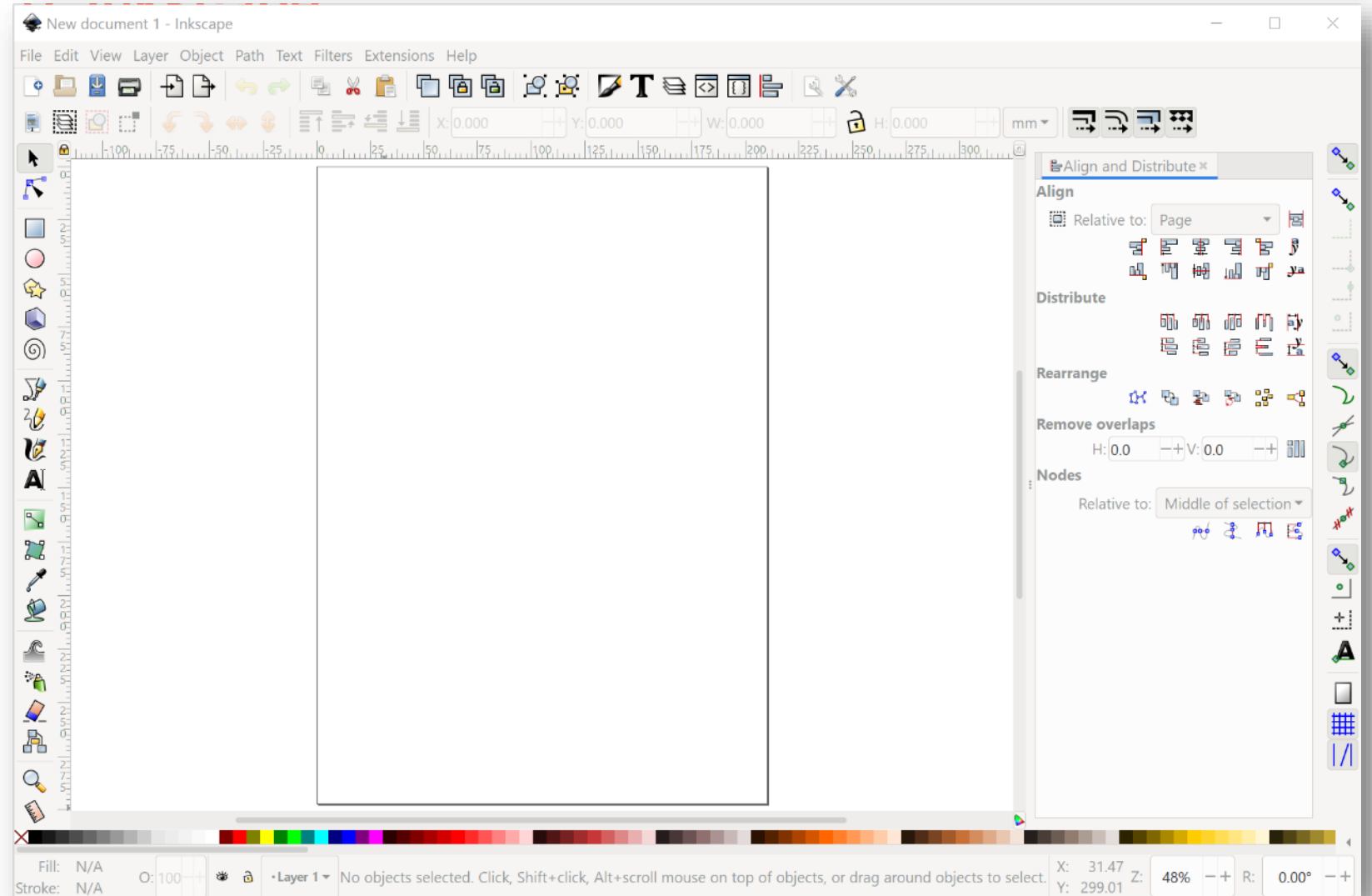
all the features you need

can be a bit finicky

[inkscape.org/en/release](https://inkscape.org/en/release)



# Tool intro: Inkscape



[inkscape.org](https://inkscape.org)



INKSCAPE  
*Draw Freely.*

♥ Help us make Inkscape awesome! ♥

English

Log in

Register

Search website



ABOUT

DOWNLOAD

NEWS

COMMUNITY

LEARN

CONTRIBUTE

DEVELOP

SUPPORT US



GNU/Linux



Linux based Free Desktop  
Systems

Windows



Microsoft's Windows Desktop

dmg file for Intel  
architecture



dmg (Intel)

Source Archive



xz tarball

## Release Notes

Inkscape 1.1.2 is a maintenance and bugfix release, which brings you more than 40 bug fixes, 11 crash fixes, 8 fixes for extension failures, 15 improved user interface translations and improved documentation.

### Bug fixes

#### General

- Fixed **Windows test builds**, so testers can again try out intermediate versions ([MR #3762](#))
- Fixed **building Inkscape with GCC 12 / C++17** ([MR #3683](#))
- Fixed **building Inkscape with Poppler 21.11.0**, e.g. on Slackware Linux ([MR #3636](#), [Bug #2906](#))
- **Toolbar fields** now use the units the user selected as display units (in Document preferences) again ([MR #3716](#), [Bug #1747](#))
- **Mouse cursors** for tools are now completely visible, no matter how transparent the currently selected color is ([MR #3640](#), [Bug #2025](#))

## Inkscape 1.1.2

All Platforms

Responsible People

Revisions

1.1.2 2022

1.1.1 2021

1.1 2021

Show more...

Versions

1.1 2021

1.0 2020

0.92 2017

[inkscape.org/release/](https://inkscape.org/release/)



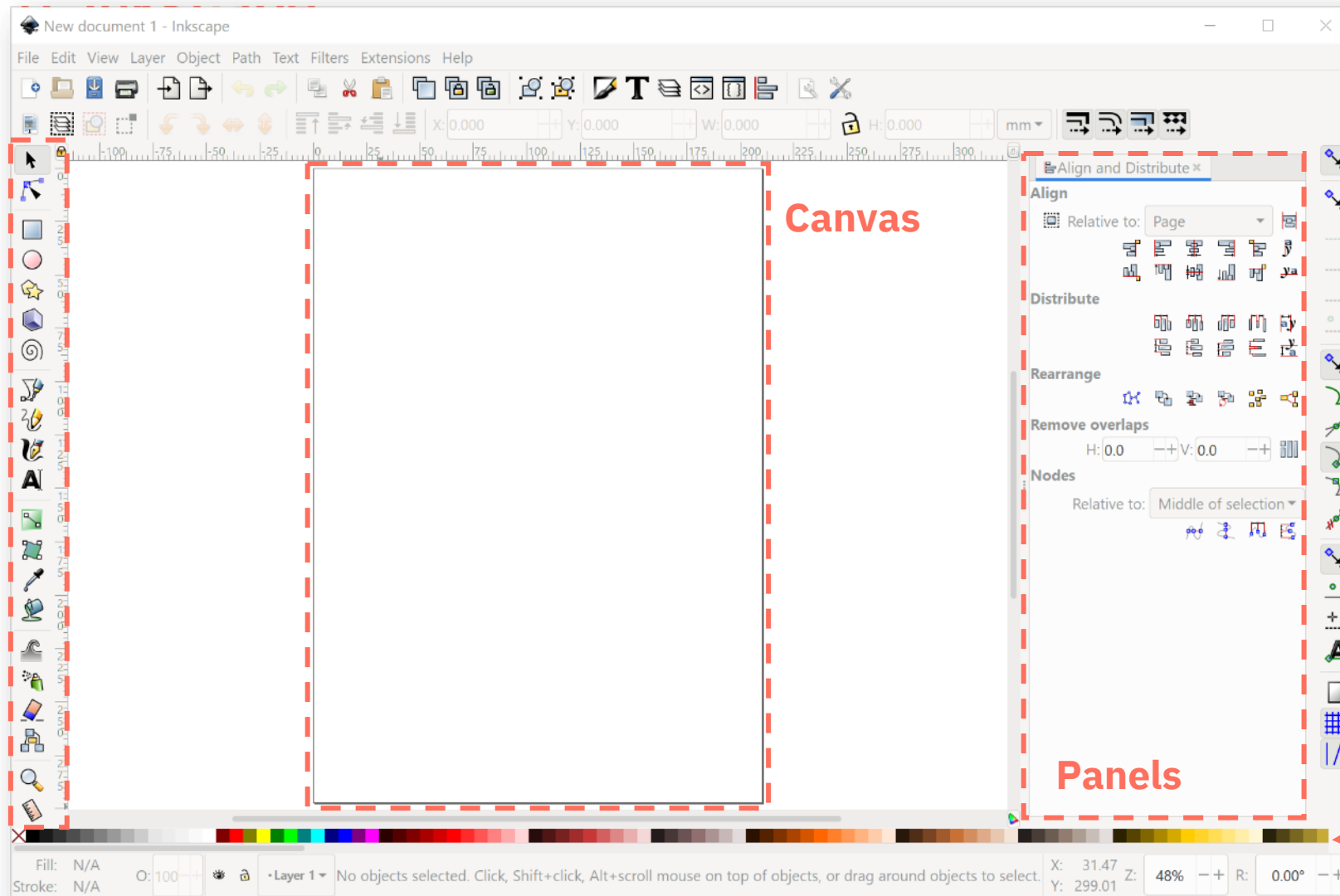
Toolbox

Canvas

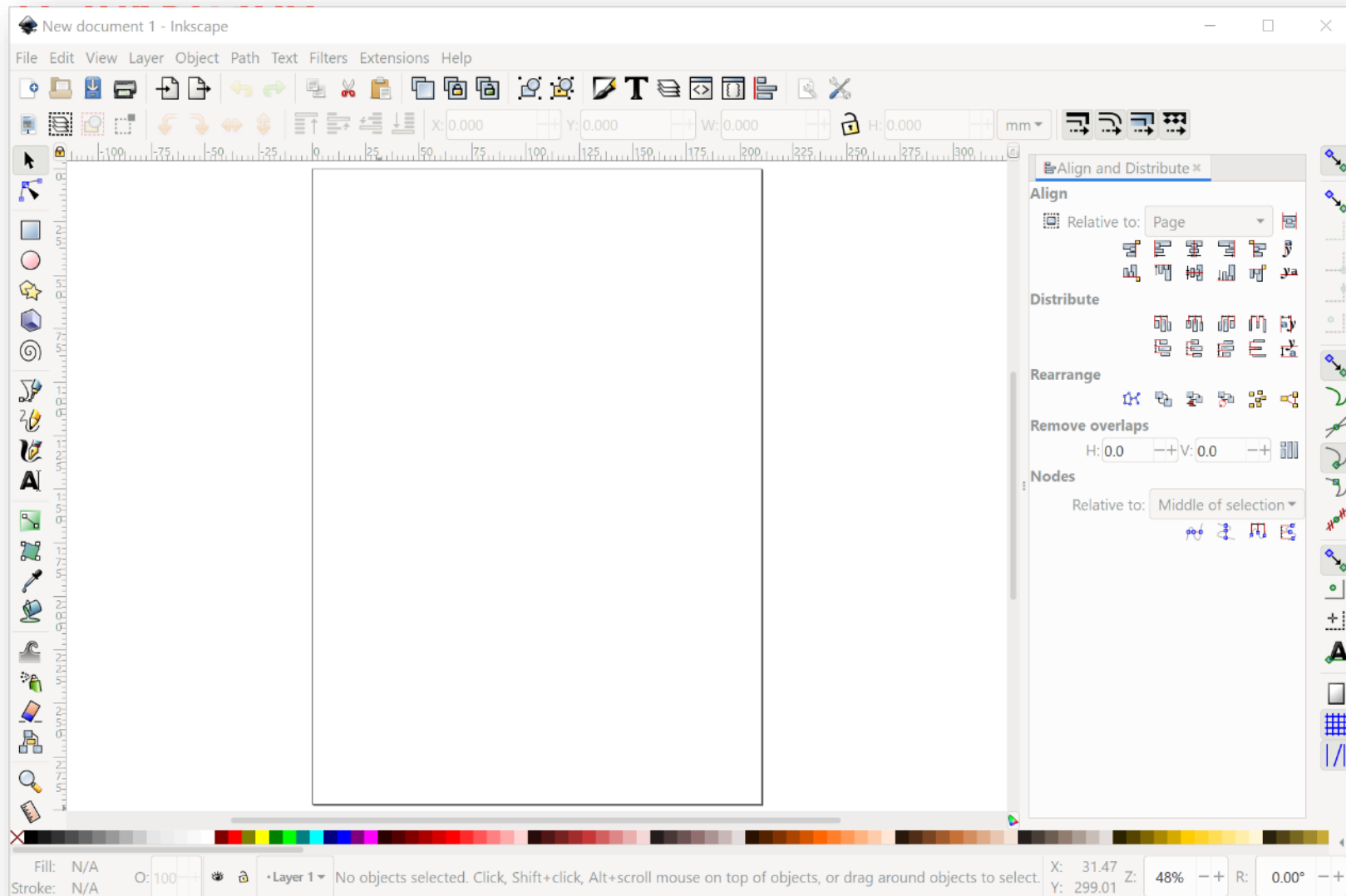
Snapping  
settings

Panels

Color  
panel







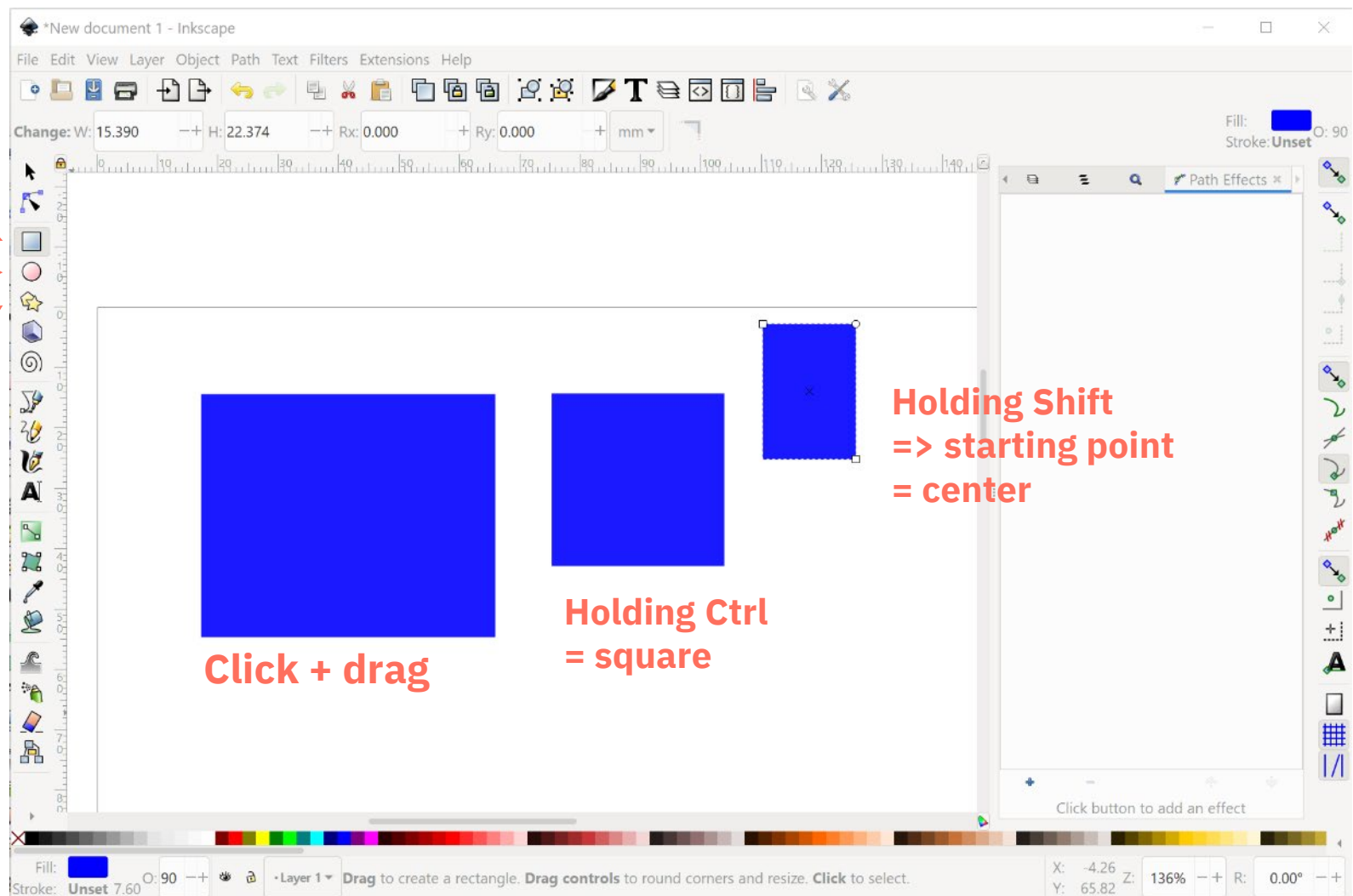
## Moving around

- Scroll wheel  
= up and down
- Scroll wheel + shift  
= left and right
- Scroll wheel + control  
= zoom in / out
- Drag + spacebar  
= pan around

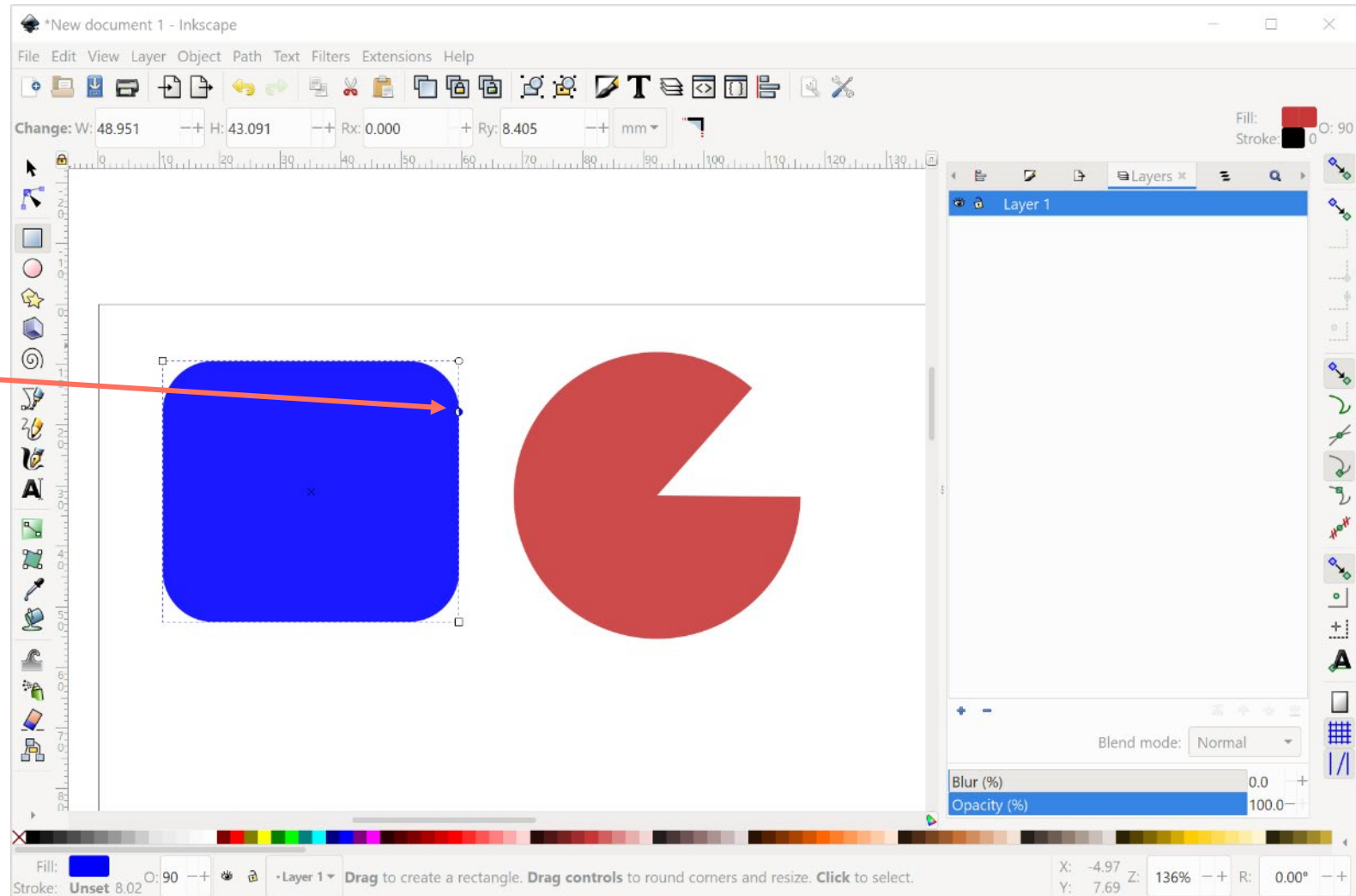
Creating rectangles

Circles

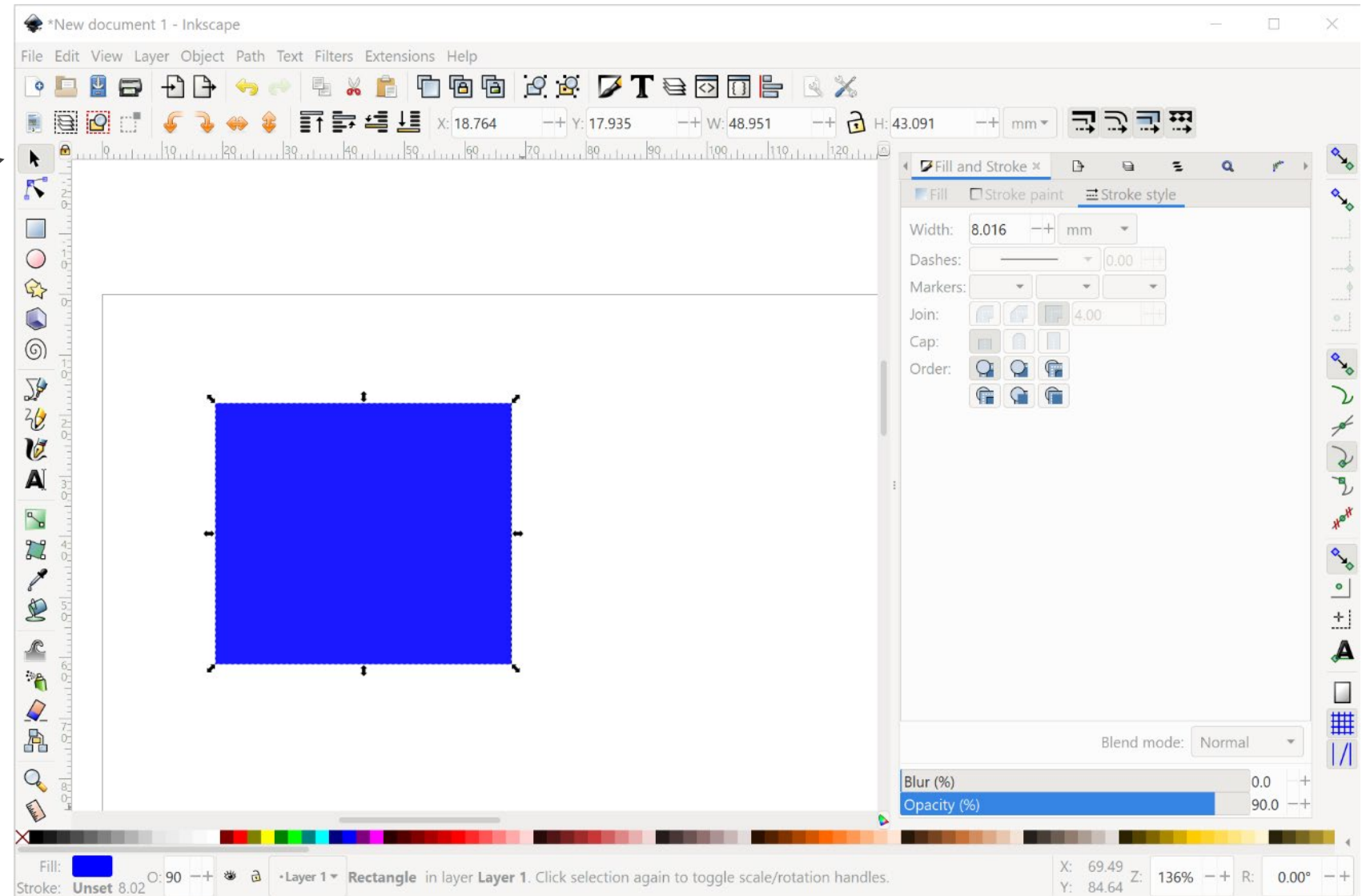
Polygons



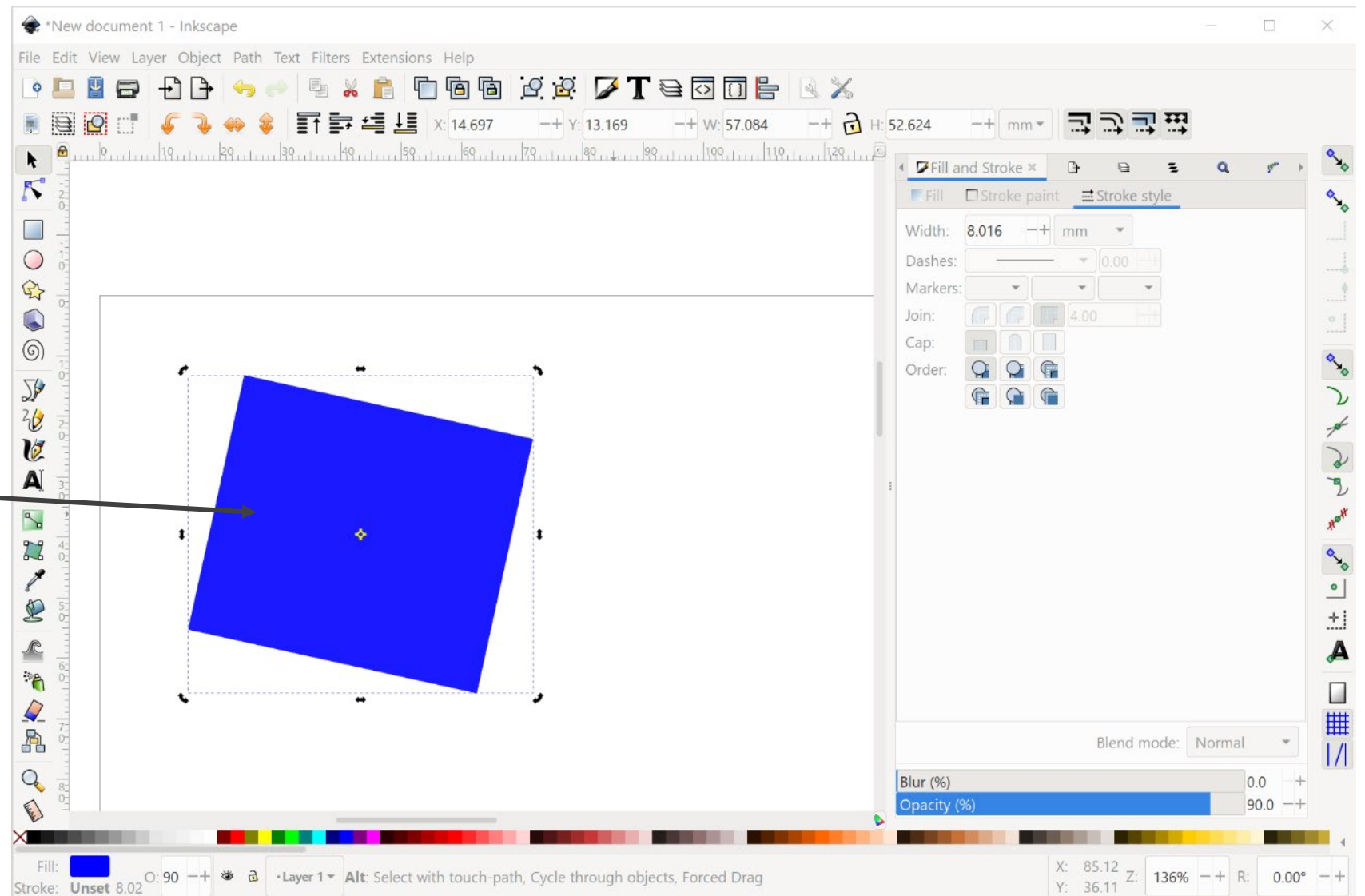
Using the little dots, you can change certain shape properties (e.g. rounded corners)

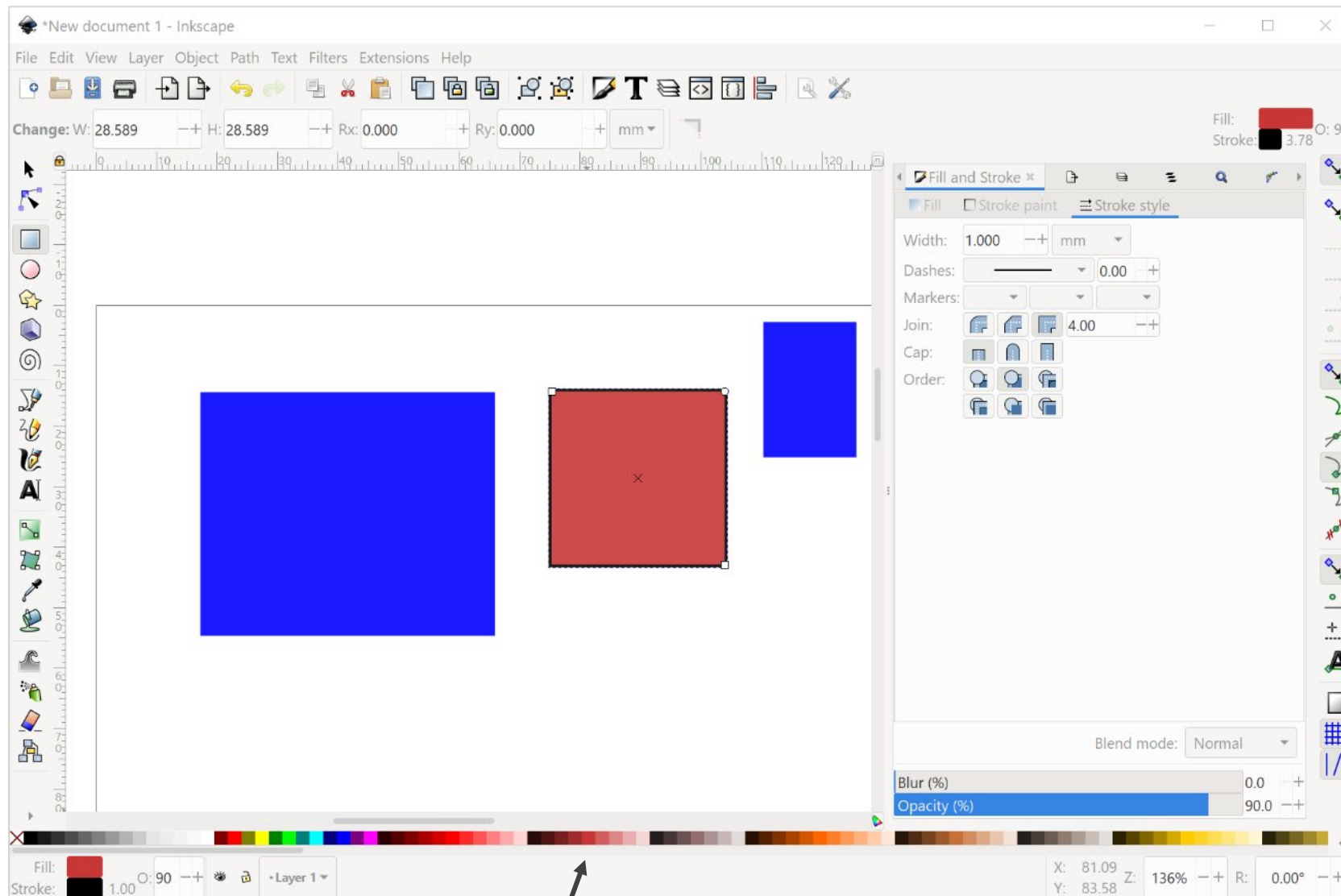


With the selection tool selected, you can change the size and position of the shape



Click a second time on the shape to change rotation and skew

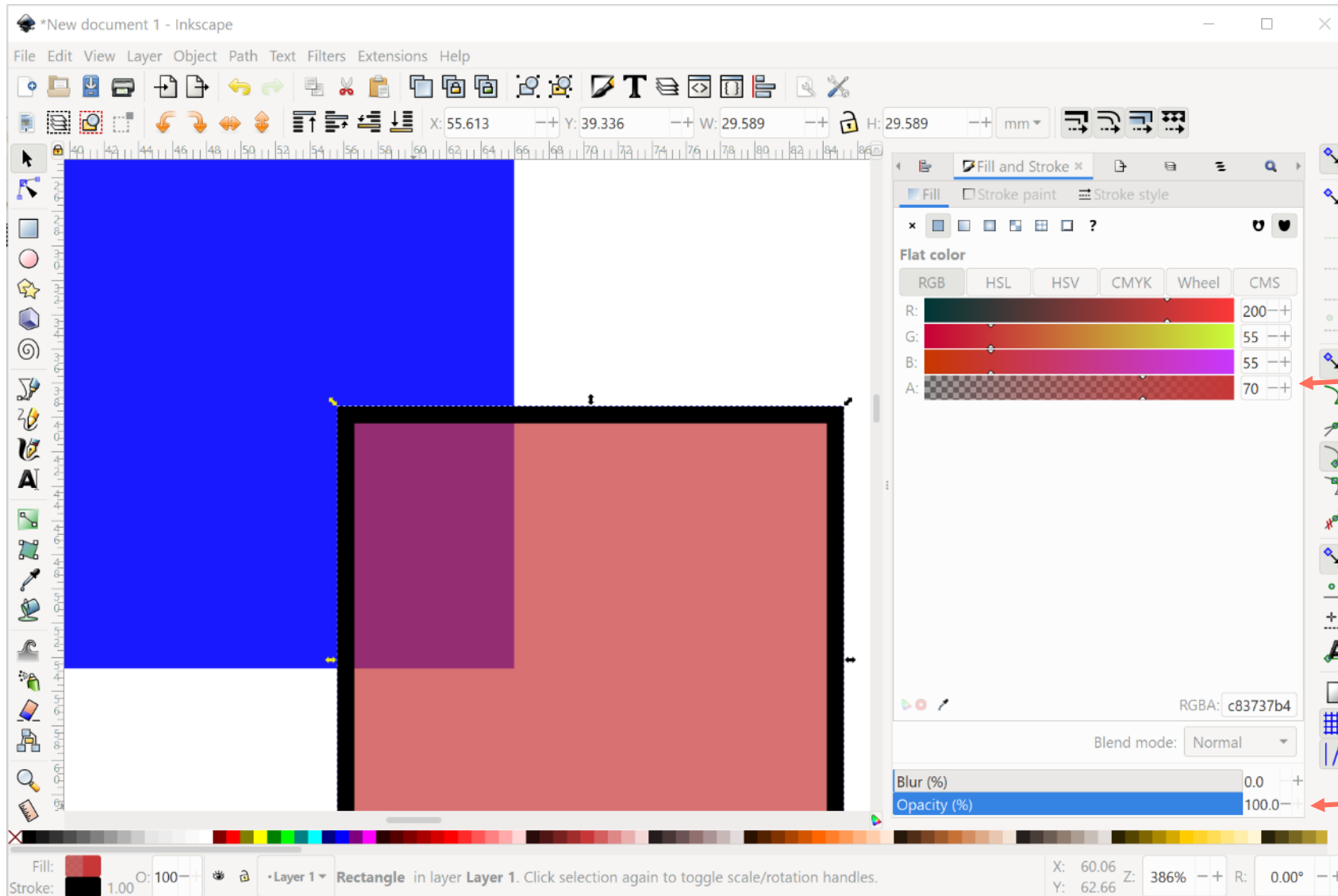




With the shape selected,  
click a color to set the **FILL**

Shift + click to set  
the **STROKE**





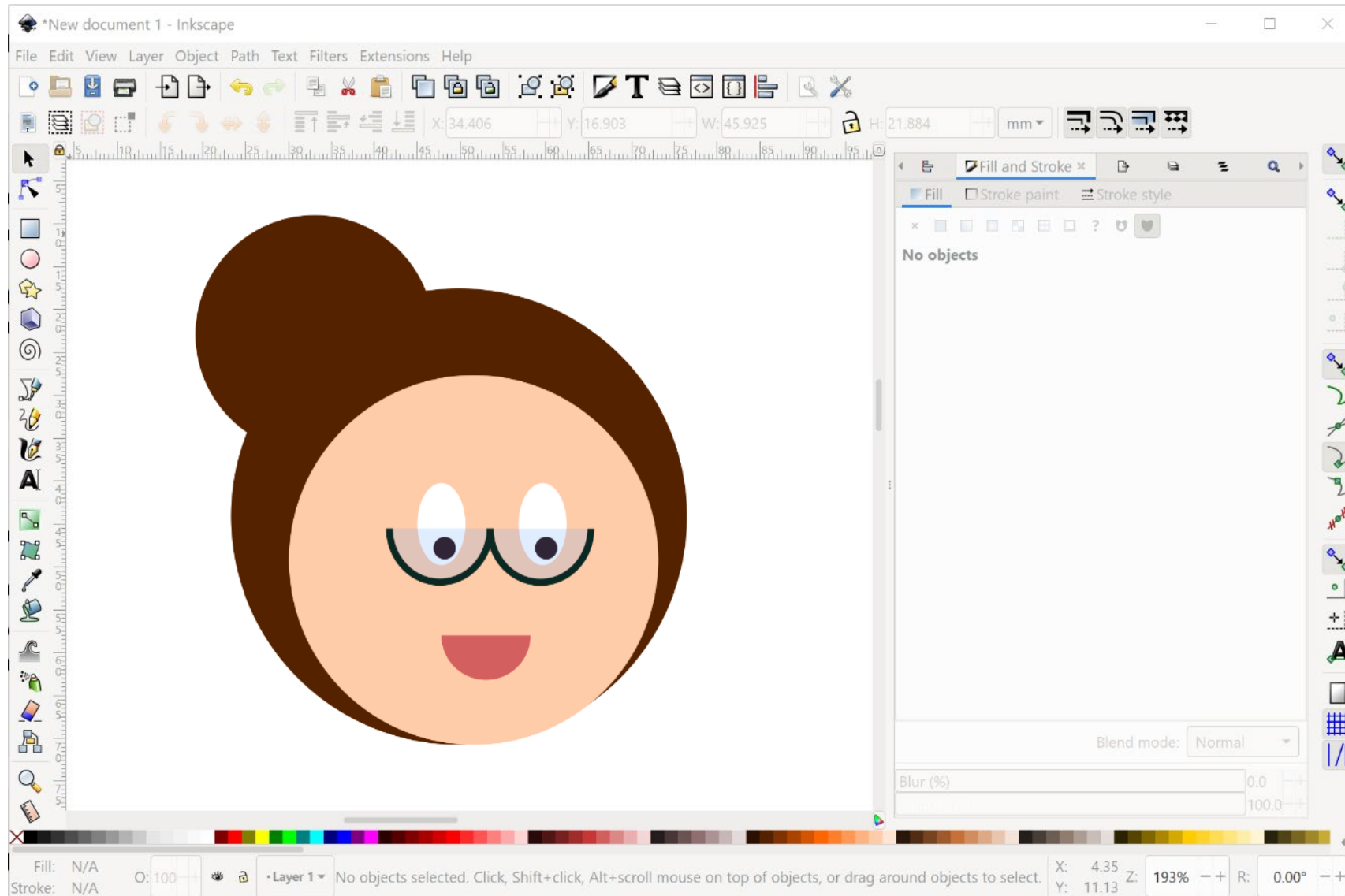
In the **fill and stroke** panel, you can change the colors and style of stroke and fill

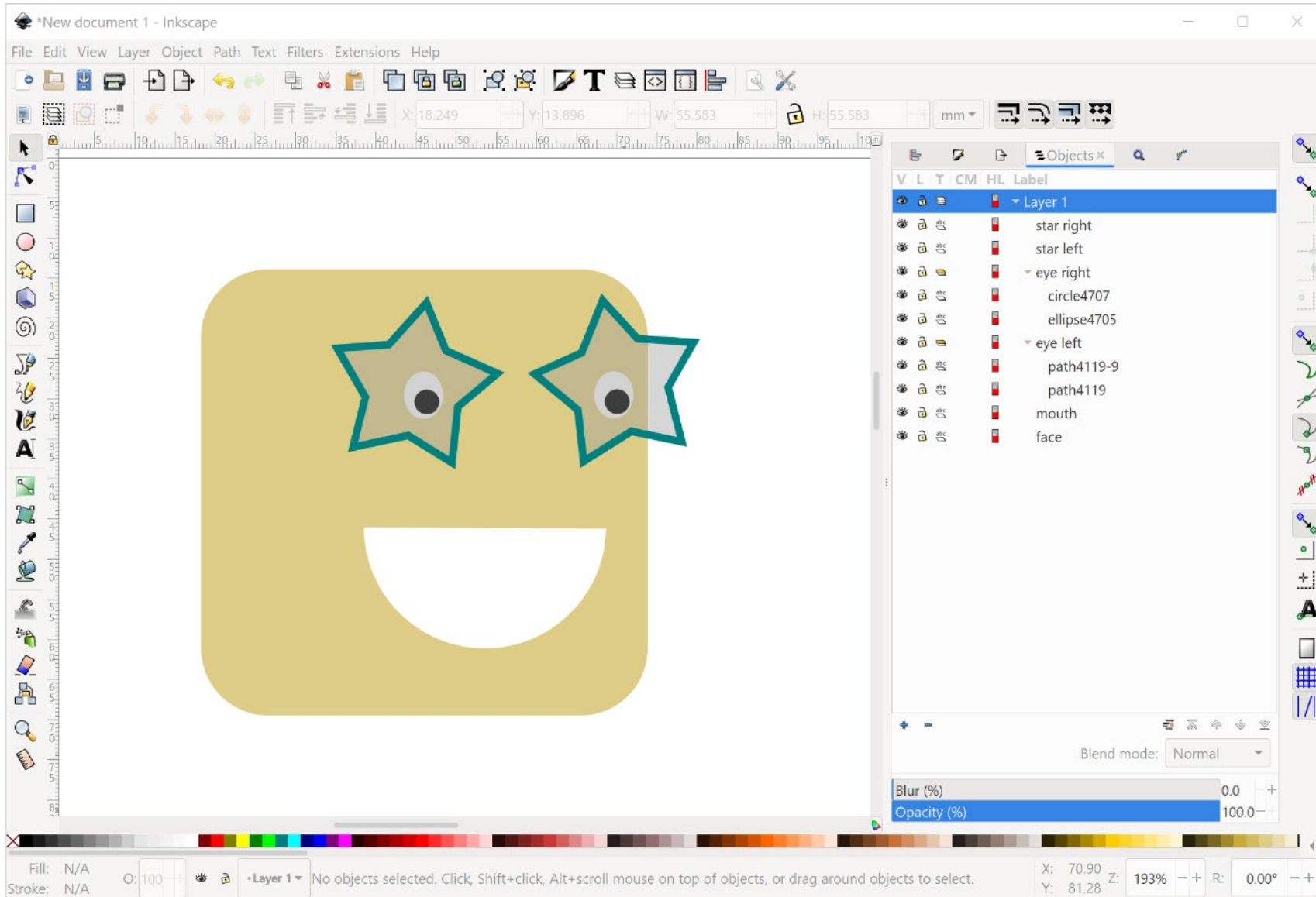
Transparency of the fill only

Transparency of the entire shape (stroke + fill)

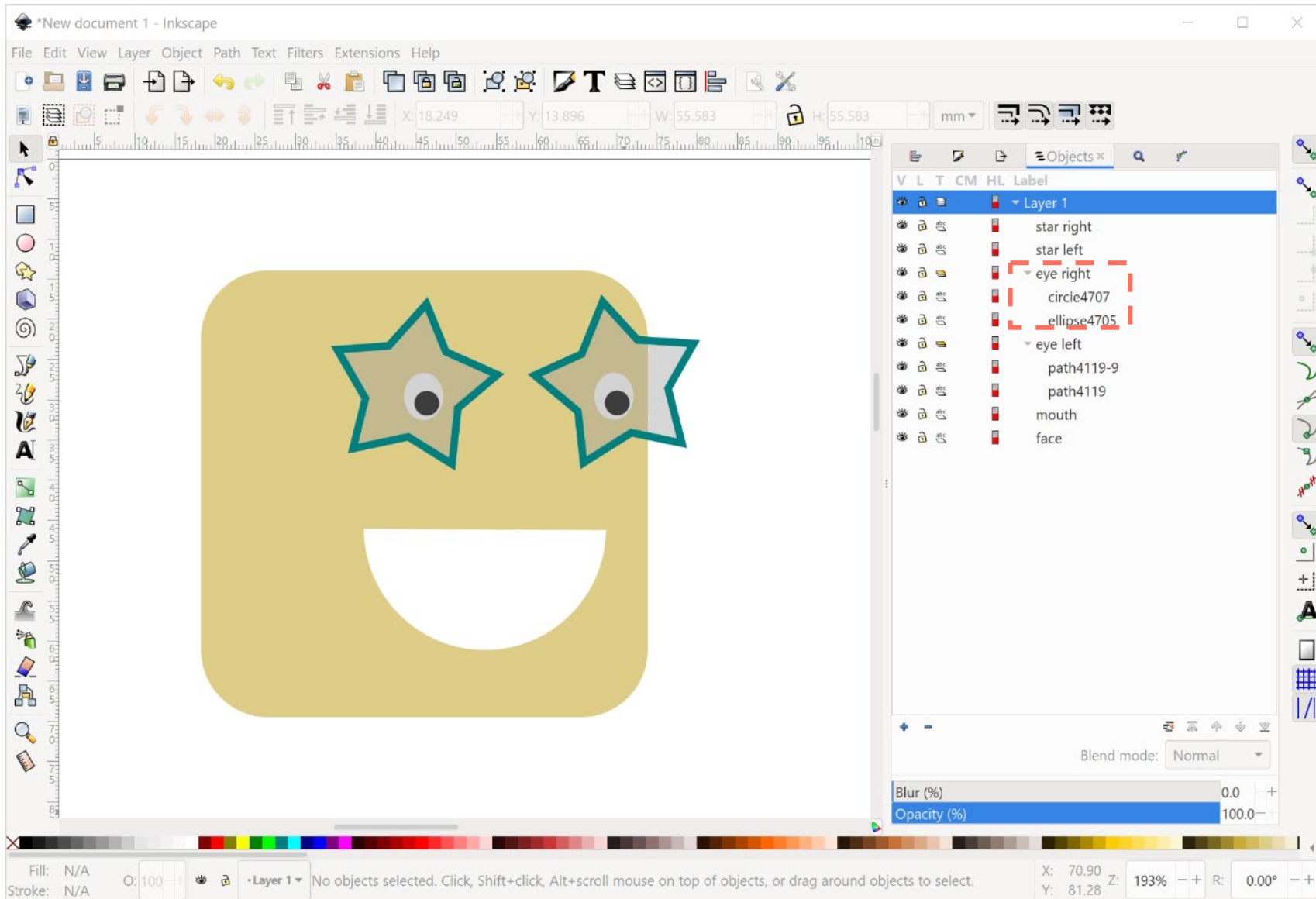
# Exercise: shapes

Recreate the following visual as good as possible:



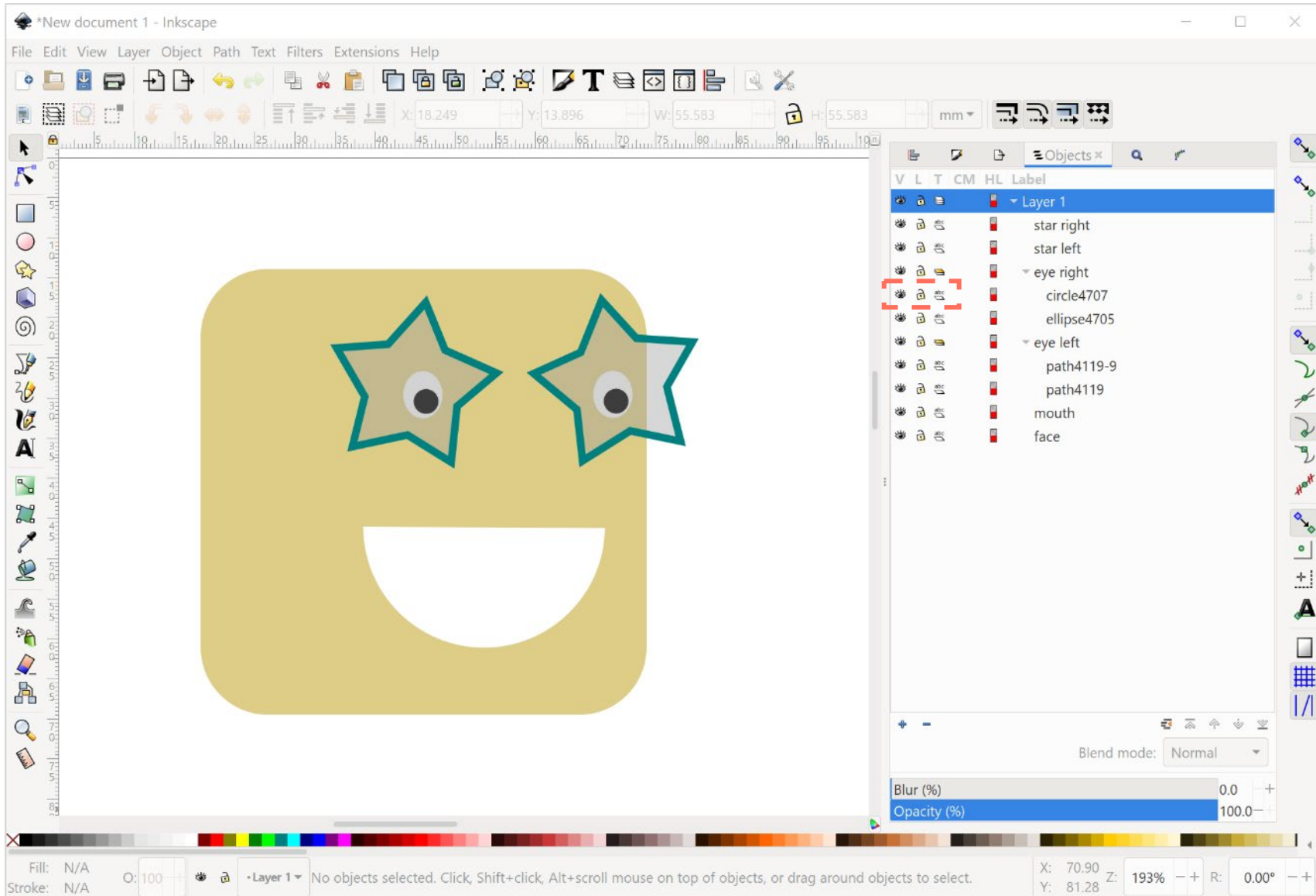


In the **objects** panel, you get an overview of all the shapes in your picture



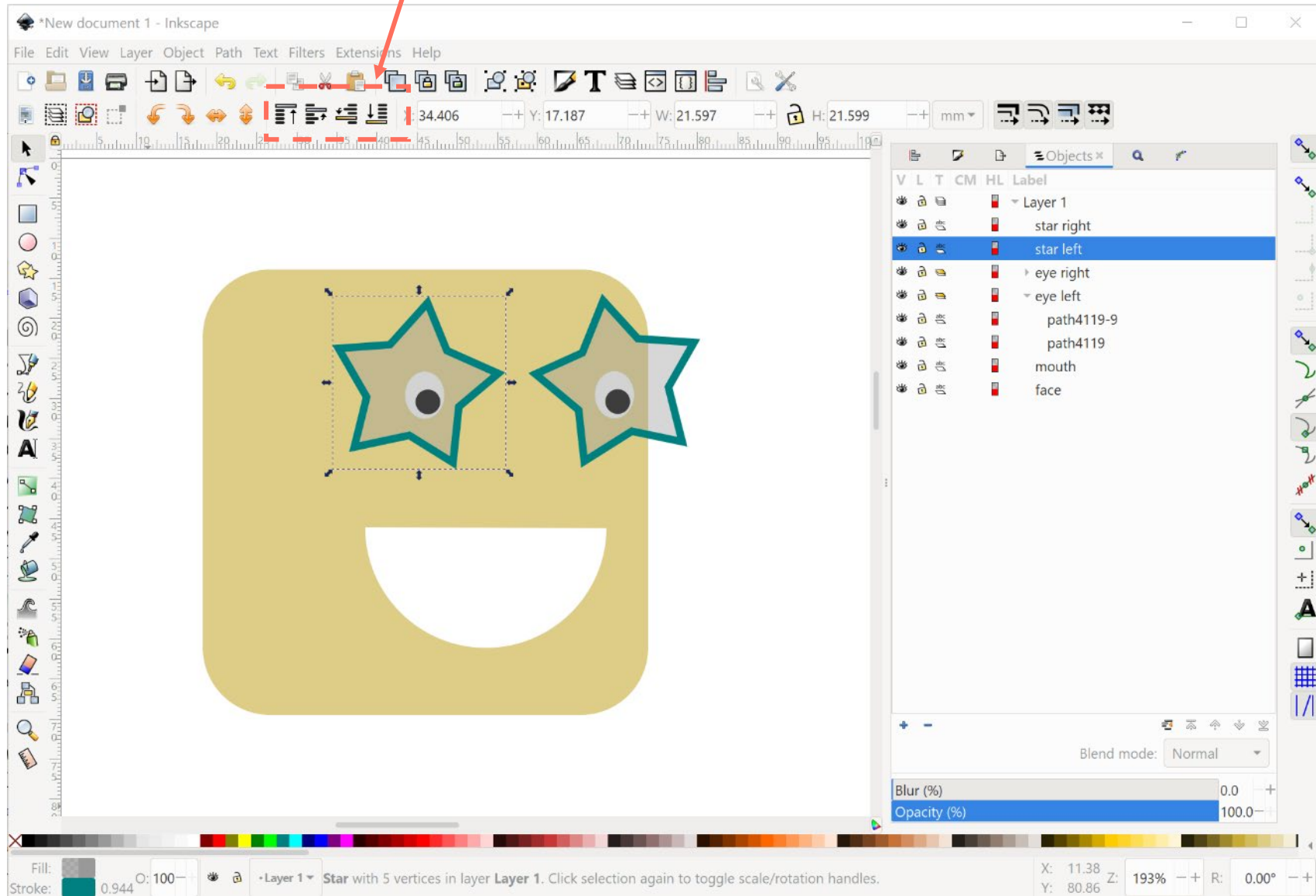
Select objects and  
**group** them to keep  
them together  
(Shift + G)

(Ungroup:  
Ctrl + Shift + G)



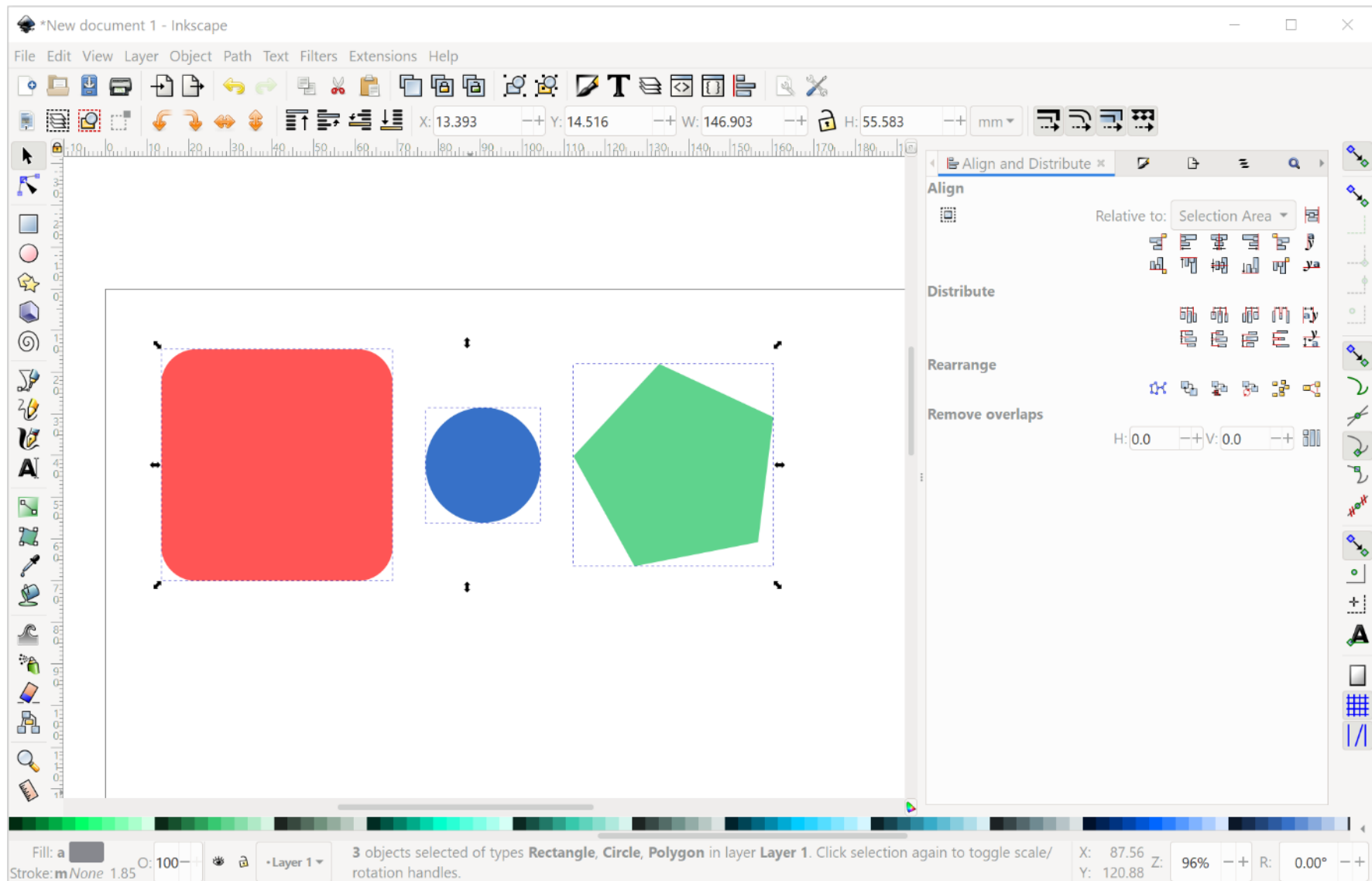
You can **hide** or **lock** objects or groups using these buttons

Or by using the  
lower/raise buttons

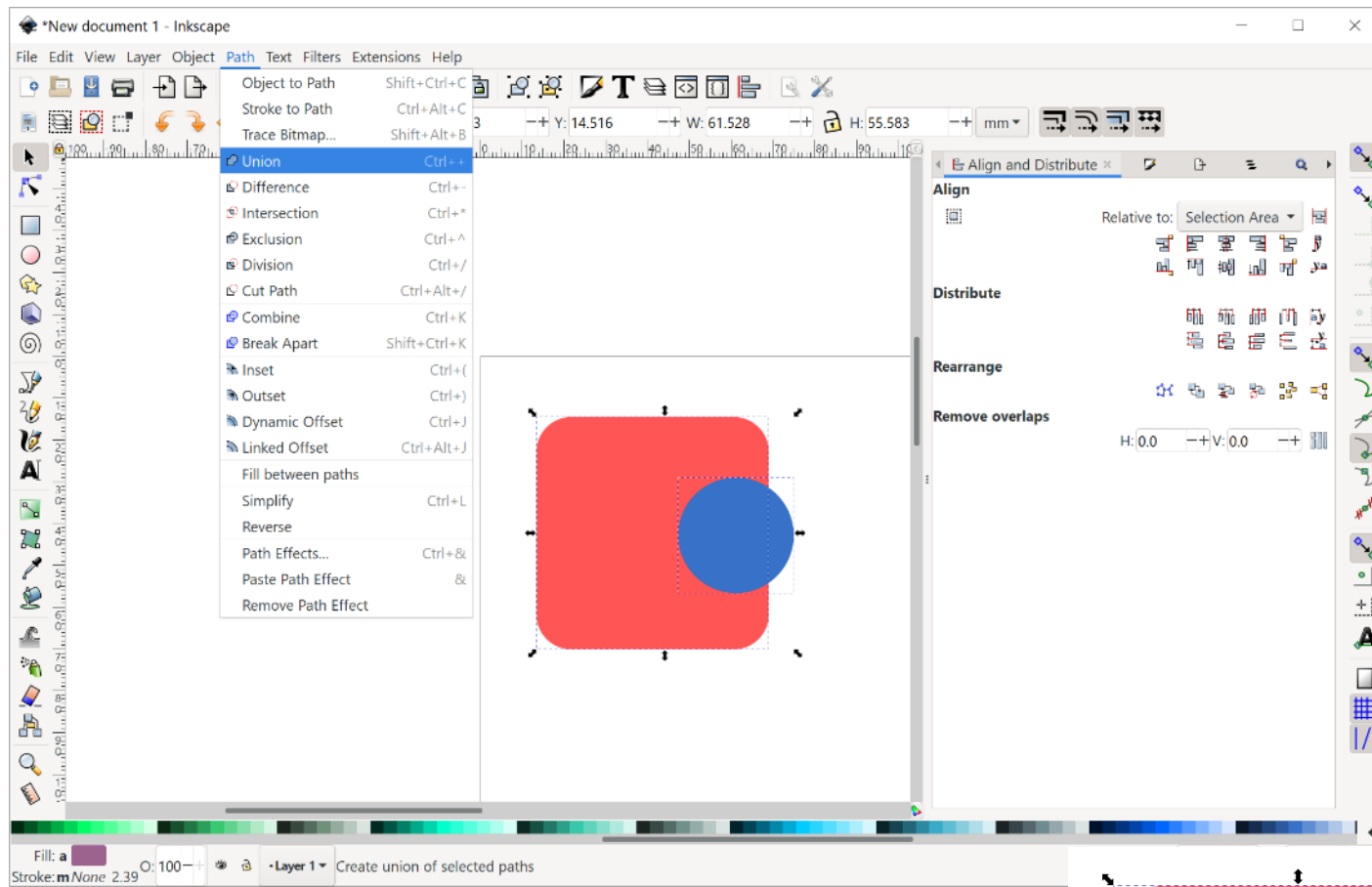


Move items up or down  
in the stack by  
dragging them



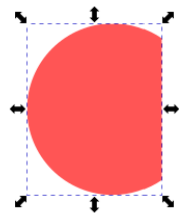
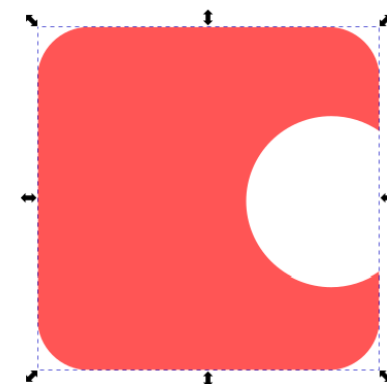
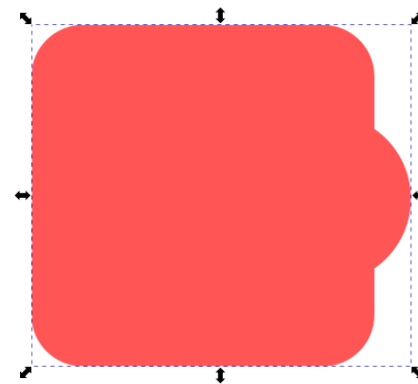


Nicely align objects  
relative to the page or  
each other using the  
**Align and Distribute**  
panel



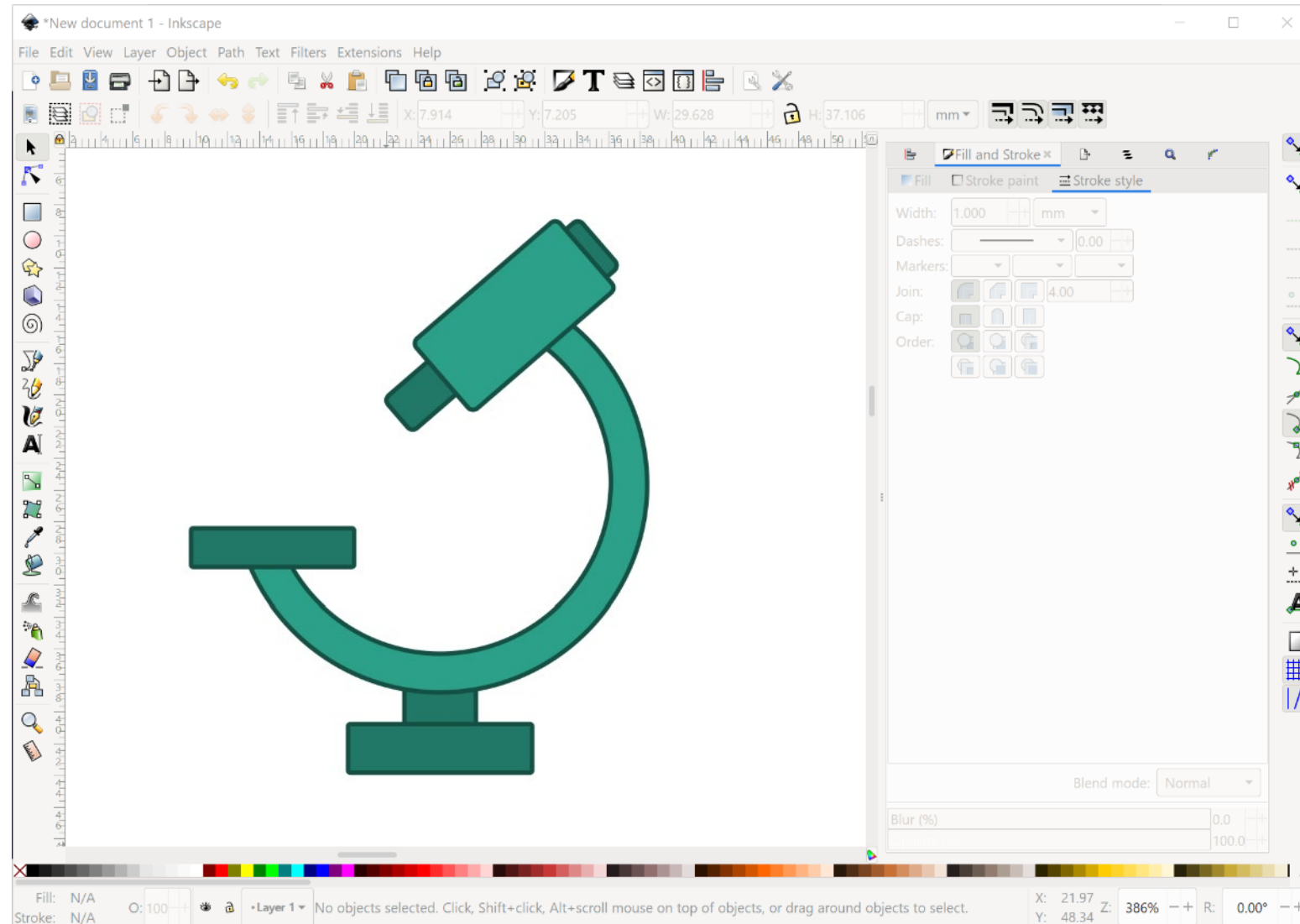
Create complex shapes by **combining** simple shapes in different ways:

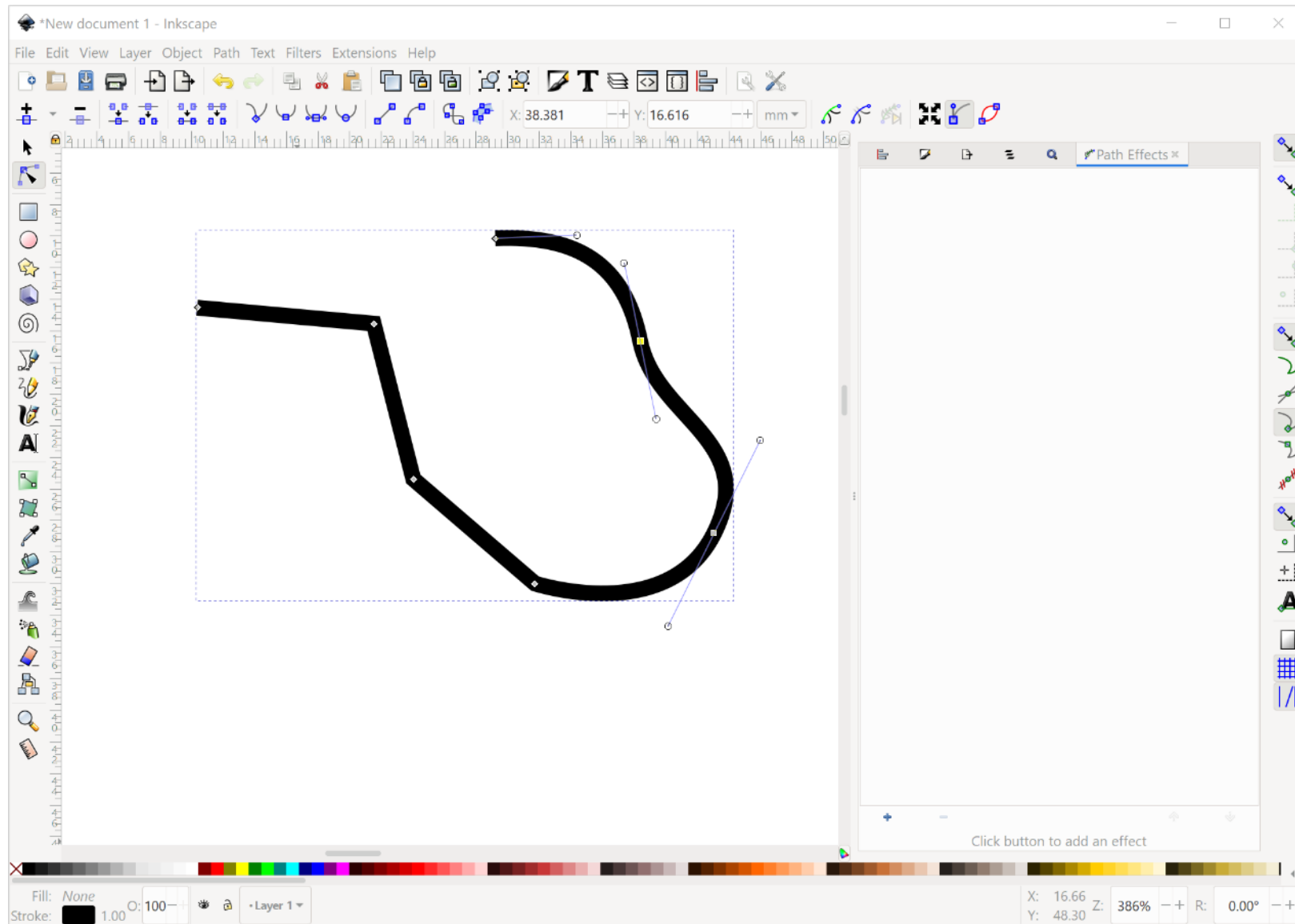
- union
- difference
- intersection
- ...



# Exercise: advanced shape manipulation

Recreate the following icon as good as possible:

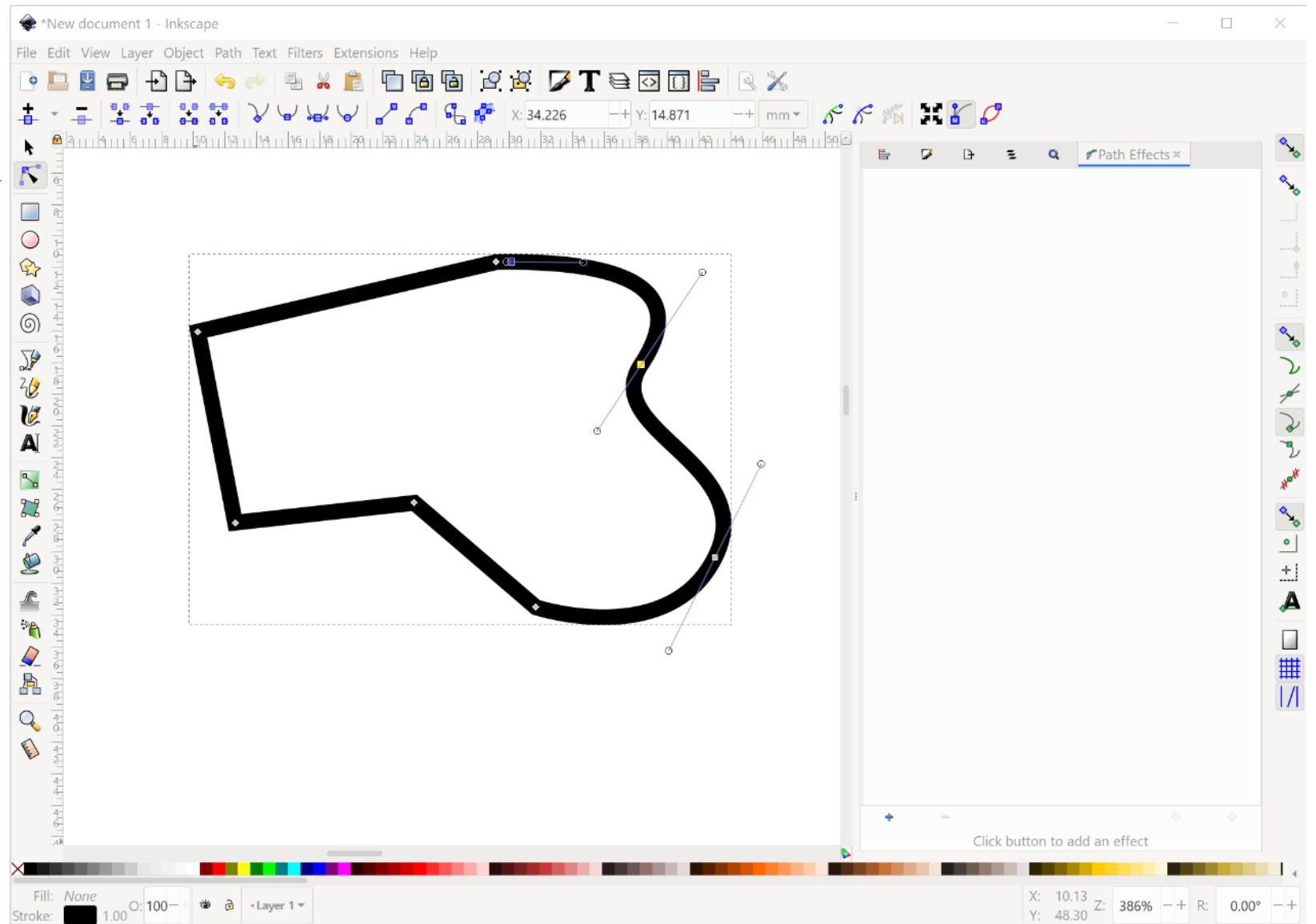




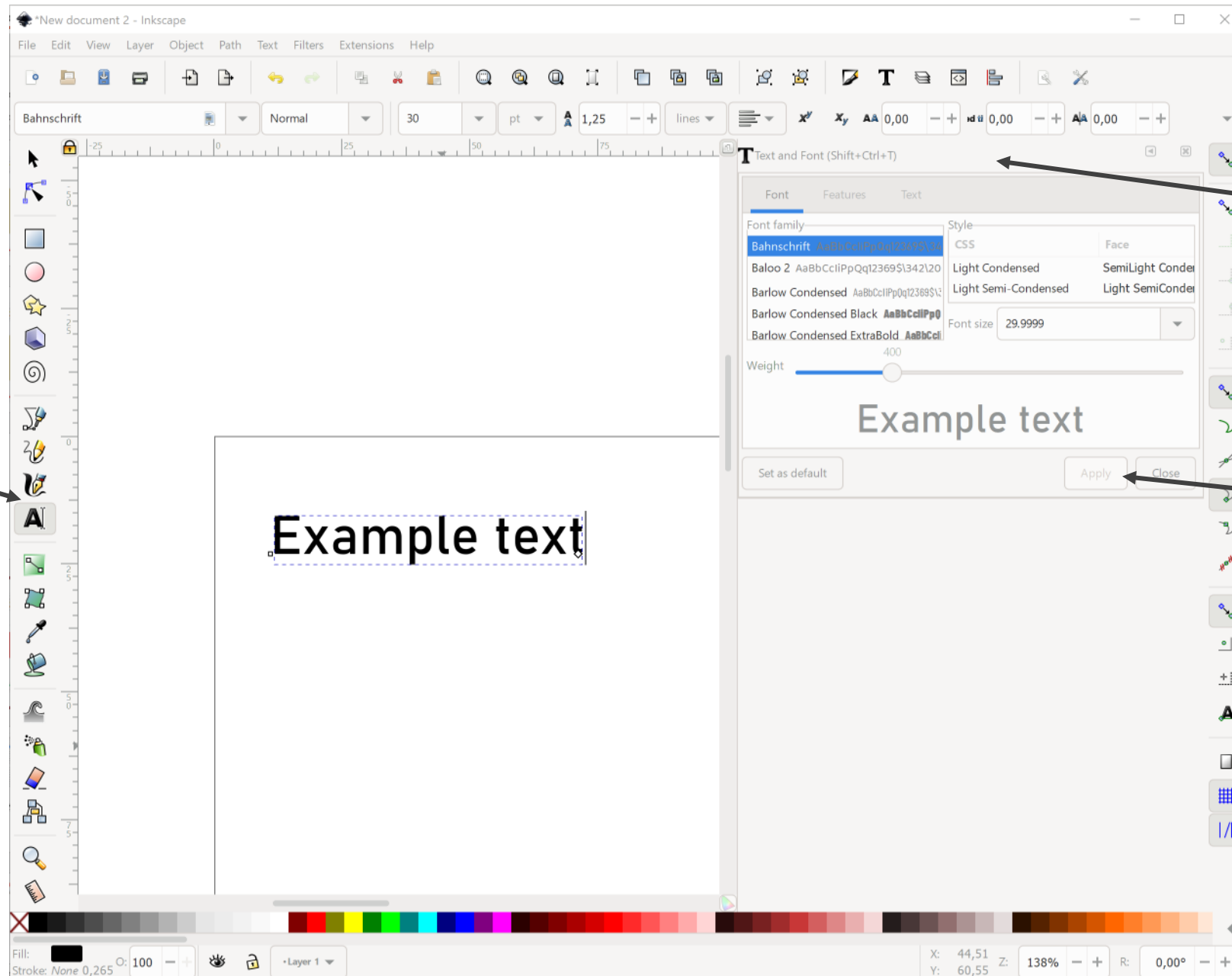
Draw your own paths using the **Bezier** path drawing tools:

- click for a corner point  
(consists of only an anchor)
- click and drag for a bending point  
(consists of an anchor with handles)

Manipulate the anchors  
and handles using the  
**Node** tool



Add text using  
the text tool



Change settings  
in the 'Text and  
Font' panel or  
the tool controls  
bar

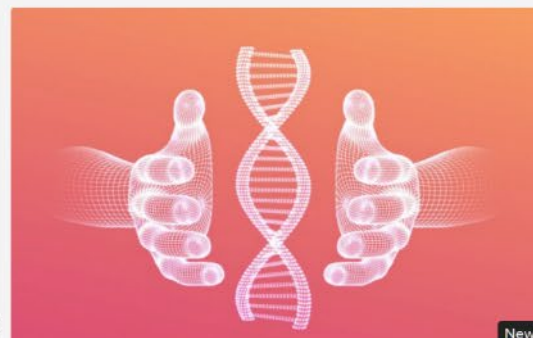
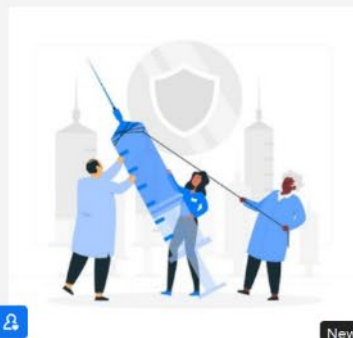
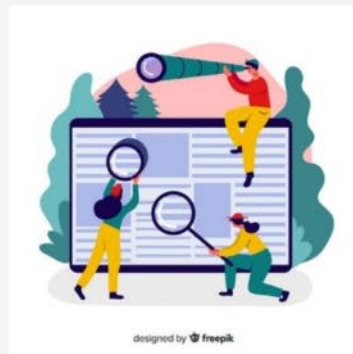
Hit 'Apply' to  
update the text



Free ×

Vectors ×

4,262 Resources

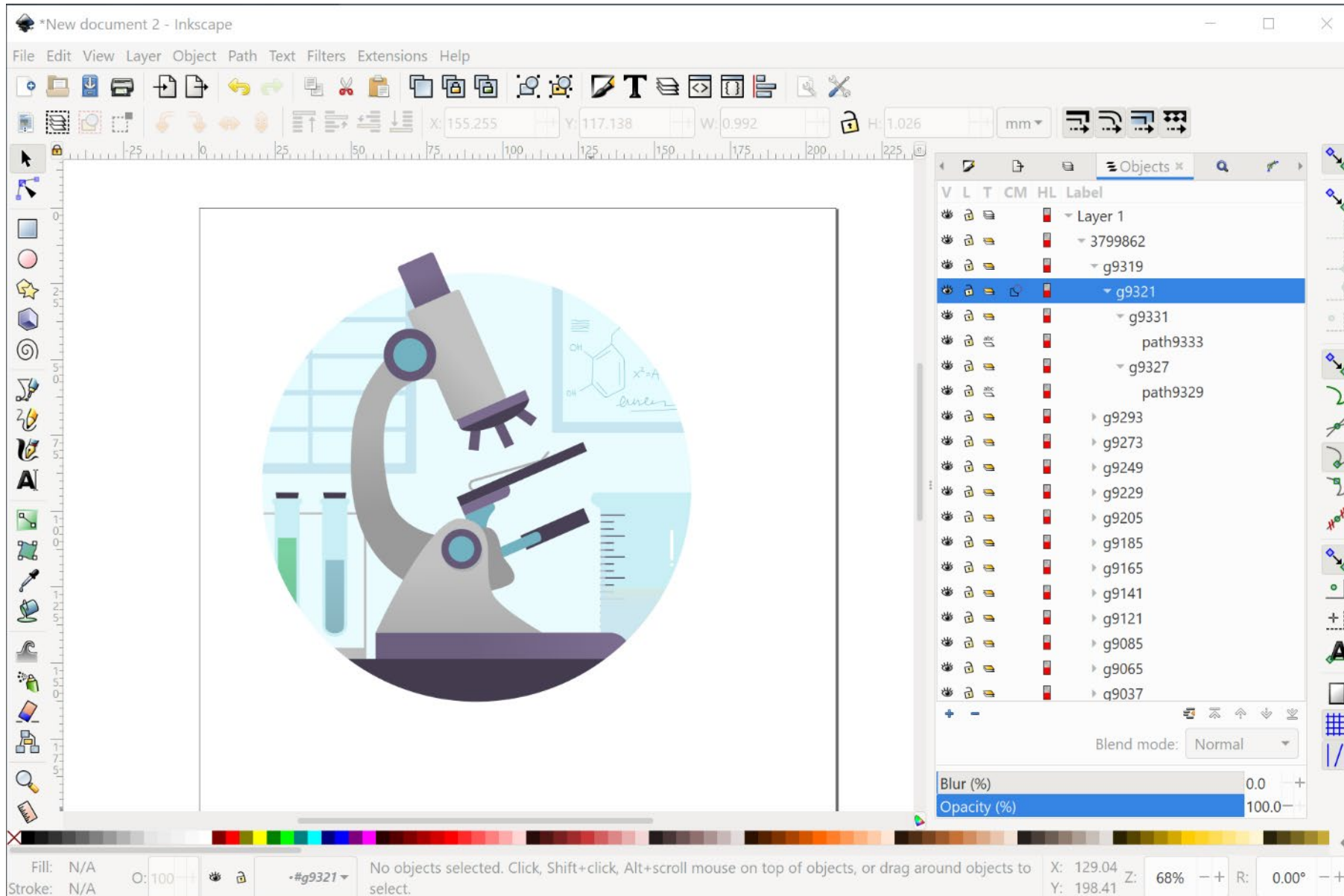


! Copyright complaint

🔧 Download problems?



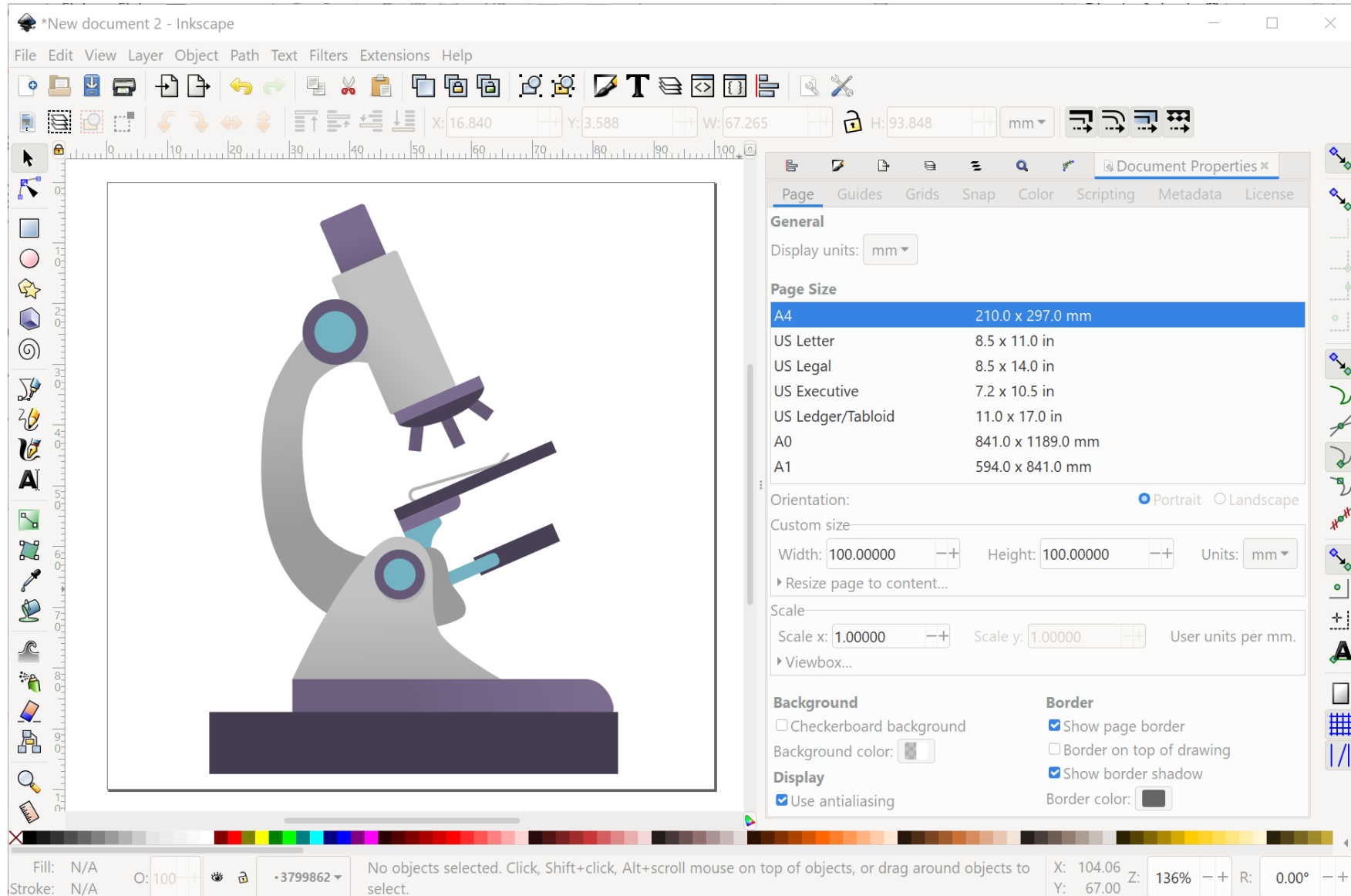
**Free Download** 900  
Free license with attribution



Edit an existing vector image (e.g. one you downloaded from Freepik) using **File > Import**

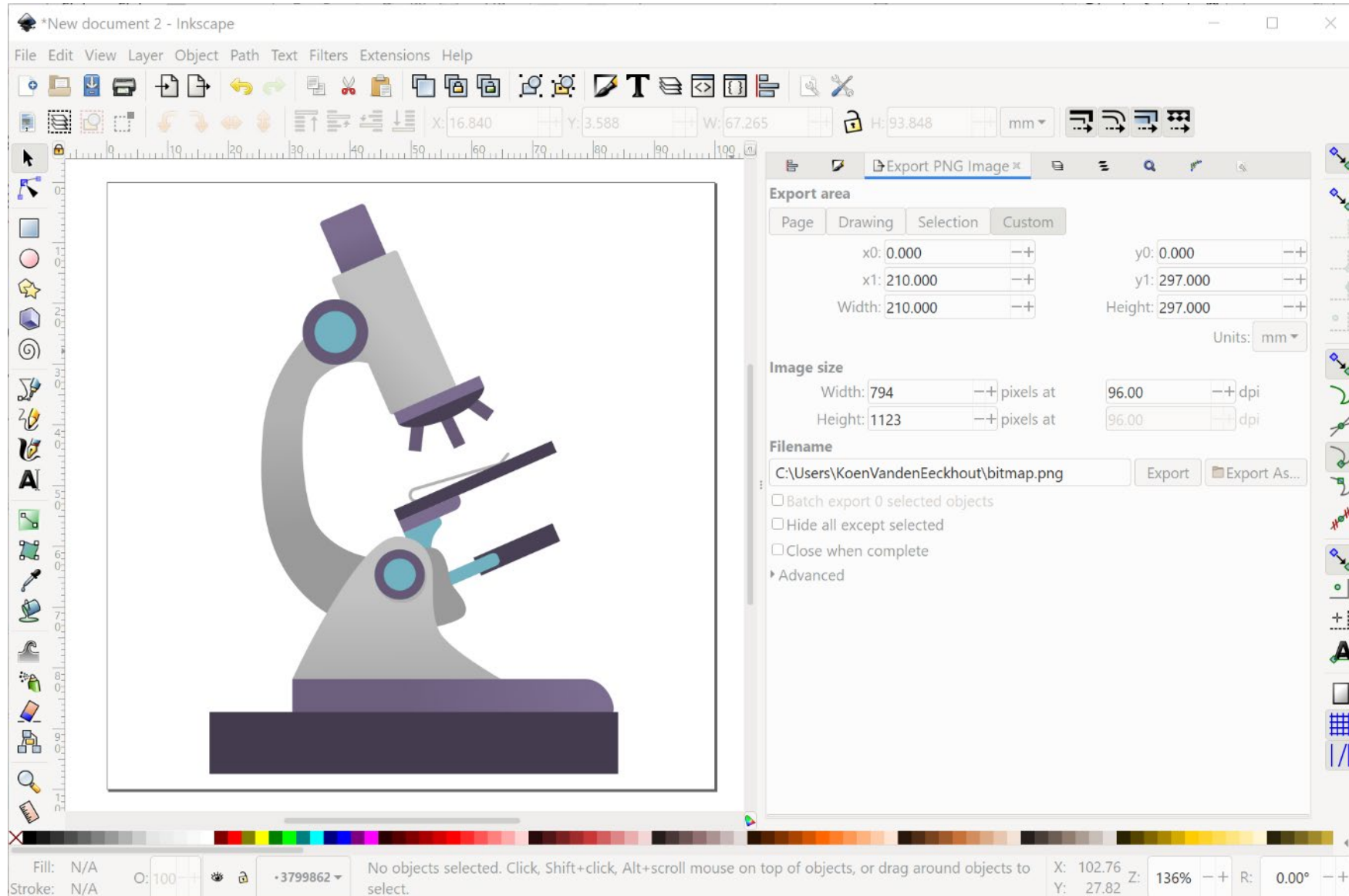
### **Some troubles you might run into:**

- Inkscape doesn't support .eps files
  - if you have an .eps file, use [these steps](#) to get it into Inkscape, or an online tool to convert it into an .svg file
- Some downloads come in .ppt format (e.g. from smart.servier)
  - open the .ppt file and copy-paste the image into Inkscape
  - or save the .ppt file as a .pdf file and open it in Inkscape



## Saving your file

**Step 1:** set the desired canvas / document size

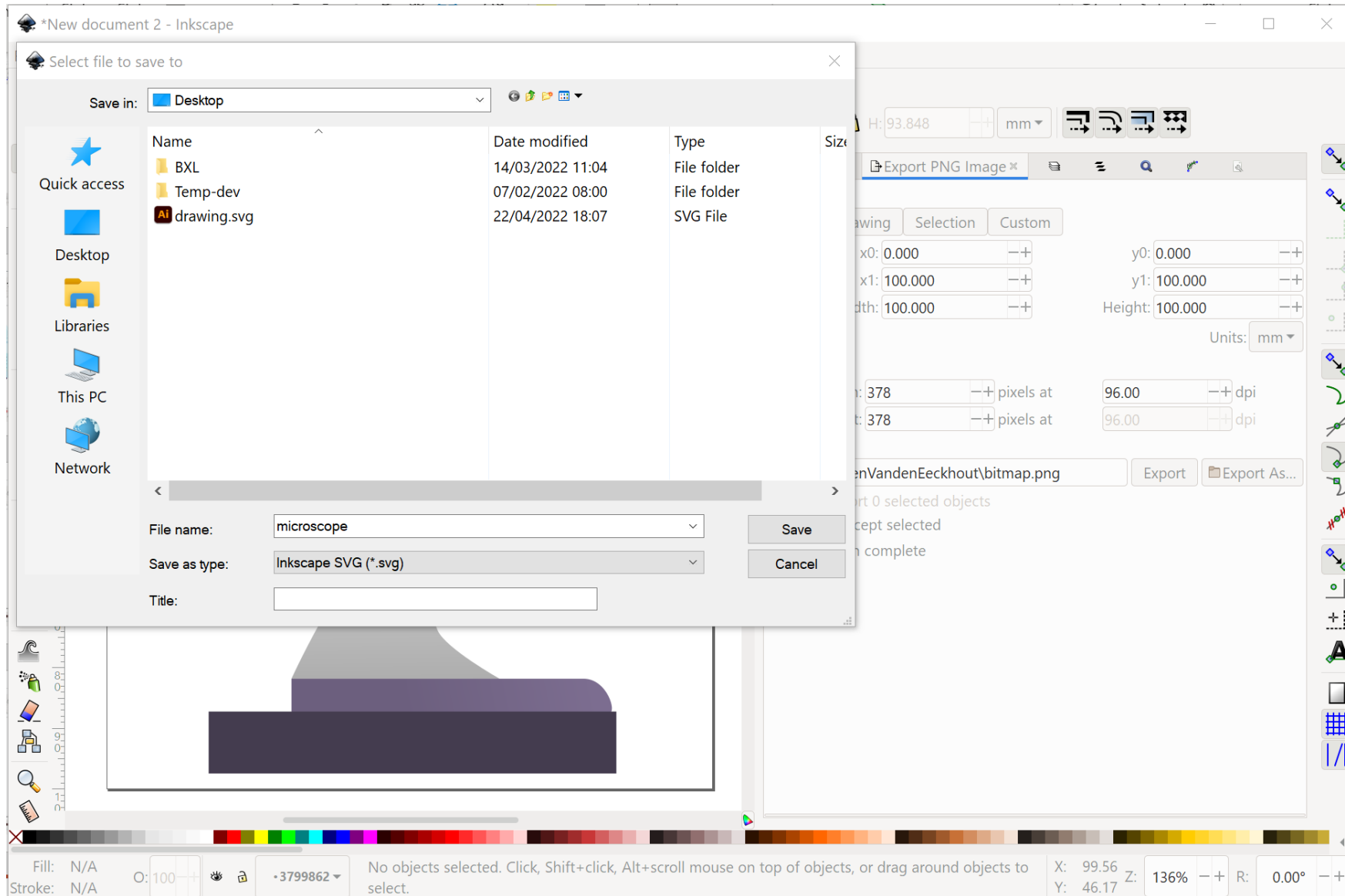


## Saving your file

**Step 1:** set the desired canvas / document size

**Step 2:** if you want to save as a bitmap image, choose File > Export PNG image





## Saving your file

**Step 1:** set the desired canvas / document size

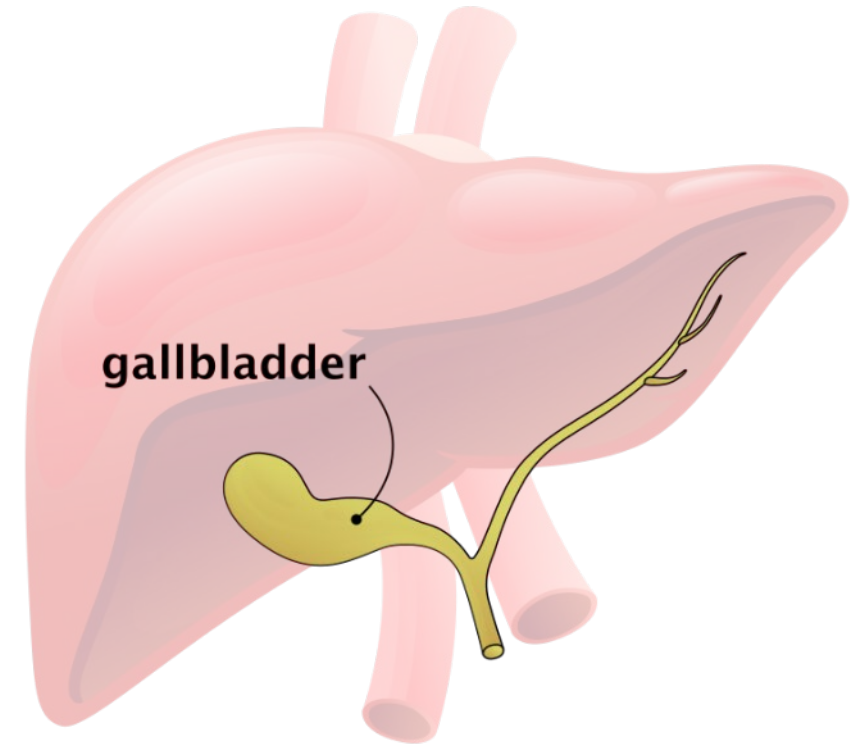
**Step 2:** if you want to save as a bitmap image, choose File > Export PNG image

**Step 3:** if you want to save as a vector image, choose File > Save



# Exercise: editing vector images

Find the following image on [freepik.com](https://www.freepik.com)  
(search for 'liver'):



- Remove everything which is not the liver or gallbladder
- Reduce the liver transparency to make it lighter
- Give the gallbladder a stroke to make it stand out more
- Add a text label and connector to the gallbladder
- Save the image as gallbladder.png with a transparent background

# Exercise: complex layouts

Let's recreate the following  
infographic as good as possible:





# Lunch break

All the slides and all the links:

[baryon.be/visuals-resources](https://baryon.be/visuals-resources)

# Creating visuals about your research

Elements of powerful visuals

Visual communication  
principles

Editing vector images

lunch break

---

**Graphical abstracts/posters**

Design principles

Bitmap images

Graphs


Legal and ethical aspects

The background is a teal-colored overlay on a blurred image of a newspaper. The newspaper features a world map at the top and several articles, including one titled 'The Nobel Prize' with subtext '114 years, 108 prizes'. Below the title are several small portrait photographs of individuals. The text 'Graphical abstracts' is centered in white.


# Graphical abstracts



Graphical abstract

https://www.elsevier.com/authors/tools-and-resources/graphical-abstract

 ELSEVIER

About ElsevierProducts & SolutionsServicesShop & Discover

Search 



Home > Authors > Tools and resources > Graphical abstract

## Graphical abstracts

A graphical abstract is a **single, concise, pictorial and visual summary** of the main findings of the article. This could either be the concluding figure from the article or a figure that is specially designed for the purpose, which captures the content of the article for readers at a single glance. Please see examples below.

The graphical abstract will be displayed in online search result lists, the online contents list and the online article, but will not (yet) appear in the article PDF file or print.

### Author instructions

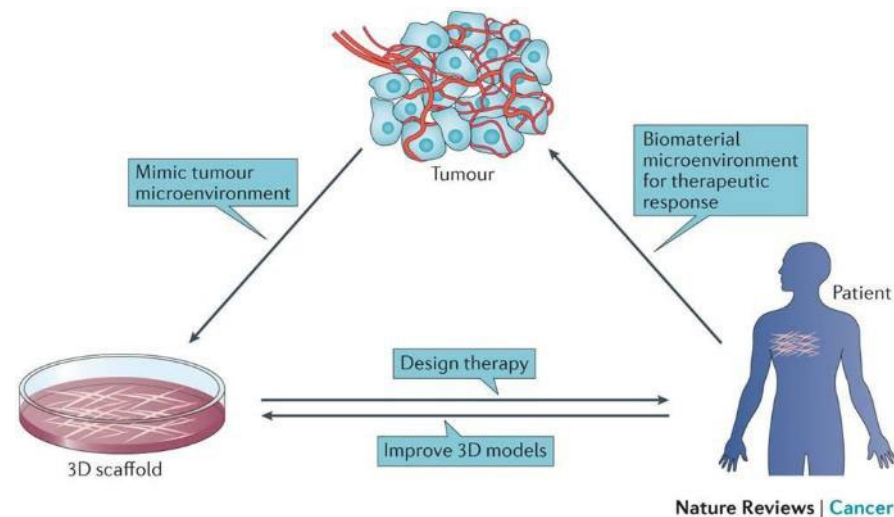
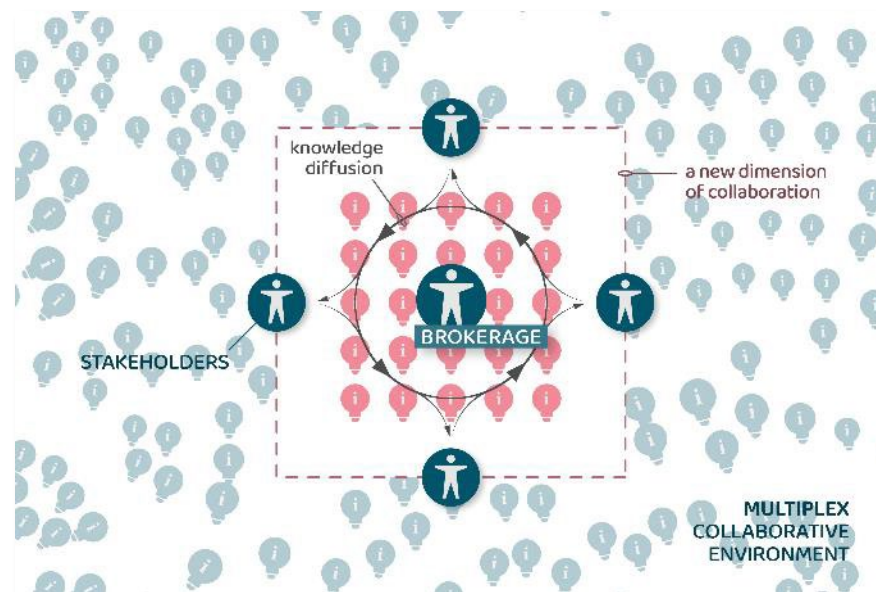
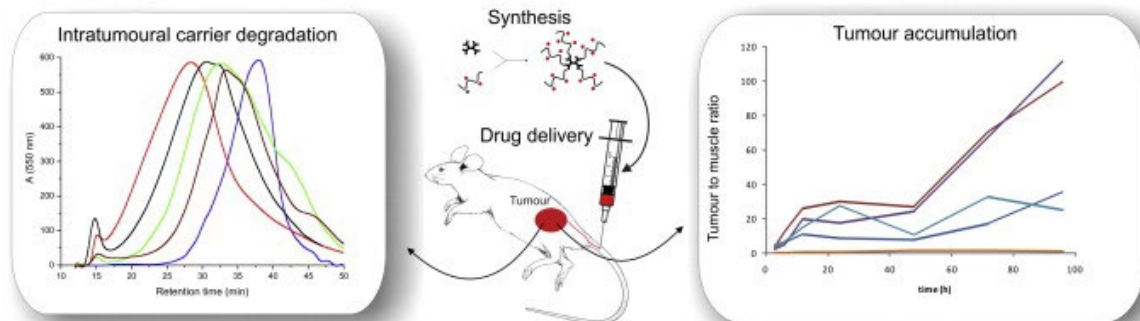
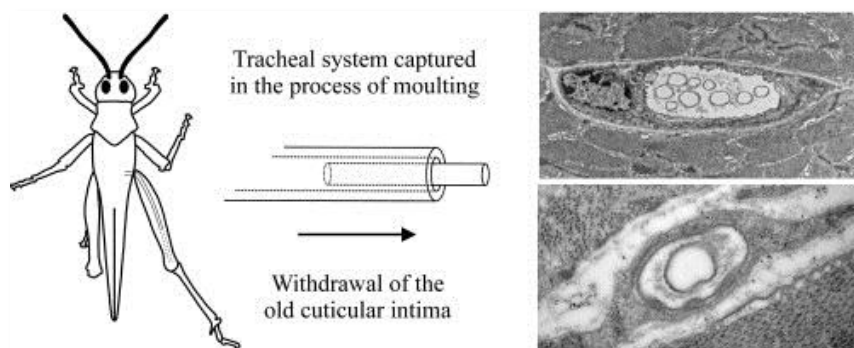
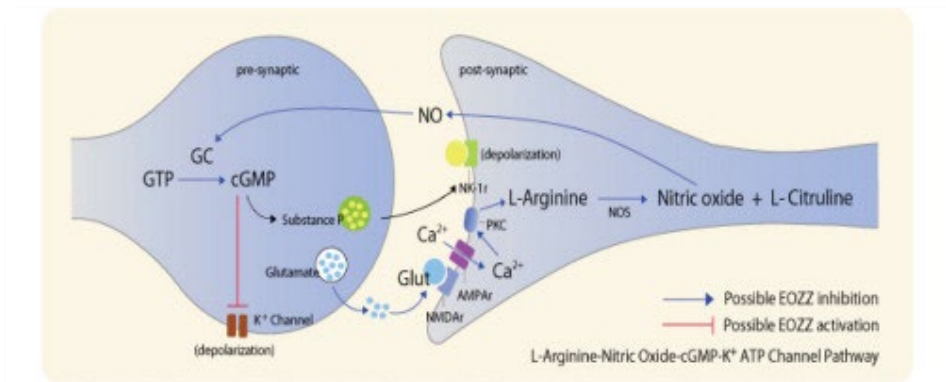
A graphical abstract should allow readers to quickly gain an understanding of the main take-home message of the paper and is intended to encourage browsing, promote interdisciplinary scholarship, and help readers identify more quickly which papers are most relevant to their research interests.

Authors must provide an image that clearly represents the work described in the paper. A key figure from the original paper, summarising the content can also be submitted as a graphical abstract. Graphical abstracts should be submitted as a separate file in the submission system by selecting “graphical abstracts” from the drop-down list when uploading files.

### Specifications:

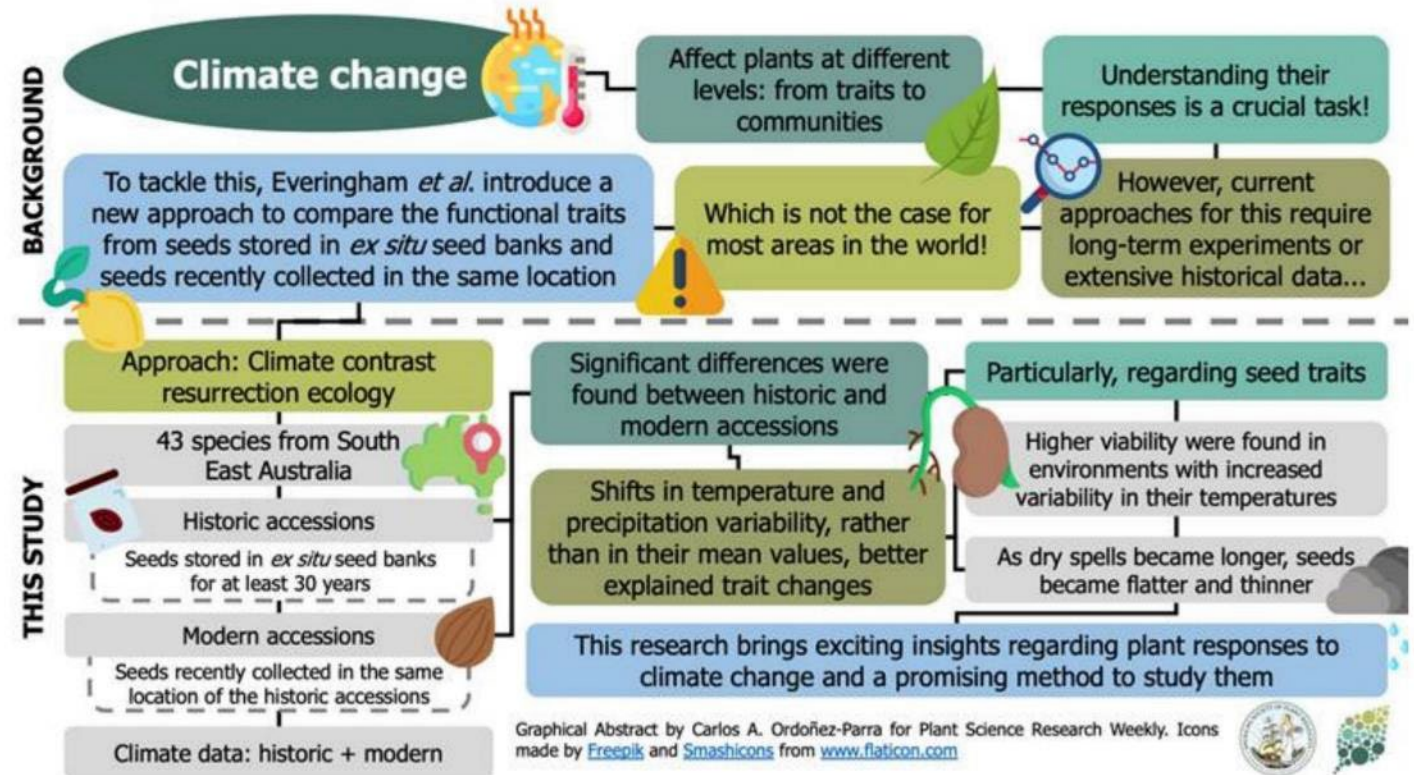
A graphical abstract should be a one-image file and should visualize one process or make one point clear. For ease of





# Common pitfalls

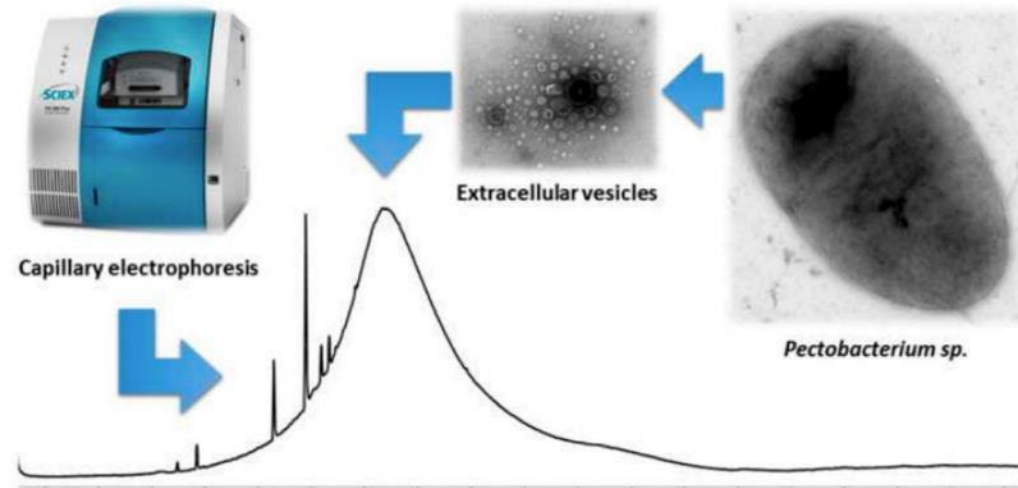
Too much text



# Common pitfalls

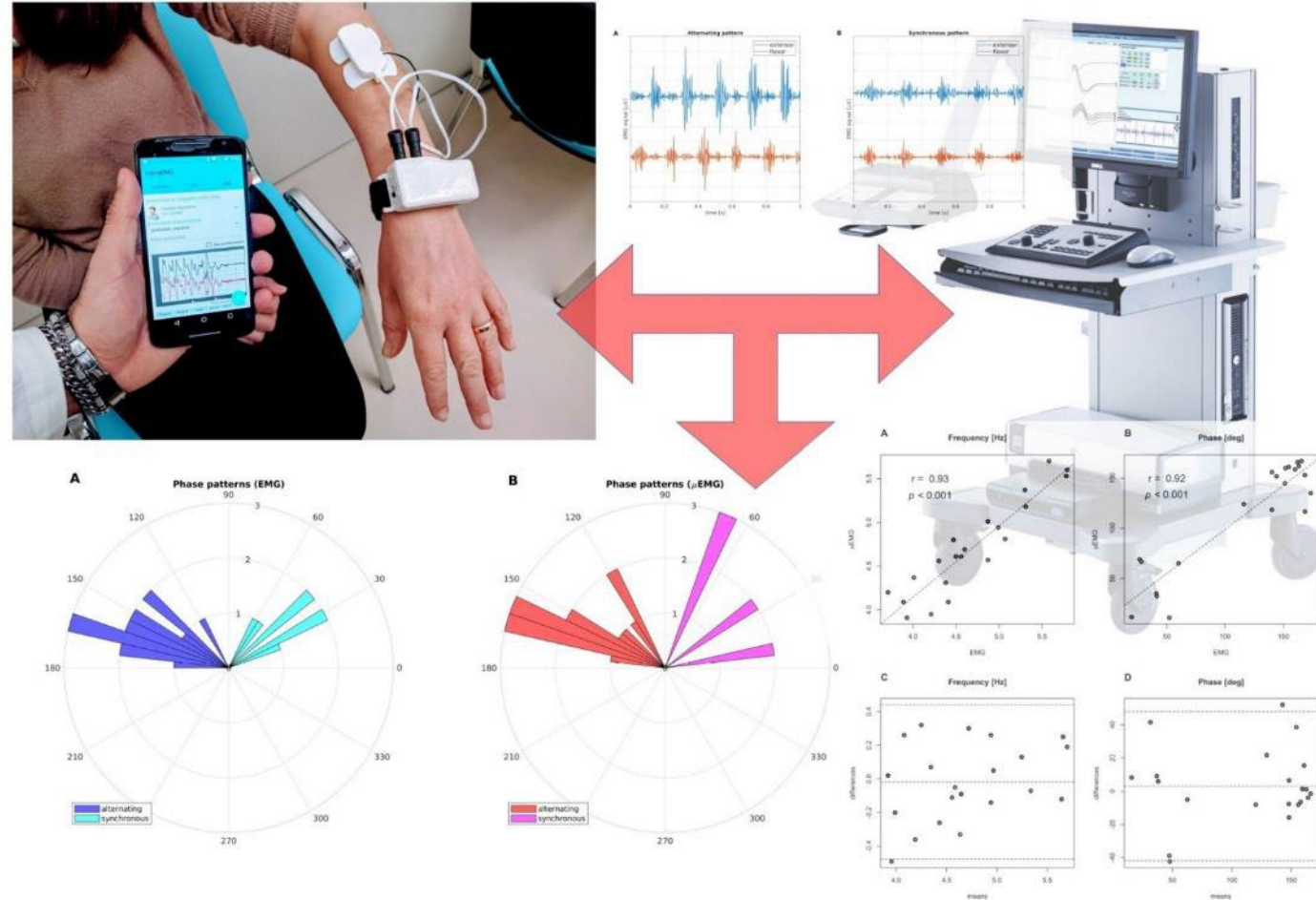
Too little text

Graphical Abstract



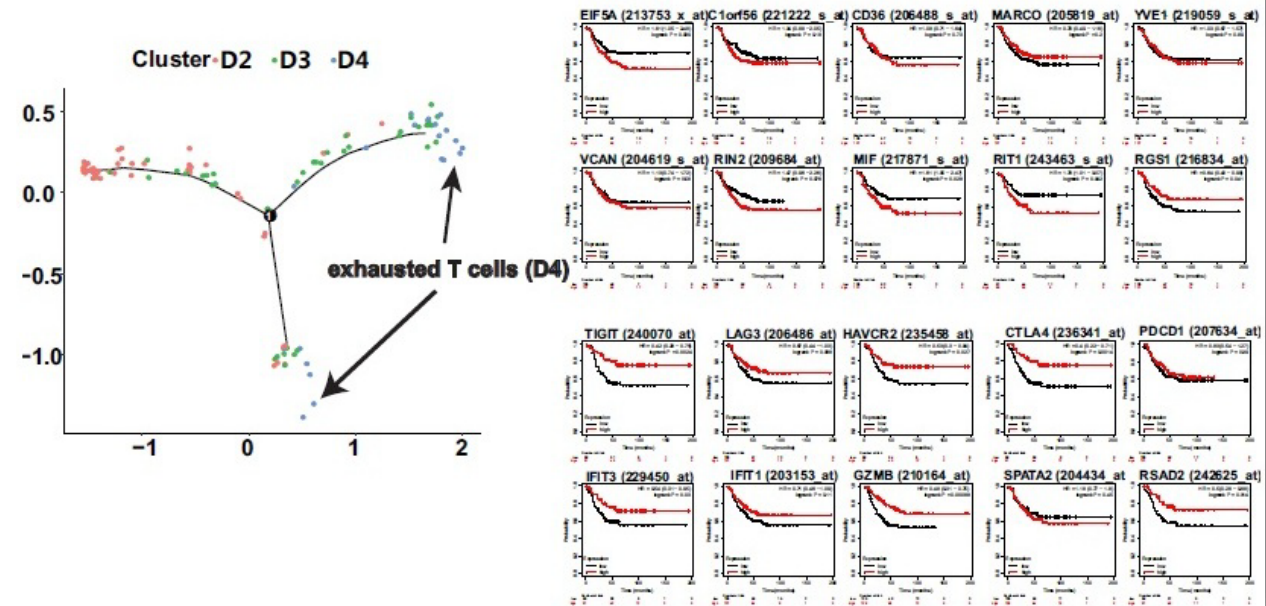
# Common pitfalls

No clear flow



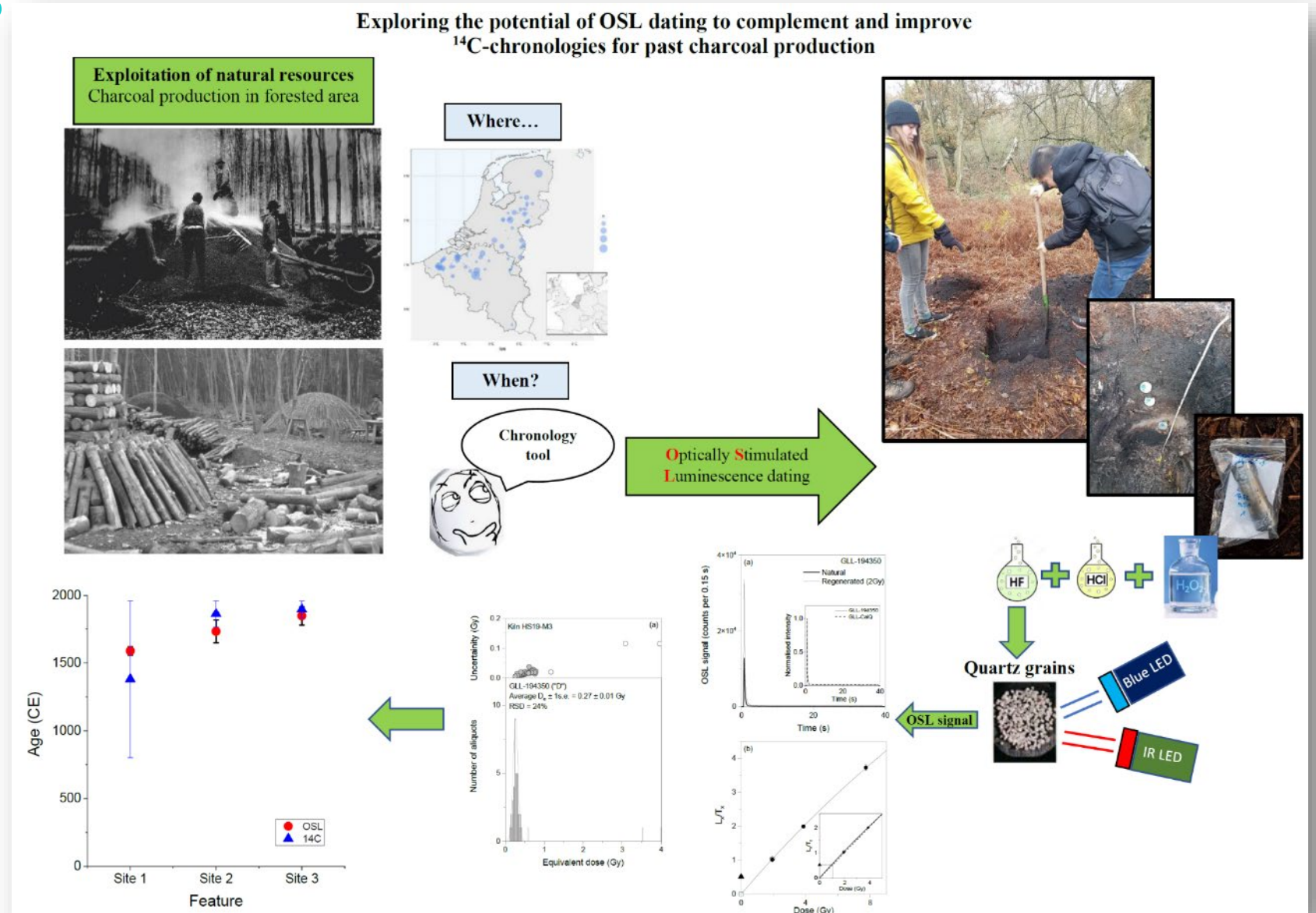


Not adapted to the medium (e.g., size)



# Common pitfalls

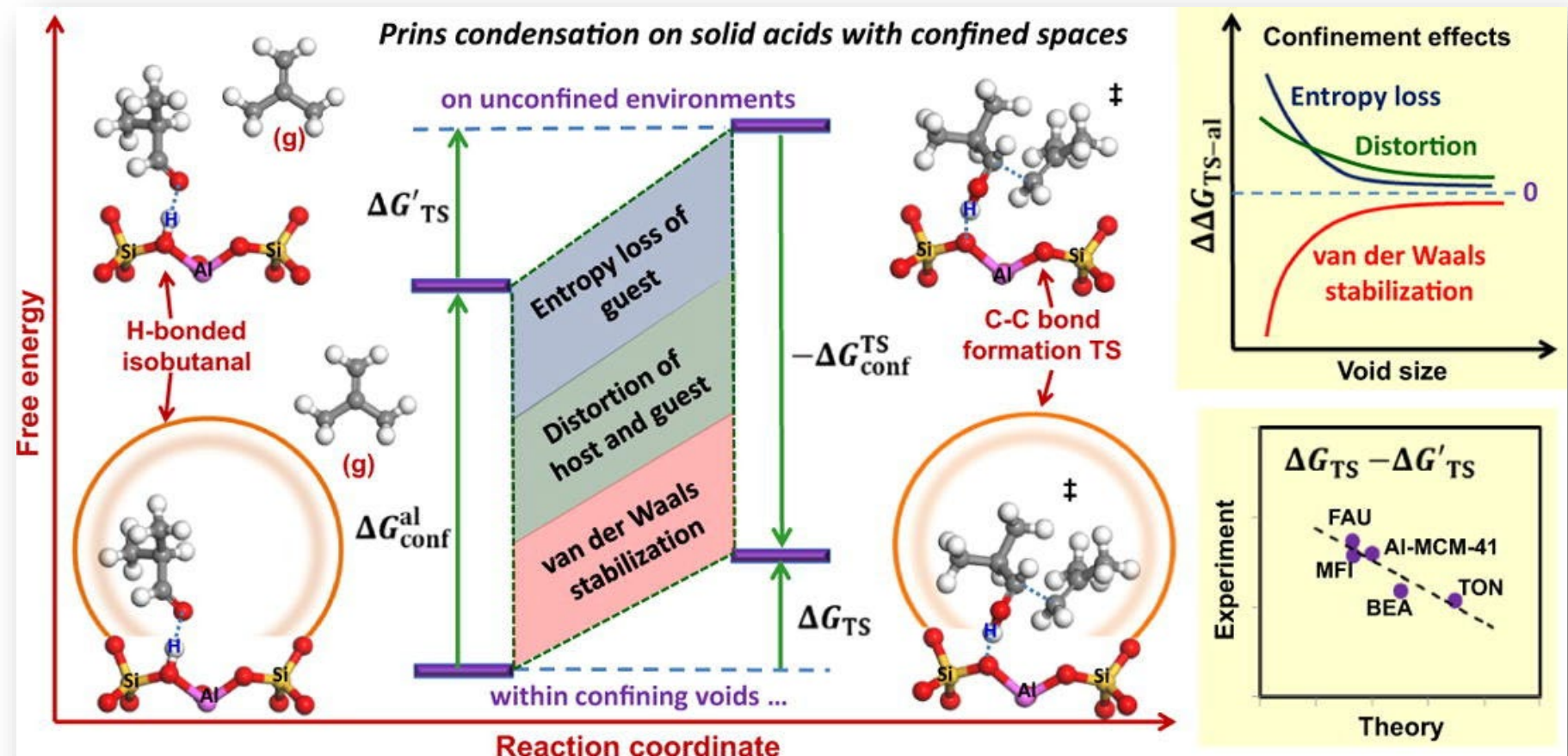
Hierarchy – e.g.,  
photographs can take up  
a lot of space, without  
much added value

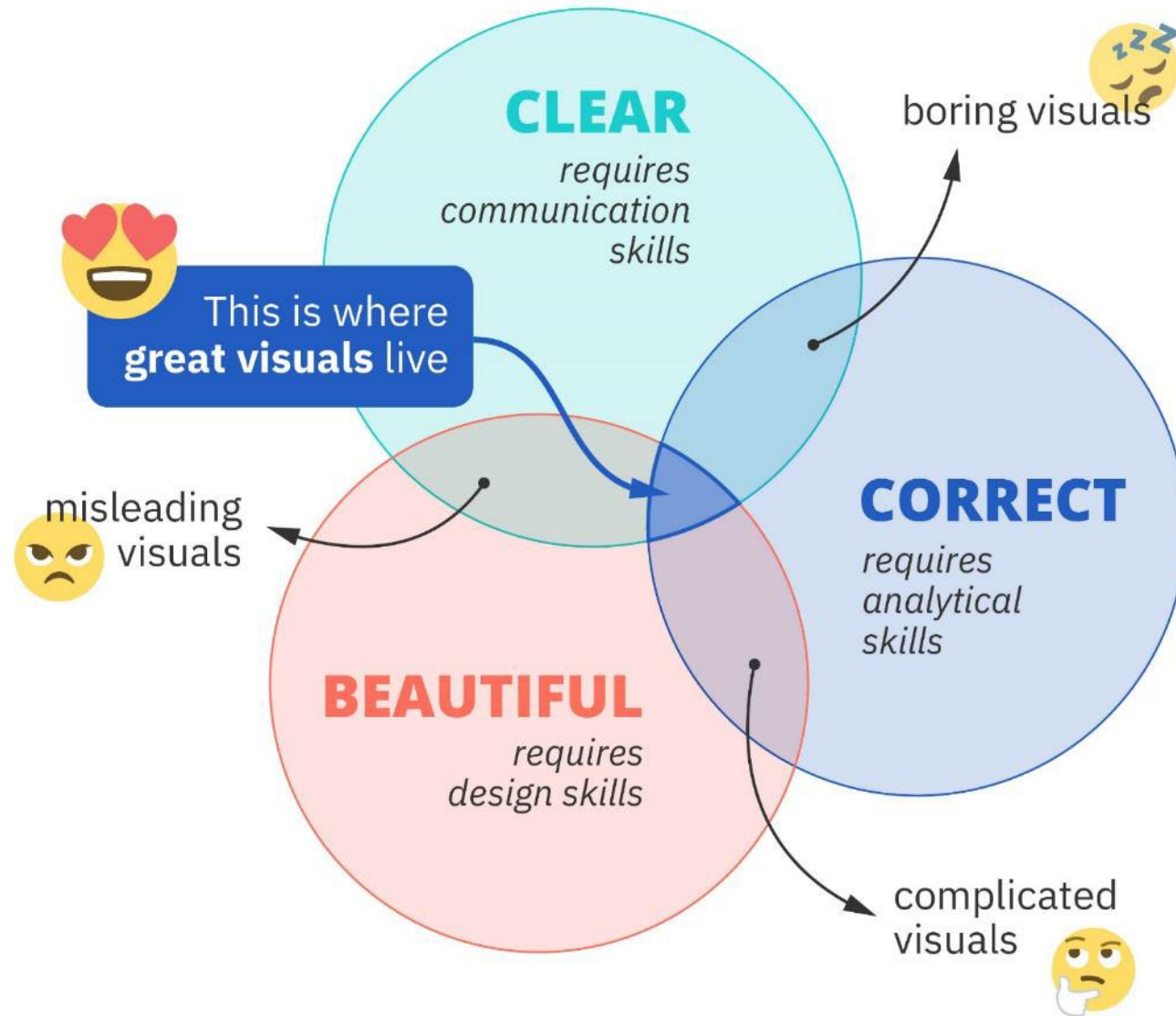




# Common pitfalls

No room to breathe, make sure to leave some white space!





# Creating visuals about your research

Elements of powerful visuals

Visual communication  
principles

Editing vector images

lunch break

---

Graphical abstracts/posters

**Design principles**

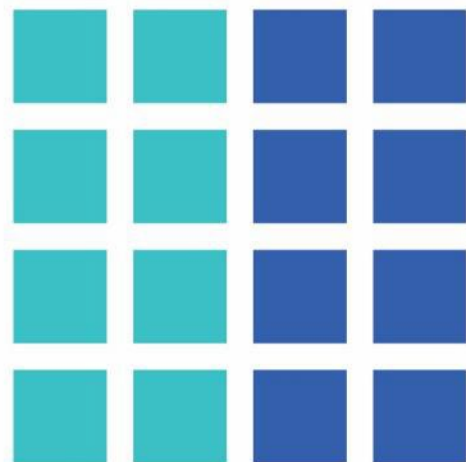
Bitmap images

Graphs

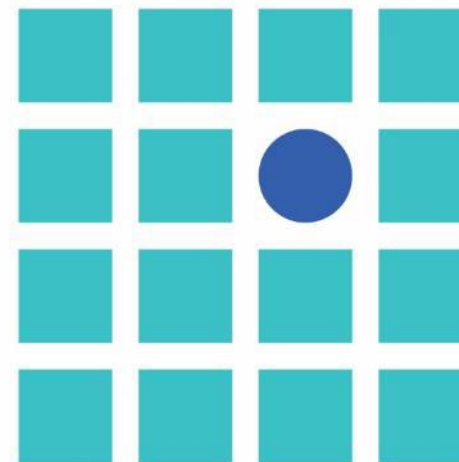
Legal and ethical aspects

The background is a blurred, high-angle shot of a newspaper page. At the top, a world map is visible. Below it, there are several small, square portrait photographs of men, likely Nobel laureates. To the right of these portraits, the text "The Nobel Prize" is partially legible, followed by "114 years, 108 prizes". The rest of the page is filled with dense, illegible text columns.

# Design principles



**similarity**

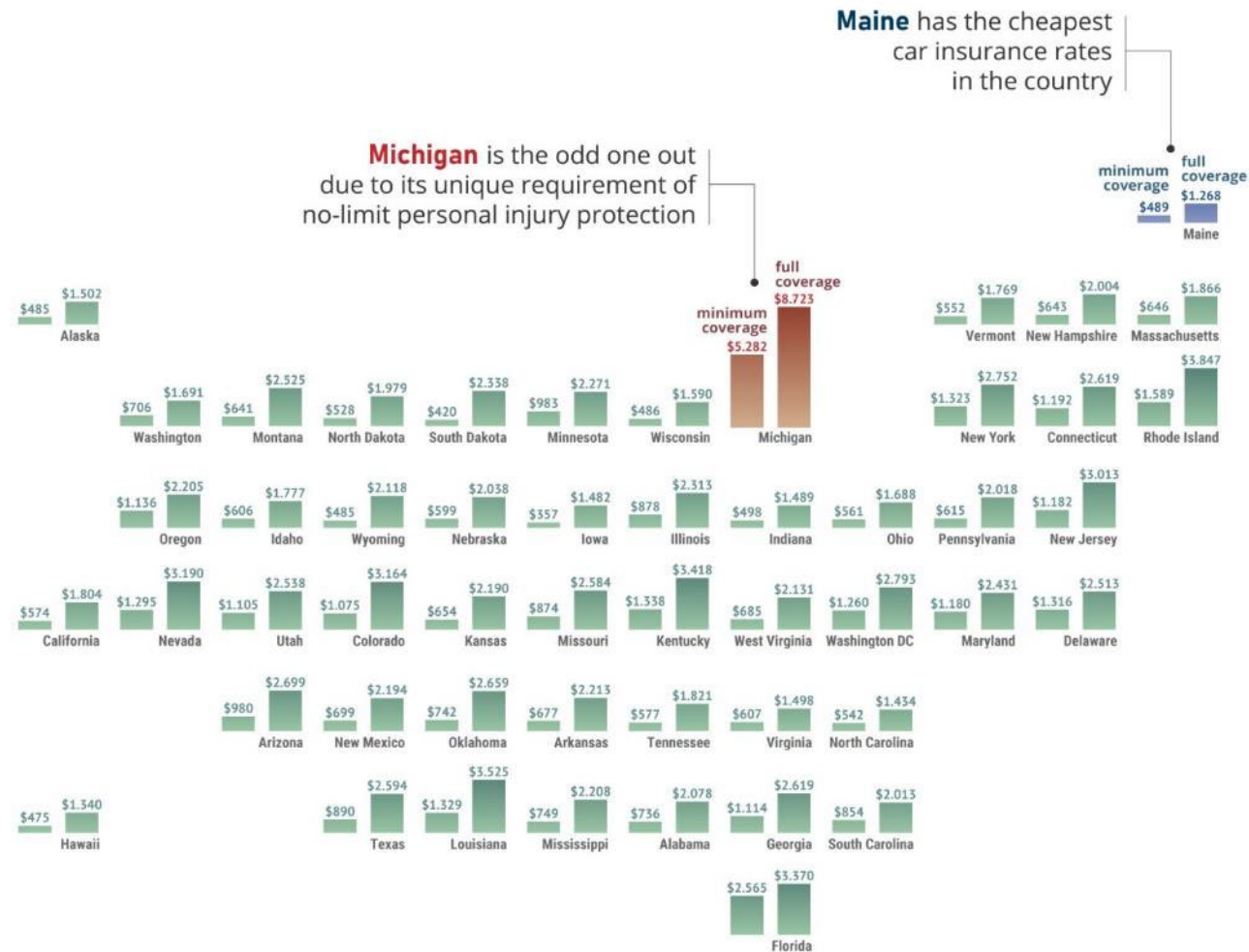


**emphasis**



# The price of security

US car insurance rates vary wildly between states



Source: ValuePenguin, Average cost of car insurance (2020)  
<https://www.valuepenguin.com/average-cost-of-insurance>

A #MakeoverMonday visualization  
by Koen Van den Eeckhout (@koen\_vde)



## HOW SUBSTANCE ABUSE EFFECTS SOUTH AFRICA

The South African Depression & Anxiety Group (SADAG) take a look at the deadly influence of substance abuse in every day South African life

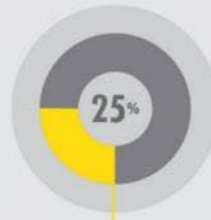
### A crisis in South Africa

Substance Abuse in South Africa is increasing. Alcohol, marijuana (dagga), cocaine, tik and heroin are some of the most frequently used substances in the country. South Africa has also become a key area for in international drug trafficking networks, and up to 60% of crimes committed involve the use of substances

#### SUBSTANCE ABUSE IN PERCENTAGES



The alcohol-related deaths of female youth in South Africa



The prevalence of DUI amongst youth in South Africa by 2011



School learners in South Africa who engage in underage drinking



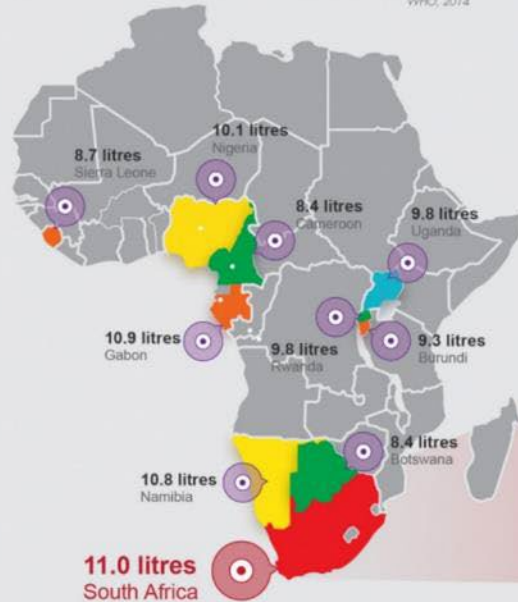
Crimes in South Africa that are directly related to substance abuse



The alcohol-related deaths of male youth in South Africa

#### PURE ALCOHOL CONSUMPTION PER COUNTRY IN 2010

WHO, 2014



USA

SOUTH AFRICA

THE RATE OF FETAL ALCOHOL SYNDROME IN SOUTH AFRICA IS 5x THAT OF THE USA

Main crisis areas | Northern Cape & Western Cape

#### RISK AREAS

182 000

Estimated illegal shebeens in SA

7000

Deaths per year caused by DUI

2x

Drug consumption in South Africa is twice the world norm

4 to 1

Men receiving AA treatment in relation to women

Design

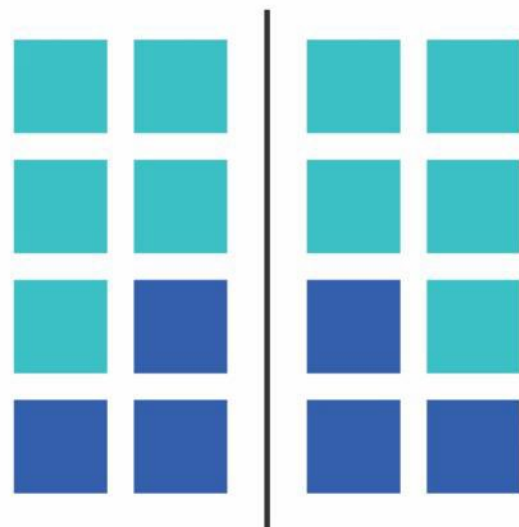
Simphiwe Xulu  
@Mr\_MediaX

Sources

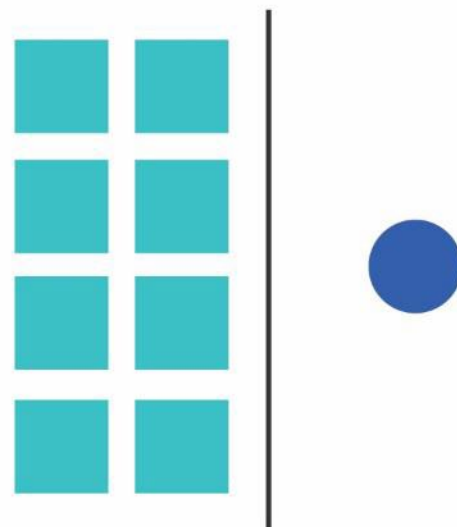
www.Sadag.org  
www.FreeVectorMaps.com

References

CDA, 2011  
MRC, 2008  
SAPS, 2011  
YRBS, 2008  
WHO, 2014  
WHO, 2011



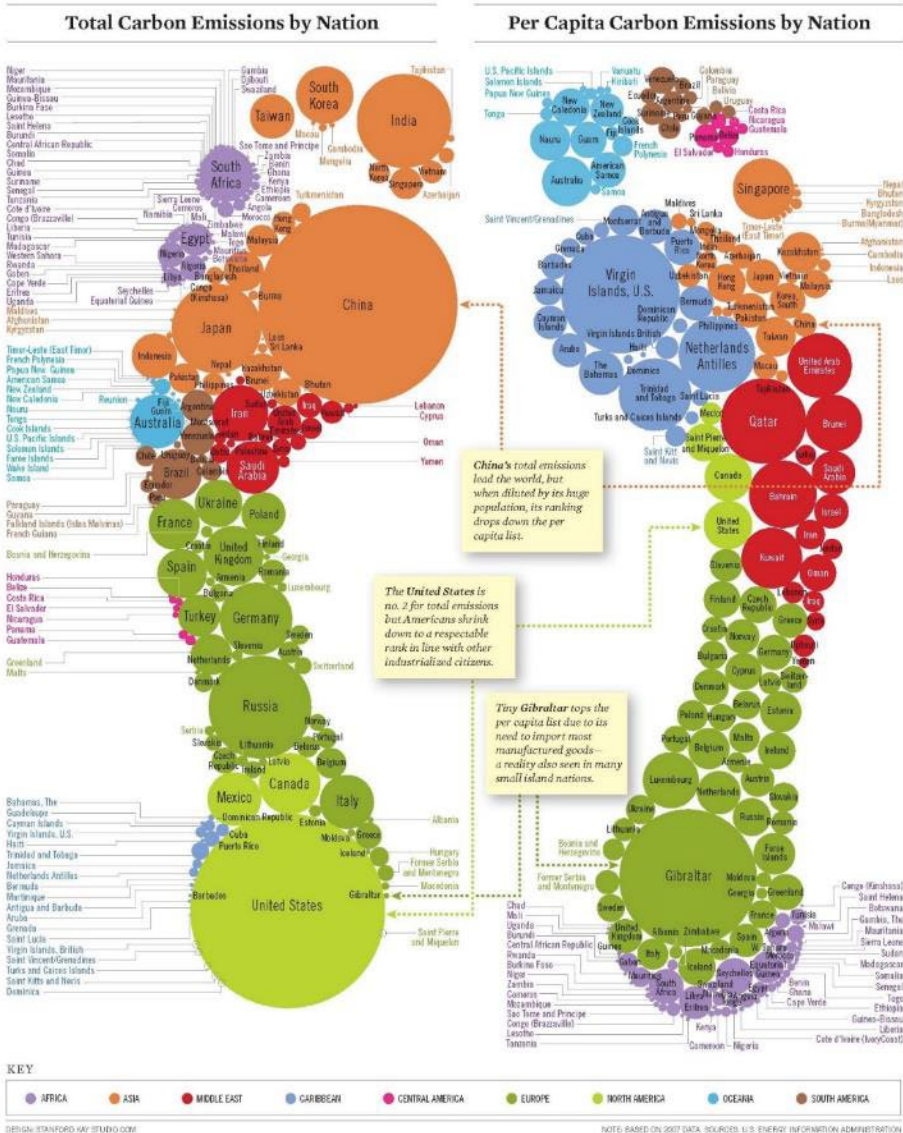
**symmetry**



**asymmetry**

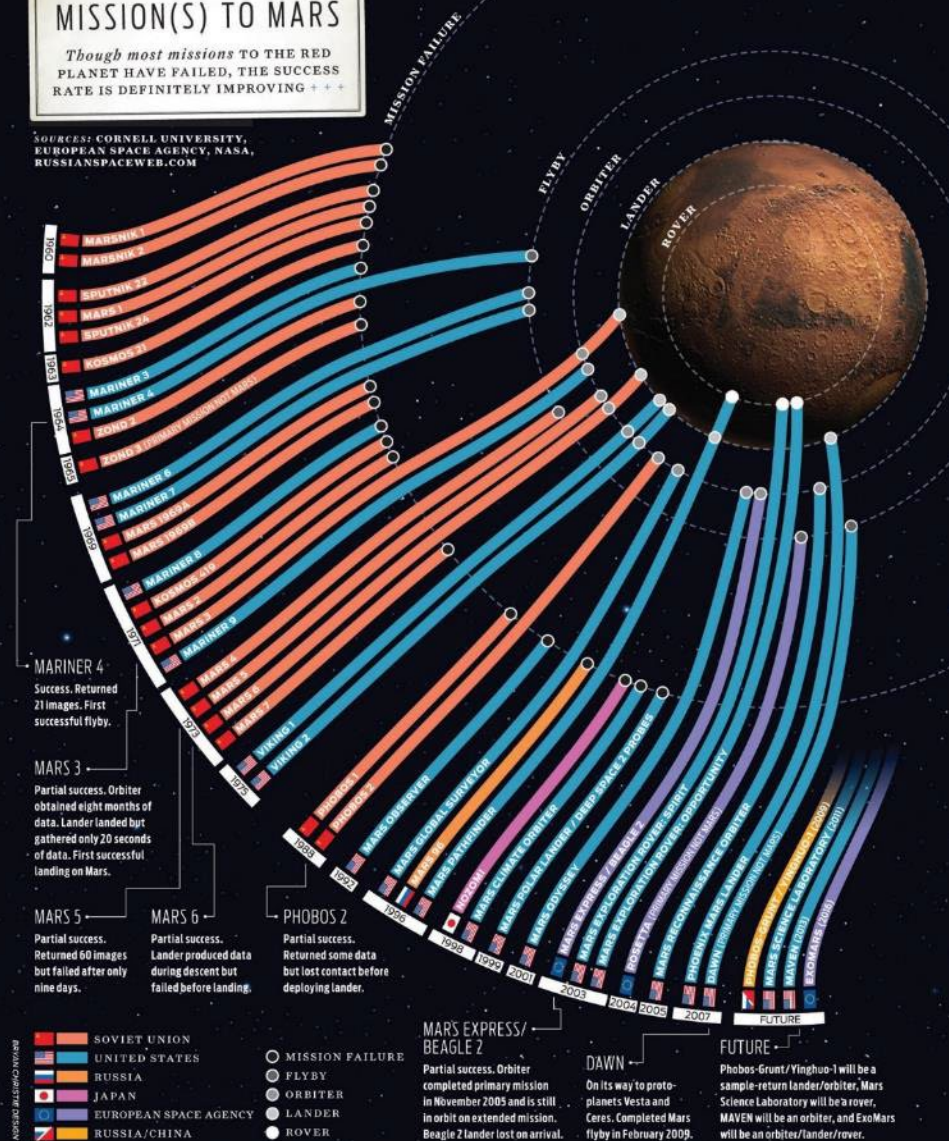
# Tracking Carbon Emissions

A footprint comparison of total carbon dioxide emissions by nation and per capita shows there's plenty of room for smaller countries to reduce their carbon footprints.  
By Stanford Kay



*Though most missions TO THE RED PLANET HAVE FAILED, THE SUCCESS RATE IS DEFINITELY IMPROVING + + +*

**SOURCES:** CORNELL UNIVERSITY,  
EUROPEAN SPACE AGENCY, NASA,  
RUSSIANSPACEWEB.COM





# 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

**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.

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

**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.

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

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

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

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**

**SHANWICK OCEANIC CONTROL AREA**

**GANDER OCEANIC CONTROL AREA**

**WESTBOUND (DAY)**

**EASTBOUND (NIGHT)**

**30°W**

**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.

**UNITED KINGDOM**  
Prestwick  
Shannon

**IRELAND**

**ICELAND**

**GREENLAND**

**CANADA**  
Gander  
NEWFOUNDLAND

**JET STREAM**

**NORTH ATLANTIC OCEAN**

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.

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

### 3 POSITION CHECK

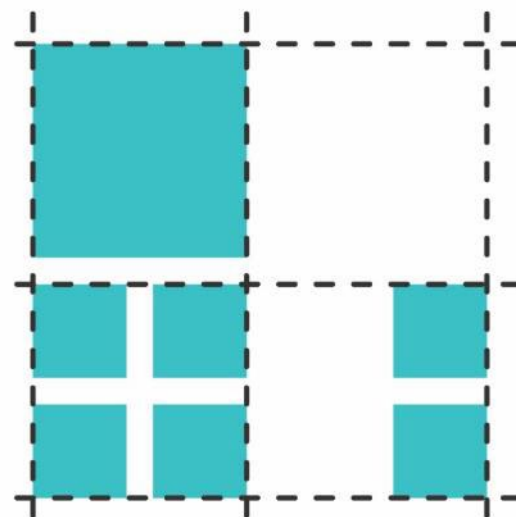
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## EAST INTO THE NIGHT

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alignment

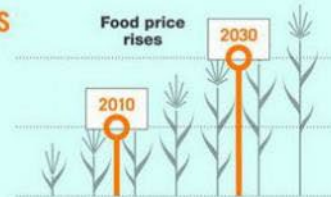


# WHAT'S WRONG WITH OUR FOOD SYSTEM?

Every night **1 in 7 people go to bed hungry**—that's almost 1 billion people worldwide. People are hungry not because there isn't enough food produced but because our food system is broken. In fact, **80% of the world's hungry are directly involved in food production**. We can address this hunger if we support small-scale food producers, tackle climate change and reduce food waste.

## CLIMATE CHANGE & FOOD PRICES

The average **price of staple foods could more than double by 2030**—with more than half of that increase due to changes in average temperatures and rainfall patterns.



## HIGH TEMPERATURES

In July 2010, temperatures exceeded 40°C (104°F) in Russia, destroying millions of acres of wheat. Wheat **production plunged 30%** and the **price internationally increased by 85%**.



## DROUGHT

In 2010, a drought in Ukraine caused wheat **production to plummet 20%** compared to the year before.



## MONSOON

Heavy rainfall and multiple typhoons hit Southeast Asia in 2011, severely affecting 6% of the region's total rice area and **driving prices up by 30%** in some areas.



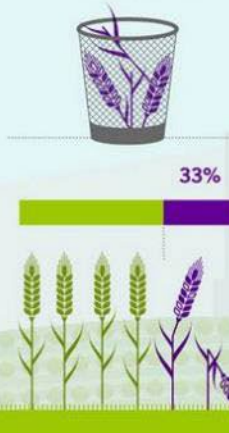
## WASTE

In both industrialized and developing countries, unacceptable quantities of food are wasted but for entirely different reasons.

## HARVEST WASTE

Currently, developing countries waste **nearly one third of food supply**. With better access to adequate storage, refrigeration and transportation this could be reduced.

### DEVELOPING WORLD



## CONSUMER WASTE

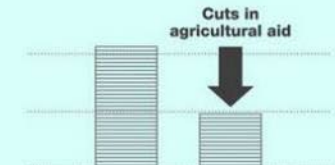
In industrialized countries we, as consumers and retailers, throw away **about one third of all food** that is produced.

### INDUSTRIALIZED WORLD



## HUNGER

There have been **cuts of more than 50% in government aid** to small-scale producers, even though the majority of the world's hungry are involved in food production.



**1 IN 7 ON THE PLANET GO HUNGRY**

**60% OF THE HUNGRY ARE WOMEN**

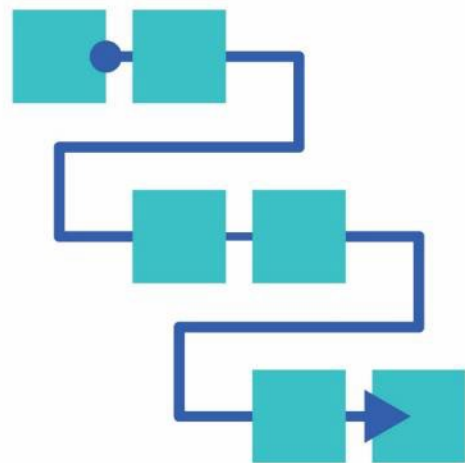
By providing women with equal access to farming resources such as **tools, seeds and transport**

**100-150 MILLION COULD HAVE ENOUGH TO EAT**

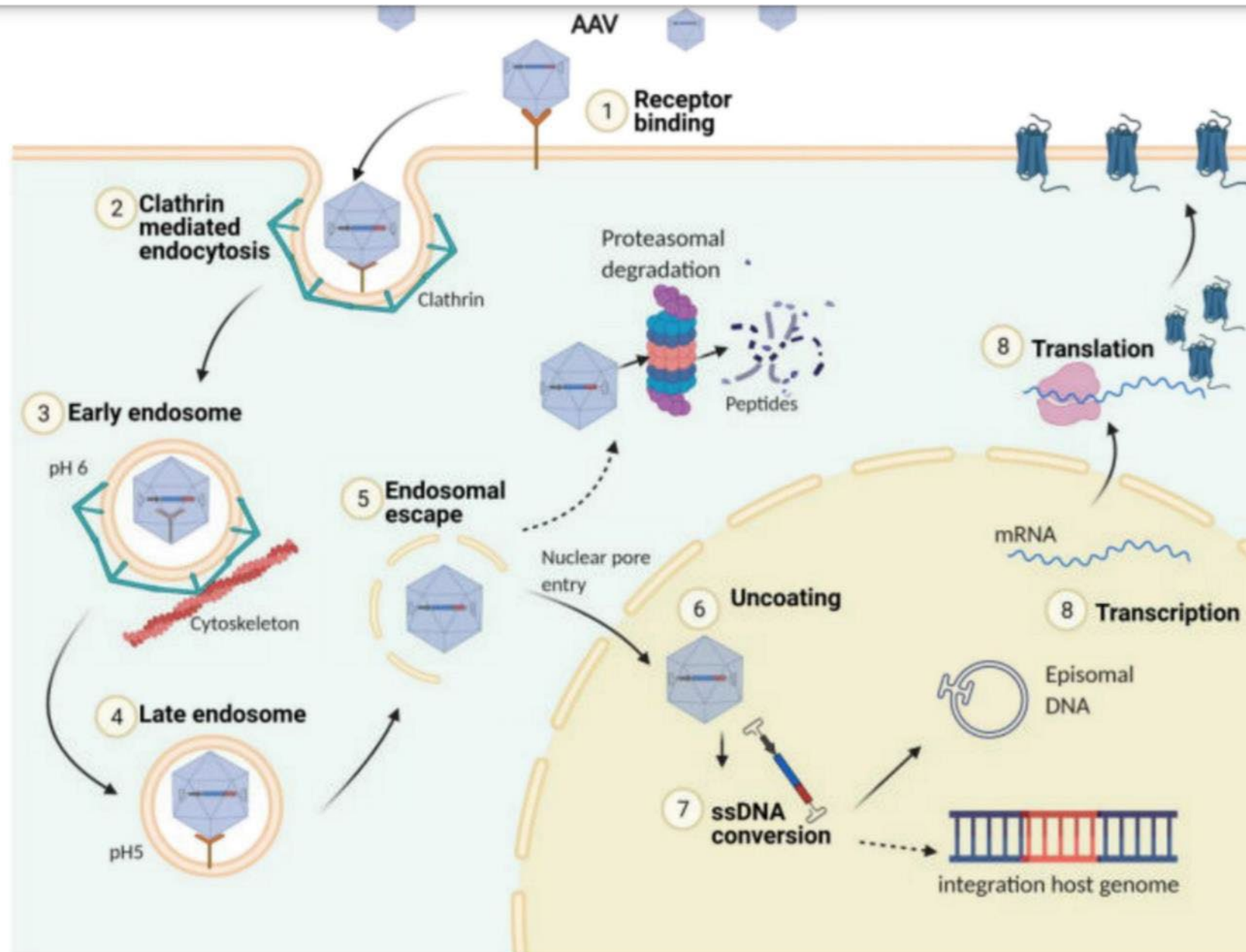
## CHANGE CAN HAPPEN

By investing in small-scale farmers, Brazil reduced the number of people living in poverty by 20 million between 2003-9. We can tackle extreme hunger by helping small-scale producers grow more food more sustainably.

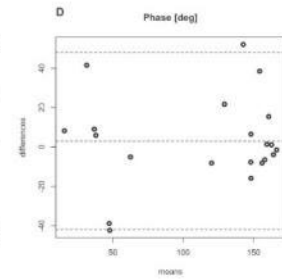
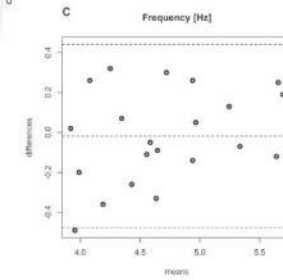
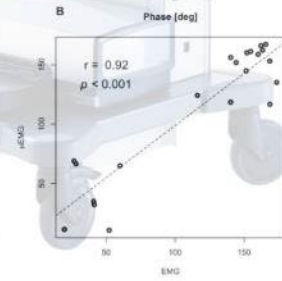
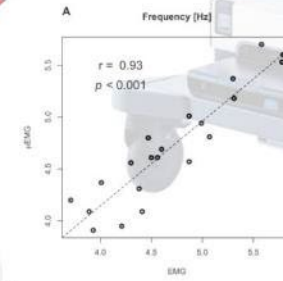
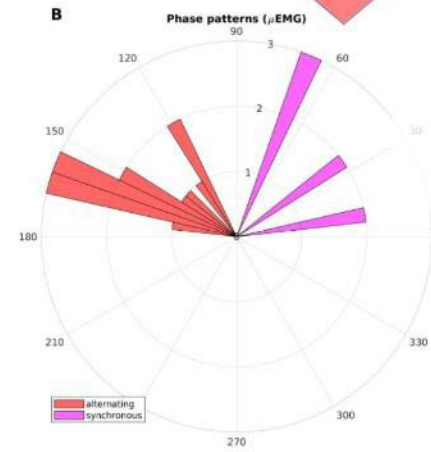
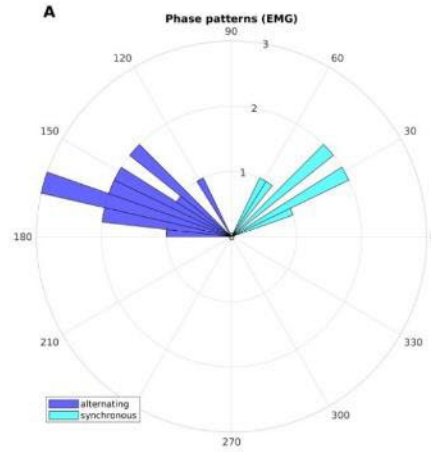
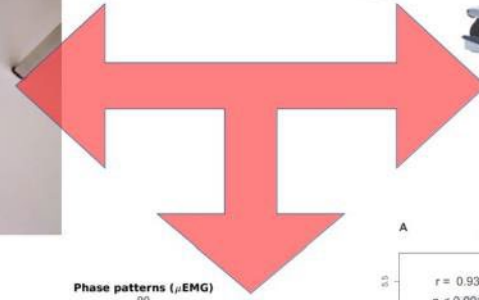
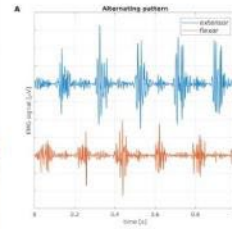


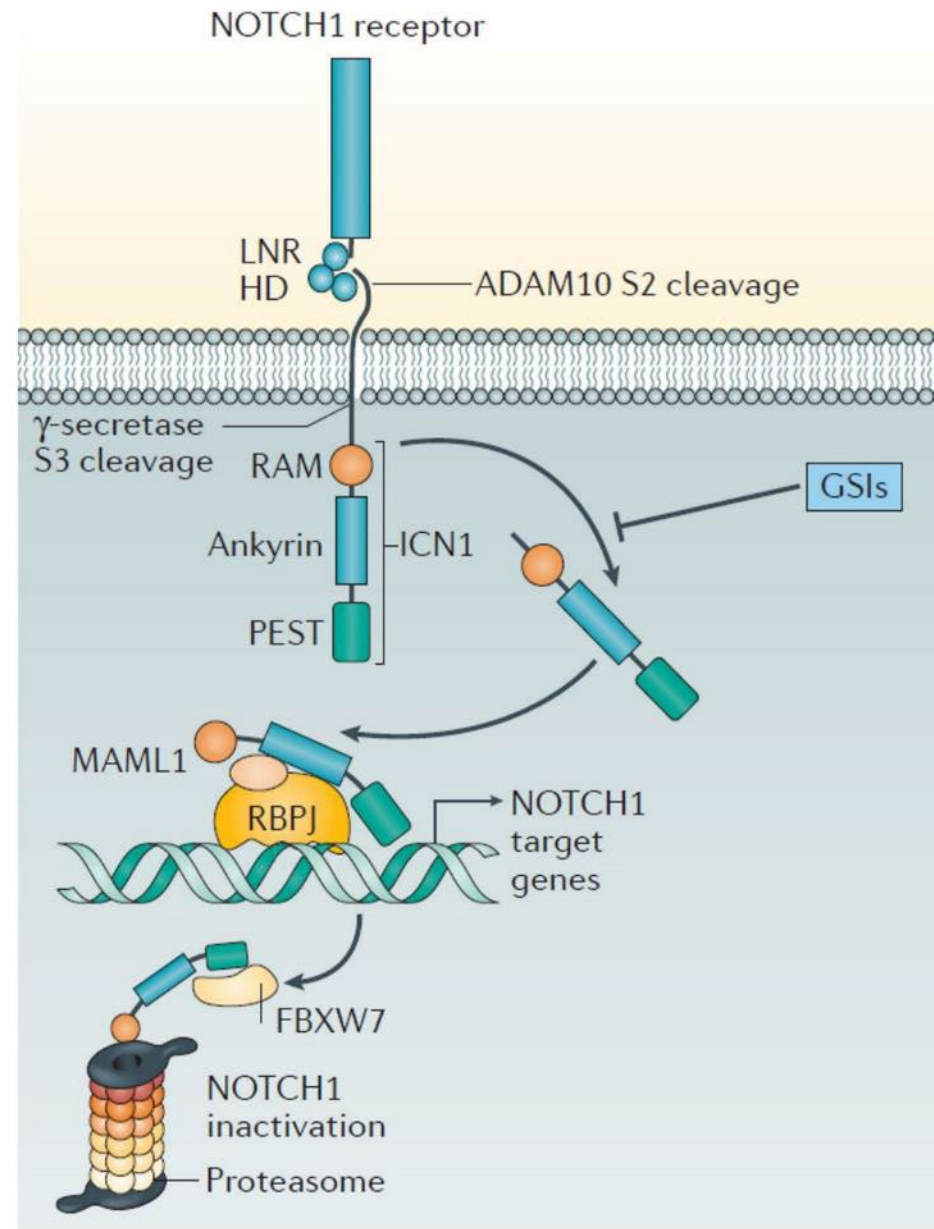


flow













**hierarchy**

## Senza catena

Trek District Bike: al posto della catena monta una cinghia in fibra di carbonio. 715 euro © [trekbikes.com](http://trekbikes.com)

**Pieghevole**

Ma Urr: una bici pieghevole con ruote da 16" e freno posteriore a pedale.  
450 euro • [dabon.com](http://dabon.com)



### Luci nel telaio

Da un progetto di Bortolani e Righi, la Plus Bike: il telaio incorpora i fari anteriori e posteriori. [www.devetasai.it](http://www.devetasai.it)



Artigianato italiano

Modello Fuga di Abici,  
prodotta artigianalmente in  
Italia, ricorda le bici da pista  
950 euro • [abici-italia.it](http://abici-italia.it)



"Bike sharing" e investimenti per le piste ciclabili, integrazioni con autobus e metropolitane e domeniche chiuse al traffico: si moltiplicano nel mondo le iniziative per promuovere l'uso della bicicletta. Un mezzo di trasporto ecologico, economico e "city friendly". Insomma, il mezzo del futuro

–  **Francesco Franchi**

**QUE ROUTE RADDOPPIANO LE QUATTRO**

La produzione mondiale di biciclette ha toccato quota 130 milioni nel 2007: più del doppio rispetto ai 52 milioni di auto immesse sul mercato. Il boom registrato dopo il 2004 è in parte dovuto alla crescente domanda di bici elettriche



**28,1 metri:** è quanto misura la bici più lunga del mondo

## BIANCHI, ATALA, BOTTECCHIA, COLNAGO

Nella classifica dei maggiori produttori mondiali di biciclette l'Italia si piazza alle spalle di Cina e Taiwan: due colossi che riforniscono i mercati di mezzo globo. I maggiori importatori sono gli Stati Uniti



**MADE IN ITALY A MARCIA INDIETRO**

Nonostante i trend mondiali di crescita generale, in Italia la produzione di biciclette è andata calando negli anni



**PEDALA RAGAZZO, PEDALA**

In Italia la metà delle bici prodotte è costituita da modelli da bambino. Le mountain bike rappresentano un quarto degli ordini



**SUL SELINO CHE NOI PORTIAMO**

Oltre al prodotto finito, il nostro Paese produce anche molti componenti per biciclette. I pezzi più esportati (per valore commerciale) sono cambi, selle e cerchi.





**METITI CALVEARE SUL GAGLIARDETTO**  
Le api sono simbolo di operosità e delicatezza. Per questo compaiono in molti stemmi, dal più famoso, quello della famiglia Barberis, a più piccoli e poco conosciuti comuni italiani.



**FAMIGLIA BARBERIS**  
- Tre api fanno capolino dallo stemma della famiglia di papa Urbano VIII.



**COMUNE DI BRENTA (NO)**  
- In questo stemma le api simboleggiano le ricche e fiorenti industrie della zona.



**COMUNE DI CASTEL MAGGIORE (NO)**  
- Celebra la laboriosità dei propri abitanti. Nell'antichità napoletana le tre api d'oro raffigurano le città.



**COMUNE DI CONERO (VA)**  
- Il lavoro si basa su un'ambiente fruttuoso. Nella zona si produceva un miele millesimo profumato.



**COMUNE DI OFFLAGA (BO)**  
- Insieme all'ape, laboriosa e fedele, le tre vigne della Trinità, o dei tre territori del Comune.



**FRAGIONE DI AVERSA (AV)**  
- È una frangente della città di Avversa. Il nome deriva dal termine dialettale "ave" (ape, in verità).



**PROVINCIA DI TIRRENI**  
- L'ape è la richiama del territorio, le api la laboriosa comunità provinciale.

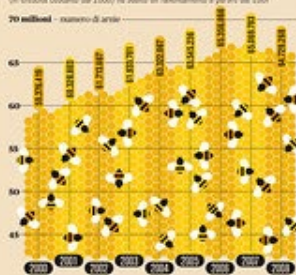
# Se le api non volano

Da anni continuano a diminuire. Vari i motivi (ipotetici, finora): parassiti, pesticidi, cambiamenti climatici. Eppure, dall'impollinazione (di cui sono vettori) dipende il 76 per cento della produzione alimentare europea. Il parlamento di Bruxelles ha votato una risoluzione per tutelarne la salute. E arriveranno un po' di fondi in più

di Sara Deganello, Francesco Franchi, Roberta Giacconi | Illustrazioni di Francesco Muzzi

## QUANDO COMINCIA A RINZARE MENO

Secondo gli ultimi dati Fao, il numero delle colonie di api nel mondo (in crescita costante dal 2000) ha subito un rallentamento a partire dal 2007.



## TUTTI GLI ATTORI DELL'ALVEARE

**A** - Nella colonia di Ape mellifera il solo l'ape regina ad accoppiarsi: in un unico nido regina incuba diversi maschi (il fuchi) di altri alvari e ne raccoglie le spermatozoi. **B** - Il fuchi muore dopo l'accoppiamento con la regina oppure perché le api operai non lo nutrono più. **C** - Le operai nutrono i maschi (danno da mangiare alle larve), crescono e si riproducono (influenzano e proteggono l'alveare) e muoiono naturalmente (dopo aver raccolto nettare, polline, acqua, miele).

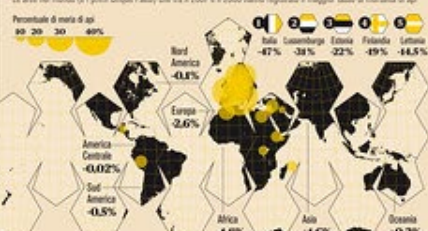


## PERCHÉ MUOIONO. ECCO LE IPOTESI

- 1. PARASSITI**  
Ad esempio varroa e noema.
- 2. OGM**  
Una tesi molto controversa.
- 3. PESTICIDI**  
Specialmente i neonicotinoidi.
- 4. BIODIVERSITÀ**  
Si impoverisce l'habitat.
- 5. CLIMA**  
Stress da cambiamento.

## DOVE MANCANO DI PIÙ NEL MONDO

La serie nel mondo (in i paesi cinque Paesi) che tra il 2007 e il 2008 hanno registrato il maggior tasso di mortalità di api.



## IL FRUTTO DELL'ALVEARE

I prodotti dell'apicoltura: produzione mondiale di miele e cera negli ultimi anni.



## DOVE MANCANO DI PIÙ IN EUROPA

Il tasso di mortalità delle api ha toccato l'apice (20-25%) in anni diversi nei vari Paesi. I paesi a essere interessati dal fenomeno: Svizzera, Austria, Germania, Svezia, Finlandia.

## GERMANIA E SCANDINAVIA, CASO PER CASO

Andamento della moria di colonie in alcuni tra gli Stati europei più colpiti.



## L'EUROPA SI INTERROGA SUI DIRITTI DELLE API

«Salviamo le api». La richiesta, più sostenuta a gran voce dagli apicoltori di tutto il mondo, è stata raccolta anche da Parlamento e Commissione europea. Da quando cinque anni fa negli Usa alcuni apicoltori aprirono gli alvari e lì trovarono vuoti, non c'è stato miglioramento. «Nel 2010 ci sono state perdite in 100 le 1.000 volte più rapide del normale», si legge nella risoluzione approvata a novembre dal parlamento di Bruxelles. Il testo (con il voto delle api) chiede di aumentare i fondi all'apicoltura e di migliorare la ricerca sulle cause della scomparsa, creando anche osservatori nazionali nei paesi. La Commissione ha accolto subito l'iniziativa. Ma

## IMPOLLINAZIONE DEI VEGETALI

Non tutti trasportano il polline dall'equivalente maschile a quello femminile di fiori e piante: scordali (A), mosto (B), papaveri (C), erica, acqua, piccoli animali, esseri umani.

## I PADRONI DELL'ARNIA

I Paesi europei con il numero maggiore di apicoltori dichiarati (Germania, Francia, Italia, Repubblica Ceca, Regno Unito) e il totale ES. I dati sono confrontati negli anni.

## CHIEDI AGLI APICOLTORI

I dati sono dichiarati dagli stessi interessati e non sono considerati molto attendibili.



## ARRIVANO I FONDI EUROPEI

I cinque Paesi con il maggior budget (in milioni di euro) destinato all'apicoltura e il totale europeo.



## QUANTE PIANTE DIPENDENTI

Quanto incide l'impollinazione delle api sulla riproduzione delle piante? Molte. A destra le specie più dipendenti dagli insetti.



## INTERVISTA

## Investiamo per studiare la moria

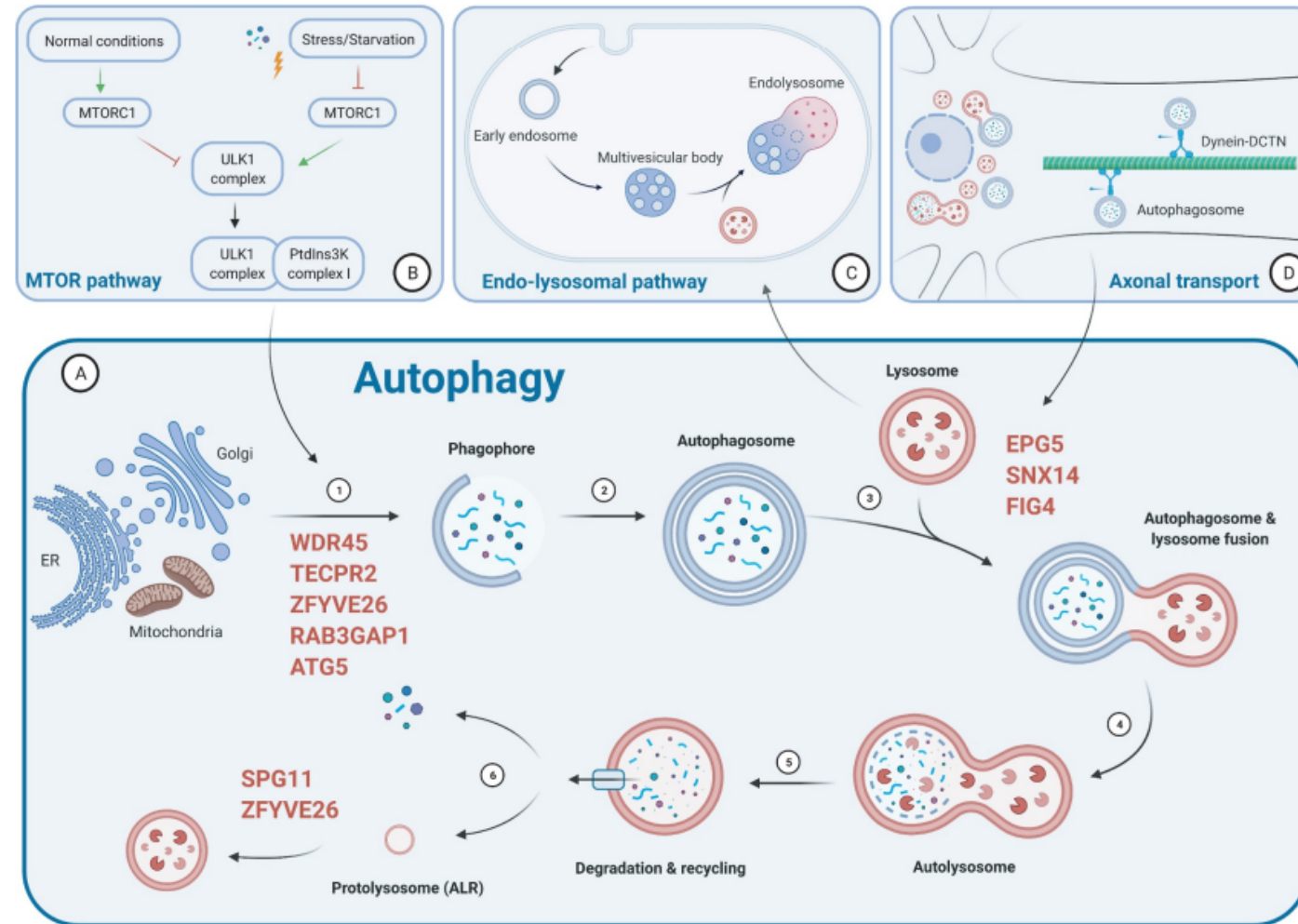
Parla l'ex ministro Paolo De Castro, relatore della risoluzione europea sull'apicoltura.

**Perché muoiono le api?**  
«Non lo sappiamo con certezza. È un fenomeno che colpisce Paesi con situazioni diverse. Cosa spera di ottenere con la sua risoluzione?»  
«Portare l'attenzione sul problema. Le api, oltre a produrre il miele, sono fondamentali per l'impollinazione da cui dipende il 76 per cento della produzione alimentare europea. Inoltre sono un indicatore ambientale. Se muoiono, vuol dire che ci dobbiamo preoccupare».  
**Perché sono aumentati i fondi al settore nonostante le api diminuiscano?**  
«Per permettere indagini più approfondite sulle cause della moria. Io già da ministro dell'Agricoltura inserii nella finanziaria 2008 un investimento da 2 milioni di euro per le api».

**Paolo De Castro** - Eurodeputato socialista, è l'autore della risoluzione europea sull'apicoltura. Agronomo e figlio di imprenditori agricoli, è stato ministro delle Politiche agricole nel secondo governo Prodi.

40 km/h è la velocità massima dichiarata di un'Ape 50 della Piaggio a pianale lungo

FONTE: Faostat, Admory Group della Commissione Europea sul programma per l'apicoltura, EFSA - European Food Safety Authority



**Figure 1.** The autophagy pathway and its relation to other intracellular regulatory and trafficking pathways. **(A)** Schematic representation of the autophagy pathway and the key steps involved, ranging from phagophore formation utilizing lipid membranes from various donor compartments (such as ER, Golgi and mitochondria), autophagosome formation, autolysosomal fusion and cargo degradation, and, finally, autophagic lysosomal reformation (ALR). Gene mutations can disturb any (and often multiple) part(s) of the complex autophagic machinery; the proteins most commonly implicated in the congenital disorders of autophagy are indicated in red, in relation to the part of the autophagy pathway affected. Close relations to the MTOR pathway **(B)**, the endo-lysosomal pathway **(C)** and (neuronal) axonal transport **(D)** emphasize that any genetic defect primarily affecting these intricately linked cellular processes may cause clinical presentations very similar to those concerning the primary autophagy machinery. Along similar lines, primary disturbances of other cellular processes and structures essential for the normal functioning of autophagy (for example, disturbances of lipid metabolism affecting the membrane sources required for phagophore formation, or of the glycosylation of autophagy proteins) may have similar biological and clinical consequences. Figure created with BioRender.com.

# Design principles

similarity

emphasis

(a)symmetry

alignment

flow

hierarchy

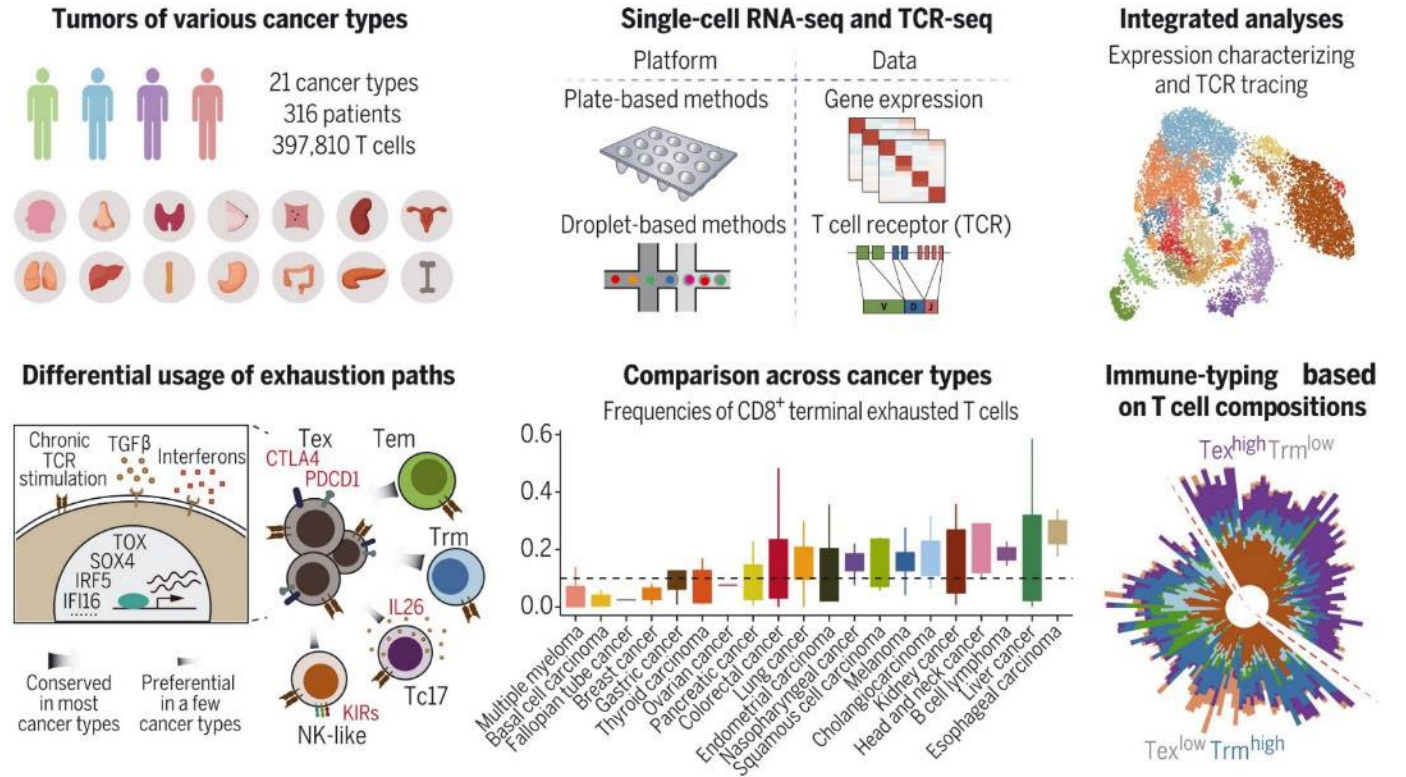


# Improving a visual

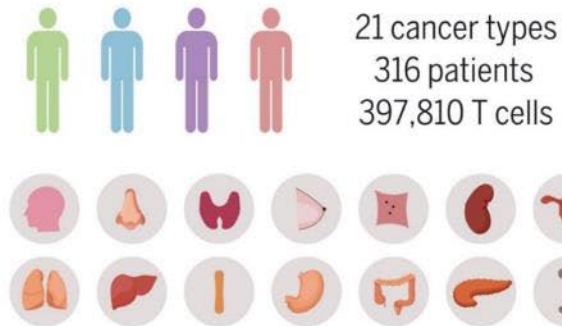
## Group exercise

Write down what you **don't like** about this visual

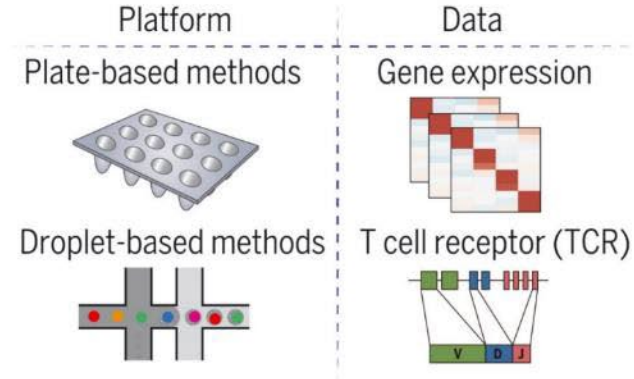
## What would you change to **improve** it?



## Tumors of various cancer types

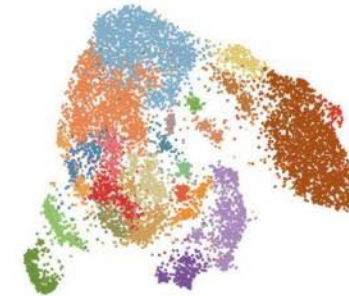


## Single-cell RNA-seq and TCR-seq

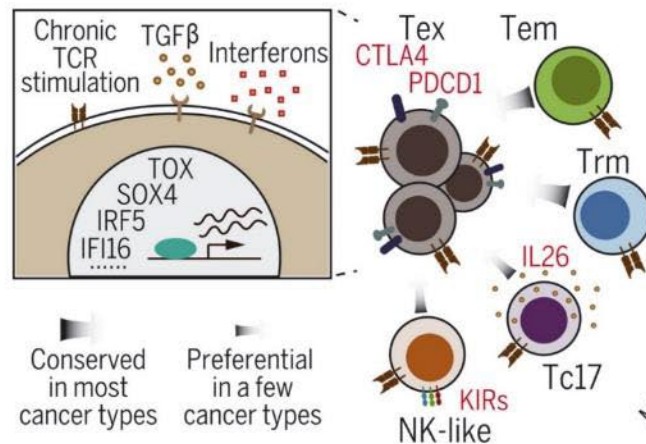


## Integrated analyses

Expression characterizing  
and TCR tracing

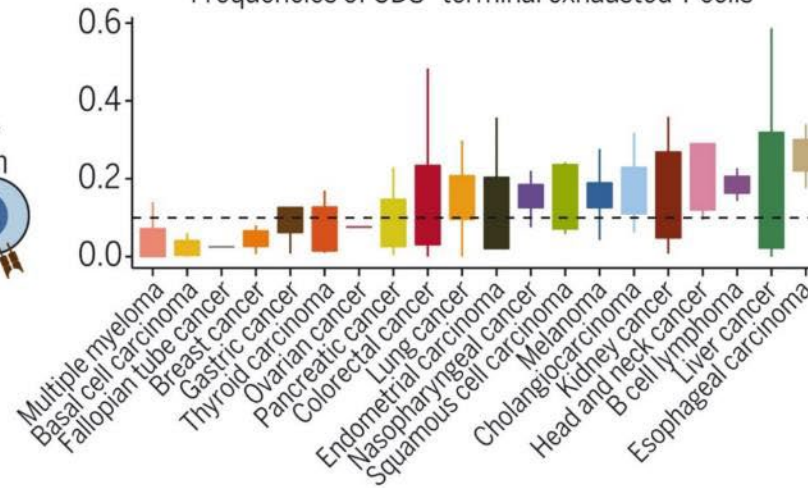


## Differential usage of exhaustion paths

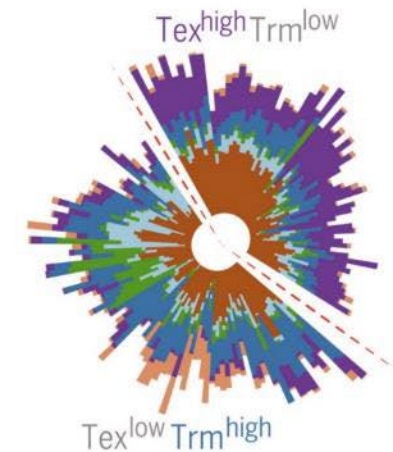


## Comparison across cancer types

Frequencies of CD8<sup>+</sup> terminal exhausted T cells



## Immune-typing based on T cell compositions



# Workflow

identify your story

**check the requirements**

sketch your concept

design


Graphical abstract

× +

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### Specifications:

A graphical abstract should be a one-image file and should visualize one process or make one point clear. For ease of browsing, the graphical abstract should have a clear start and end, preferably "reading" from top to bottom or left to right. Try to reduce distracting and cluttering elements as much as possible.

- Image size: Please provide an image with a minimum of 531 x 1328 pixels (h x w) using a minimum resolution of 300 dpi. If you are submitting a larger image then please use the same ratio (200 high x 500 wide). Please note that your image will be scaled proportionally to fit in the available window on ScienceDirect; a 500 by 200 pixel rectangle.
- Font: Please use Times, Arial, Courier or Symbol font with a large enough font size as the image will be reduced in size for the Table of Contents to fit a window of 200 pixels high.
- File type: preferred file types are TIFF, EPS, PDF or MS Office files.
- No additional text, outline or synopsis should be included. Any text or label must be part of the image file. Please do not use unnecessary white space or a heading "graphical abstract" within the image file.

⬆️

# Workflow

identify your story

check the requirements

**sketch your concept**

design



10 **Accurat** | Giorgia Lupi  
 • Exploring the phenomenon of geniuses and the brain drain

'Drawing plays an important role in the production and communication of knowledge, and in the genesis of new ideas,' says design director Giorgia Lupi, founder of Accurat, an information design agency with offices in Milan and New York. 'In addition, the act of drawing and the fact we choose to stop and draw focuses the attention. When I'm sketching, I always try to find a way to interpret both the single visual elements and the overall composition.'

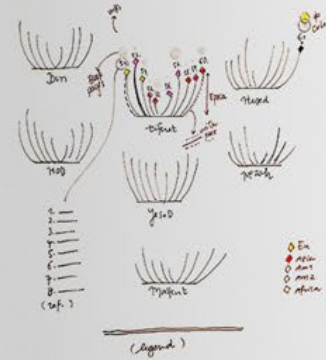
Lupi draws on white paper with Muji black-ink pens. Drawing is her primary expression, a 'functional tool for capturing

and exploring thoughts and exploring ideas towards the production of the final piece'. Her team approaches problems in the way that journalists would, rather than as data analysts, understanding in which contexts they must interpret their data.

When describing *Geniuses, Visualized*, the company's project for *La Lettura*, a magazine supplement in the Italian newspaper *Corriere dello Sport*, Lupi says: 'We aim to deliver rich visual narratives, able to maintain the complexity of the data but still making this complexity more accessible and understandable through the visualization.'

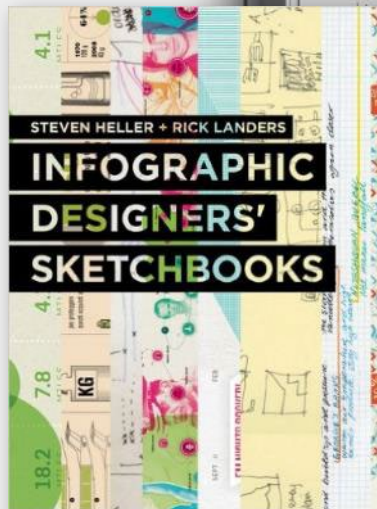
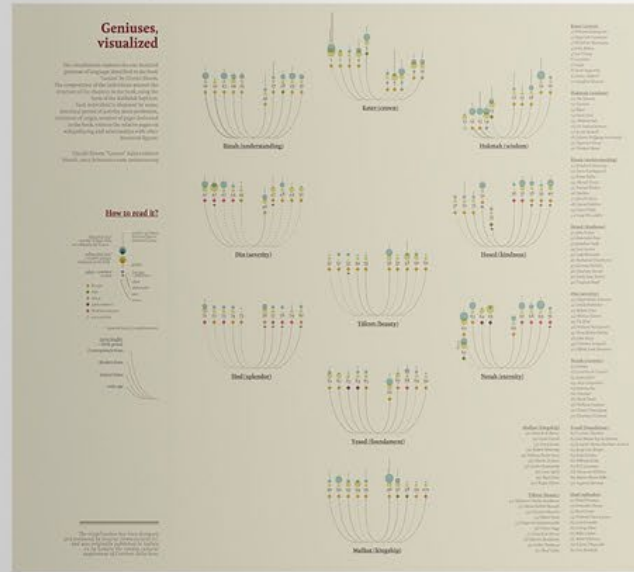
They also provide several layers of exploration on the data set being analysed. 'We call it "non-linear storytelling", Lupi says, 'where people can get lost in singular elements, minor tales and "last-mile" textual elements within the greater visualization.'

Lupi and her team regularly push the boundaries on how to 'compose' data-visualizations that achieve aesthetic beauty and elegance through new visual metaphors, intentionally avoiding the more usual and already tested styles of representation.



**Geniuses, Visualized**  
*La Lettura*, 2012

This infographic looked at the 100 'exemplary creative minds' identified in literary critic Harold Bloom's book *Genius*. Playing off Bloom's use of the Sefirot, the ten emanations of the Kabbalah, to organize the taxonomy of his chosen 'geniuses' of language - from Shakespeare to Lewis Carroll - the visualization depicts the geographic origin, time period and field of each genius, correlated with number of Wikipedia hits and connection to related historical figures.



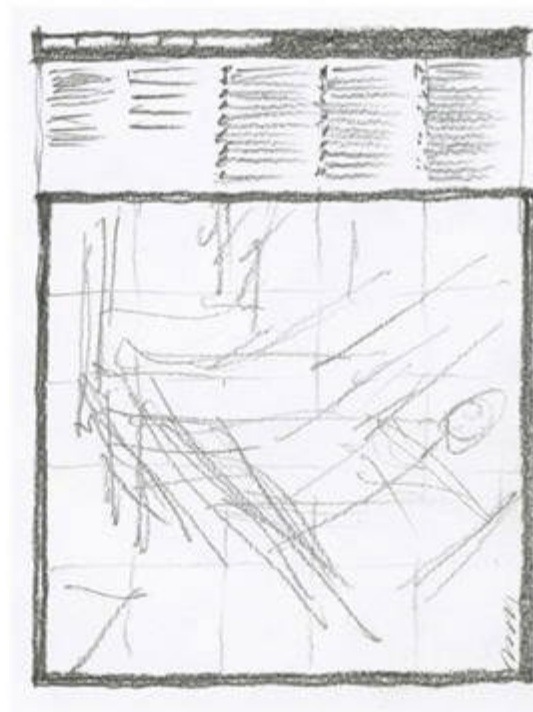
## Massimo Vignelli

- Designing a map that is really a diagram

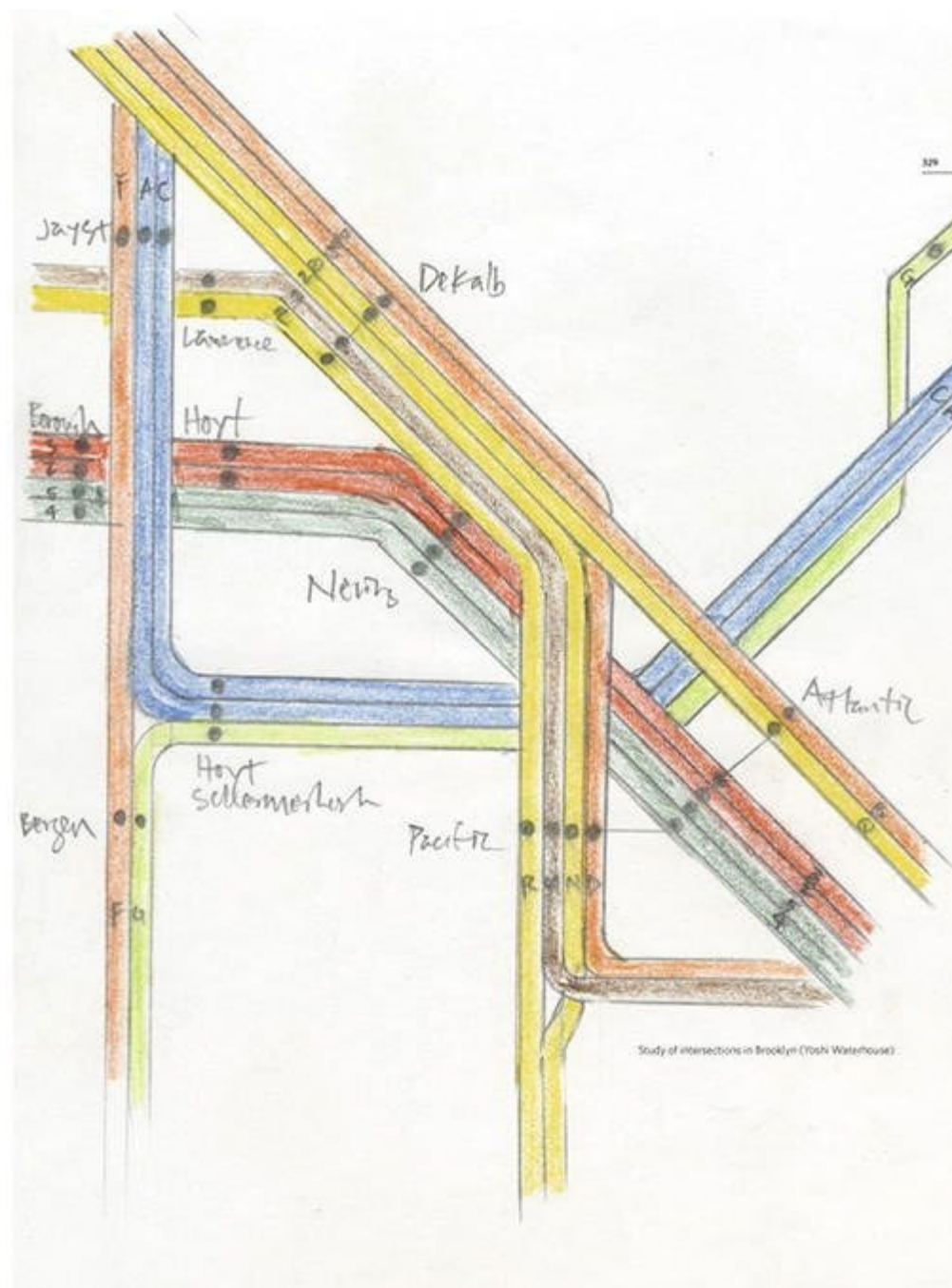
In 1972, Massimo Vignelli designed a diagrammatic for the New York City subway. He replaced the serpentine maze of geographically accurate train routes with simple, bold bands of colour that turned at 45° and 90° angles. Each route was colour-coded, its stops indicated by black dots. To make the map function more effectively, a few geographic liberties were taken, something that didn't sit well with New Yorkers. For instance, the new map showed Central Park as a square; Vignelli reasoned that for people riding underground, the park's rectangular proportions were irrelevant. There are fewer stops along Central Park West than in Midtown, so logic dictated that less map space was required. But New Yorkers wanted their rectangle back, and in 1979 the map was replaced.

As it turned out, that original map of 1972 was ahead of its time; Vignelli's economical format was perfect for web accessibility. In 2010 a new digital iteration, *The Weekender* (these pages), the result of the combined efforts of Vignelli and two associates, Beatriz Ciliaentes and Yoshi Waterhouse, went online. One of their first acts was to re-term the map; it is now a diagram. The design process began the traditional way, using black-and-white and coloured pencils. 'Sketching forces us to concentrate on the details,' Vignelli explains. 'We use the computer to refine details, but the concept is expressed with a 3b Caran d'Ache.'

The team rebuilt the diagram geometry from scratch. 'Based on a grid and a masterplan established in advance,' Vignelli says, 'we analysed the situation and worked to find the most appropriate solution for every station with several connections by discussing and sketching alternatives until we found the best one.'

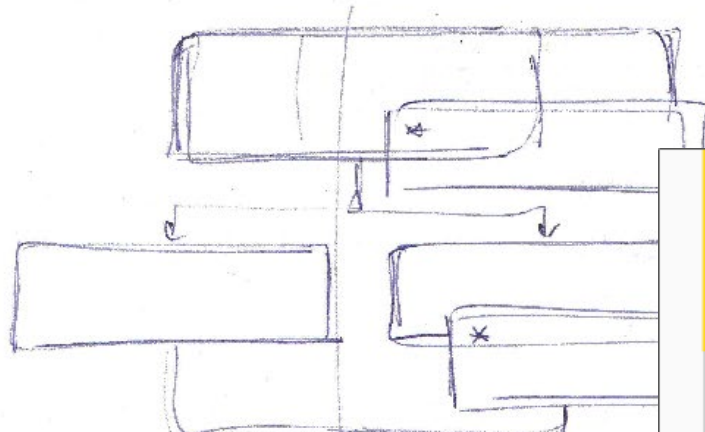


Drawing, final diagram layout with line and legend



Study of intersections in Brooklyn (Yoshi Waterhouse)

# EYnovation billing process



report to core team



HYG

NORMAL FLOW



SET !

## EYnovation billing process

This flow applies to  
punctual interventions  
(PI), subscriptions and  
events organized by a  
SSL, within the scope of  
EYnovation in Flanders.

For questions, contact  
eynovation@be.ey.com



Your task as  
an EYnovator



What the Core  
Team does for you

Estimate and check the required  
number of hours with your  
partner



\* A combination of different  
SSLs is possible. If so, make a  
tailormade division of hours.



**EXTERNAL ACTION:**  
PI: fill out form with startup  
all: charge customer for  
the PI or subscription



**INTERNAL ACTION:**  
Book hours on EYnovation  
dummy code of partner

\* If your partner doesn't have  
an EYnovation dummy code  
yet, inform the Core Team.

Report to the Core Team

Core Team bills quarterly to VLAIO

approval process  
(couple of months)

Core Team gets money from VLAIO



flow for external EY entity

standard flow

Core Team puts money on  
the EYnovation code of  
EYnovation Partner

\* For details, see Excel file  
on pricing for EYnovators

Core Team lets external EY  
entity know for what amount  
they can send an invoice to  
EYnovation Partner

\* Code: XXXXXXB2

internal process  
(pre billing tool)

EYnovation Partner approves

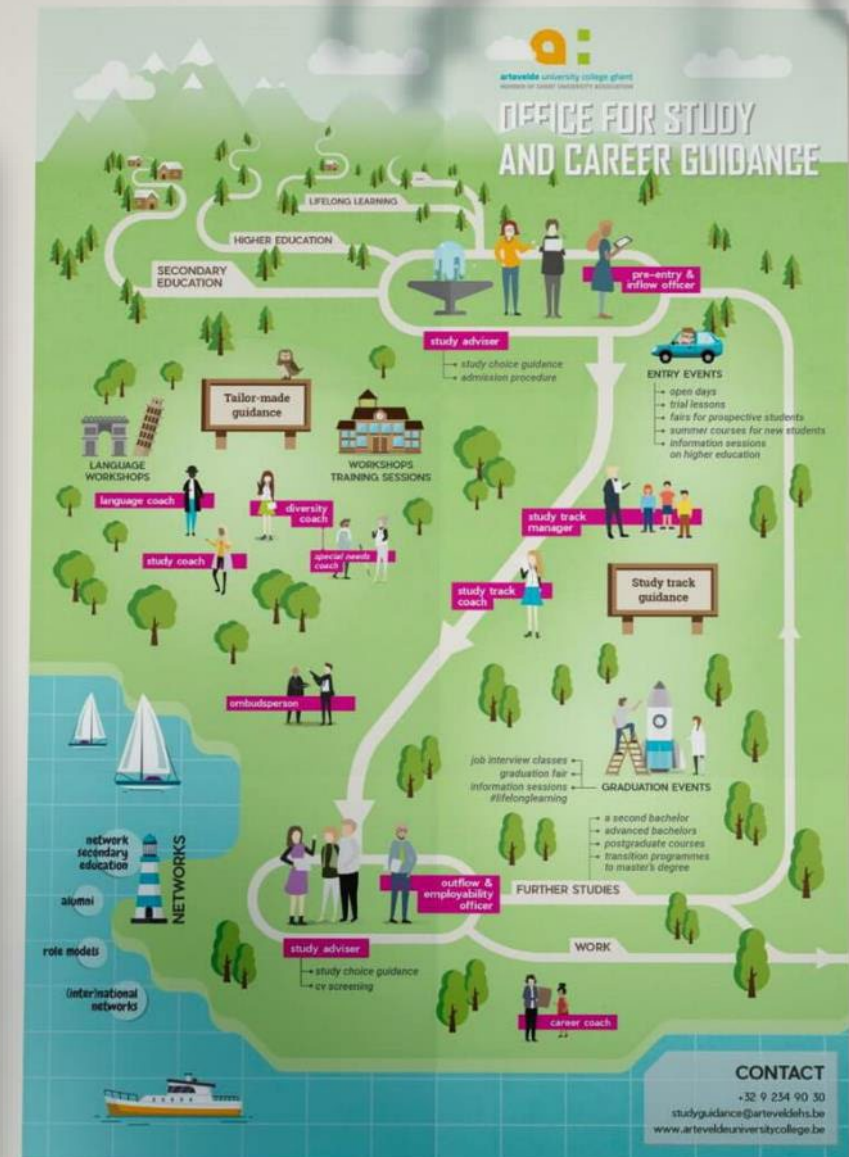
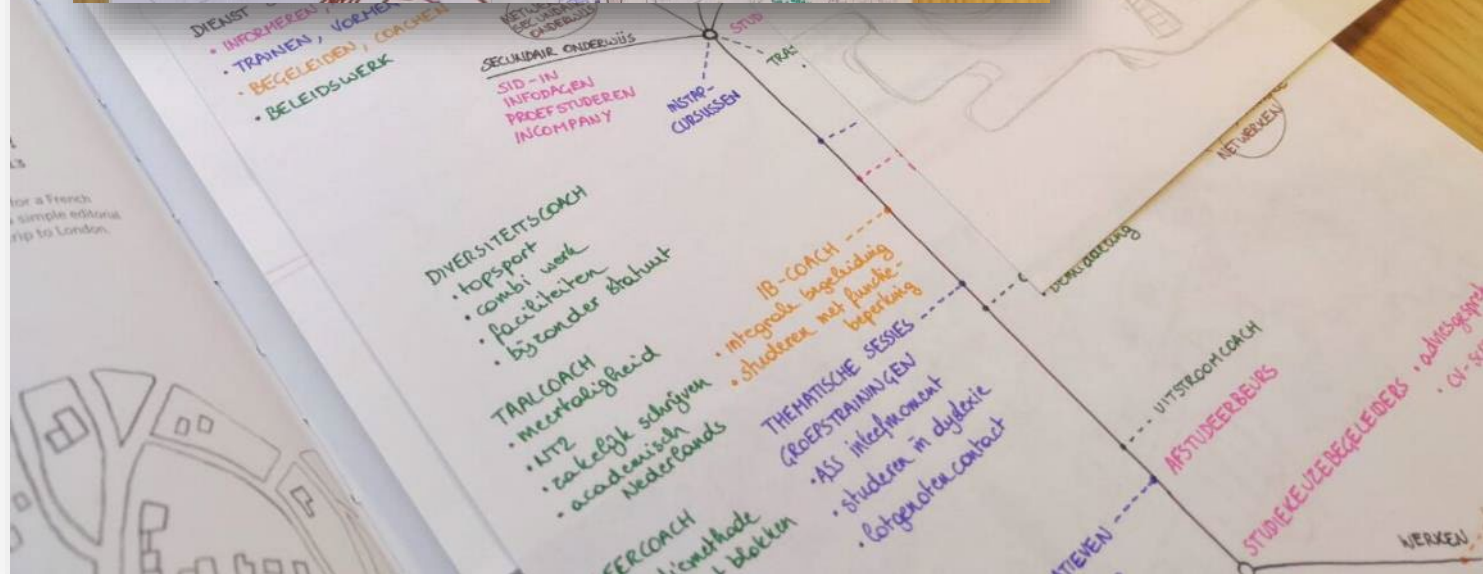
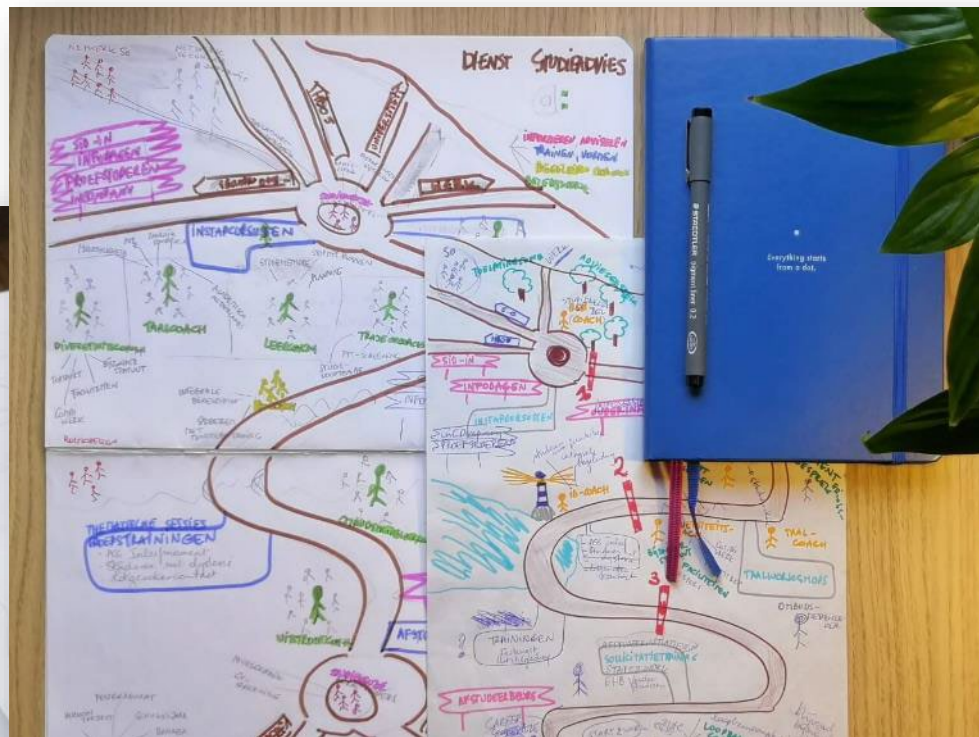
Core Team puts money on  
the SSL partner(s) code(s)

\* For details, see Excel file  
on pricing for EYnovators

You're all set!











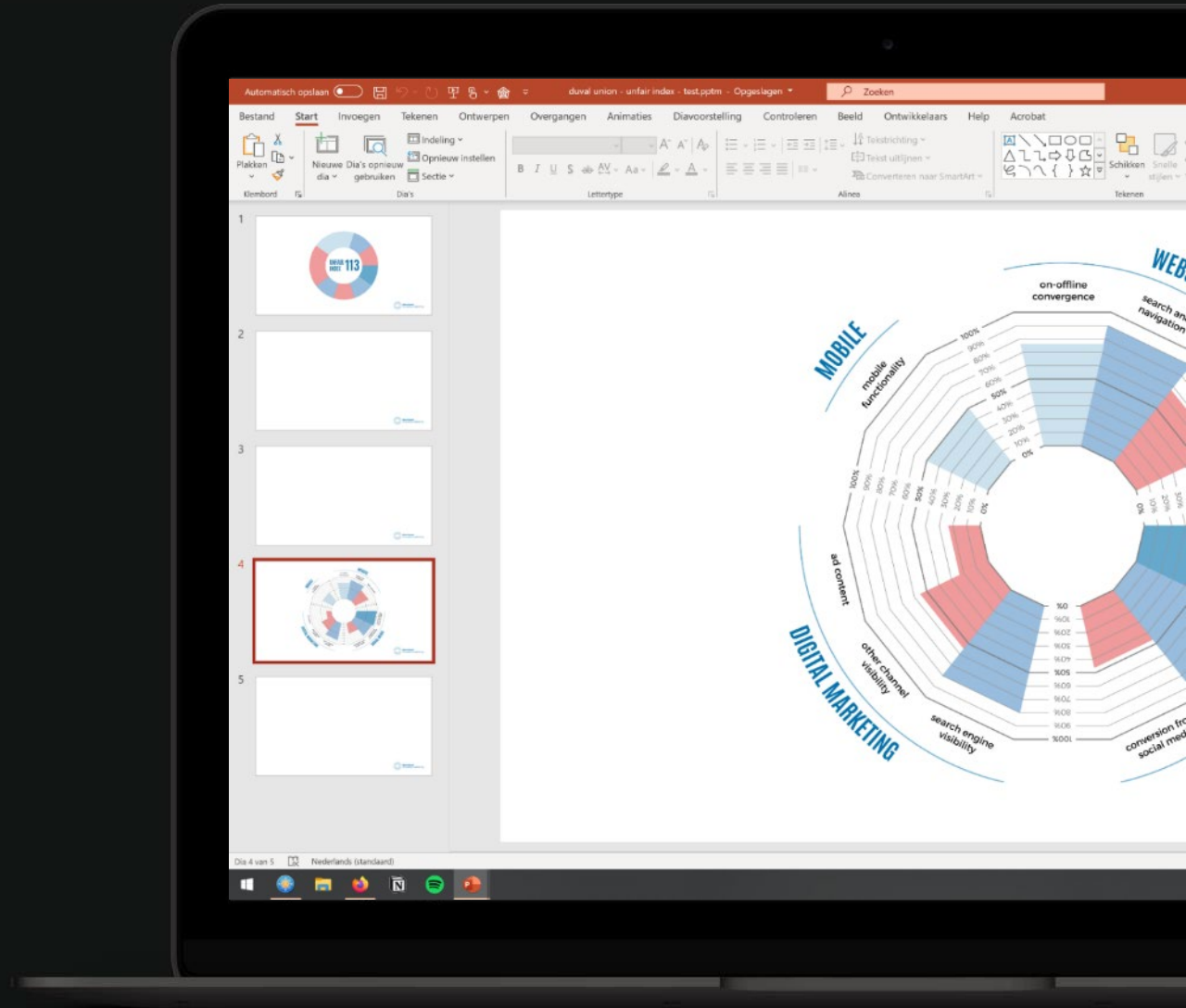
# Creating layouts

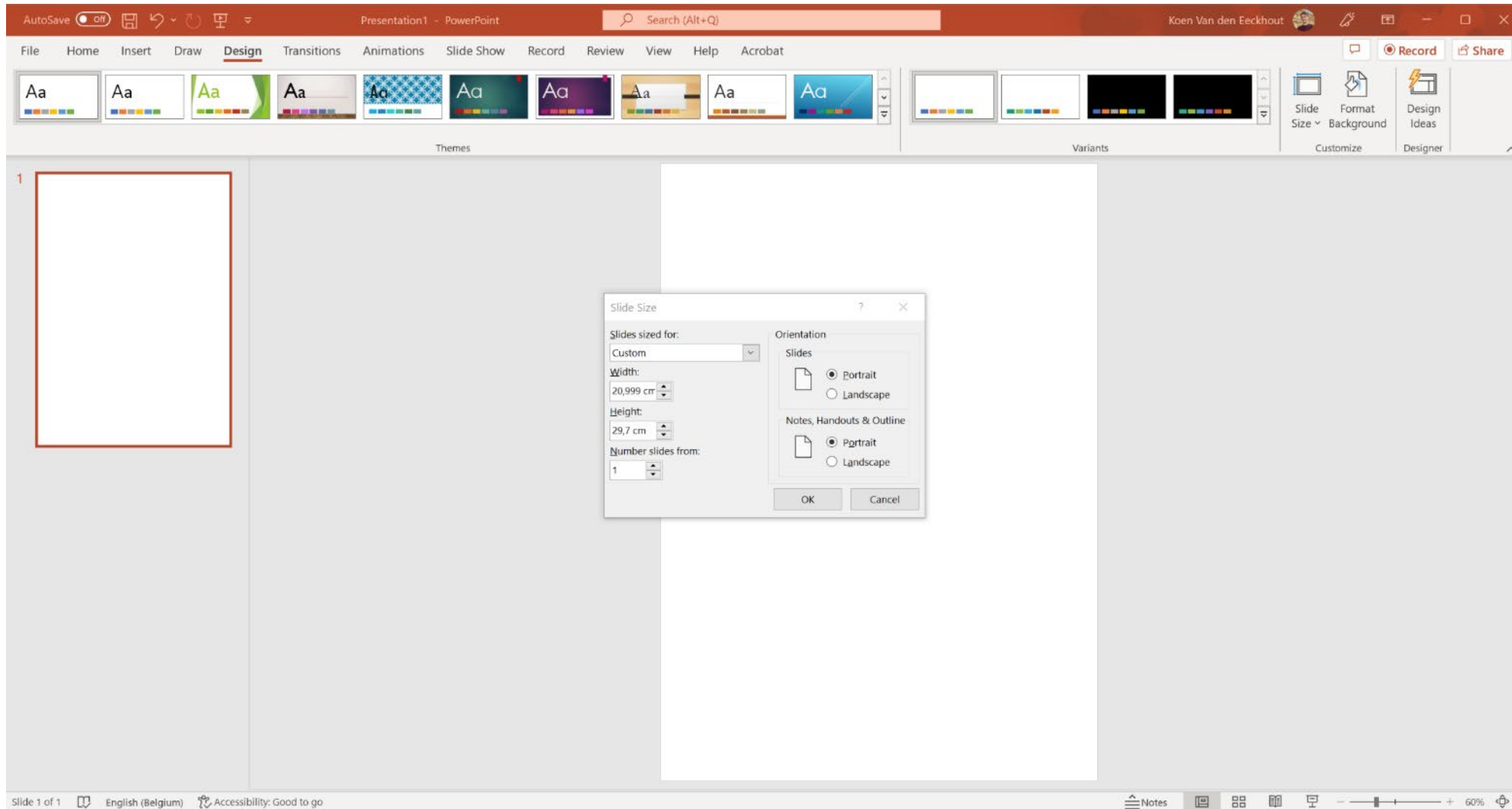




## Microsoft PowerPoint

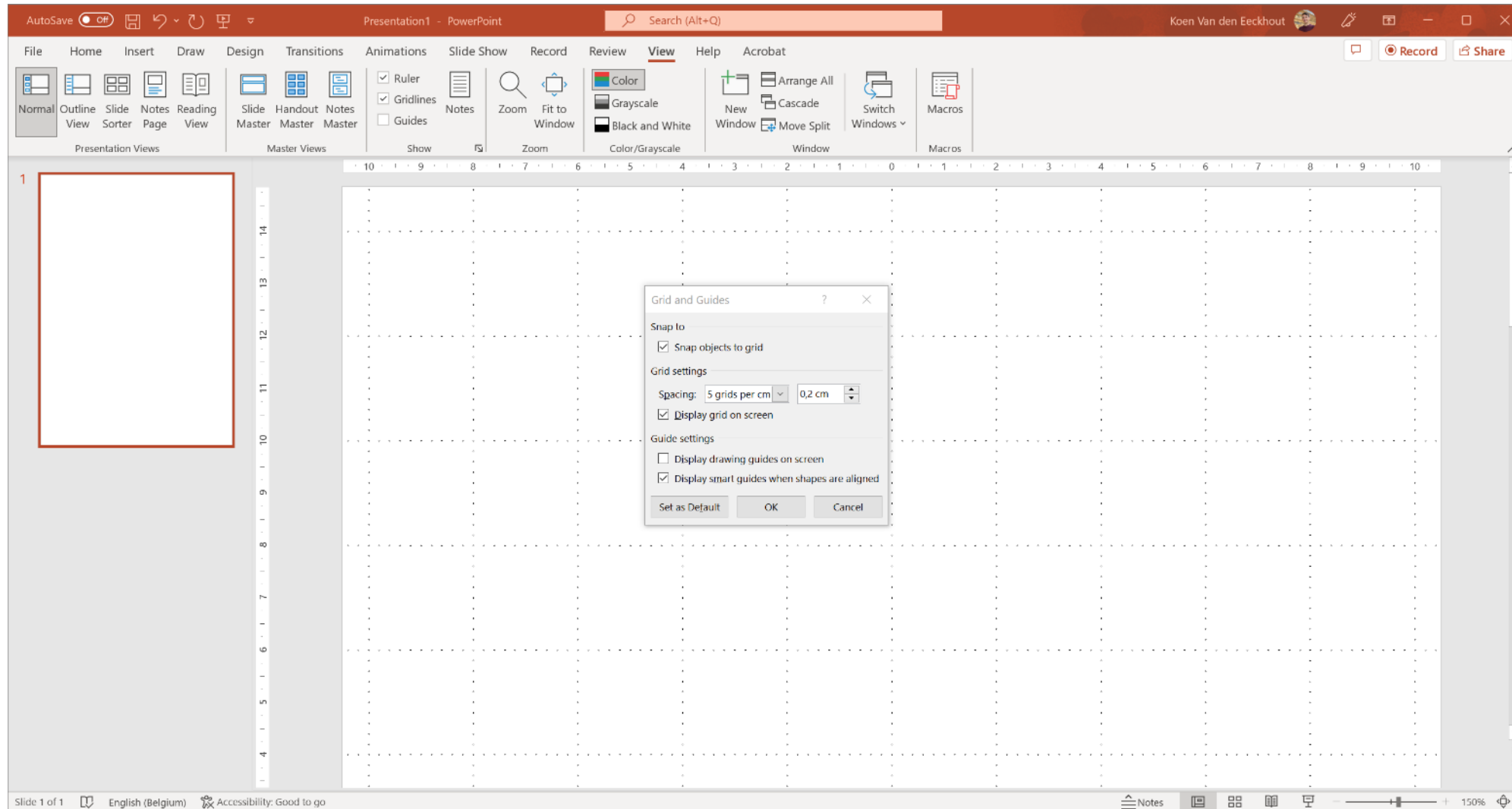
drag-and-drop, easy to use  
you already have it, and know it  
templates available  
works with bitmap and vector images



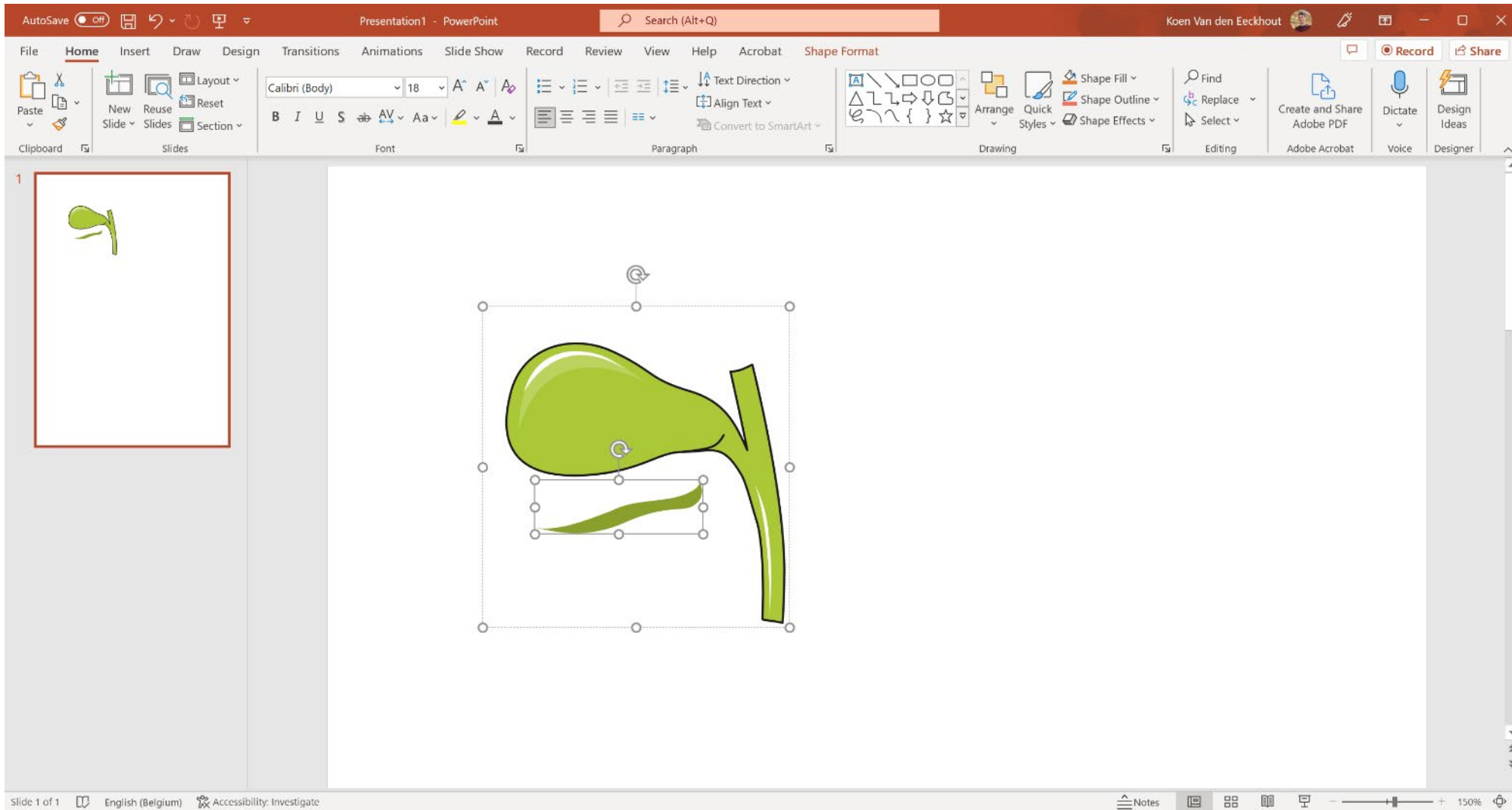


## Canvas size:

use *Design > Slide Size > Custom Slide Size* to set your preferred page size

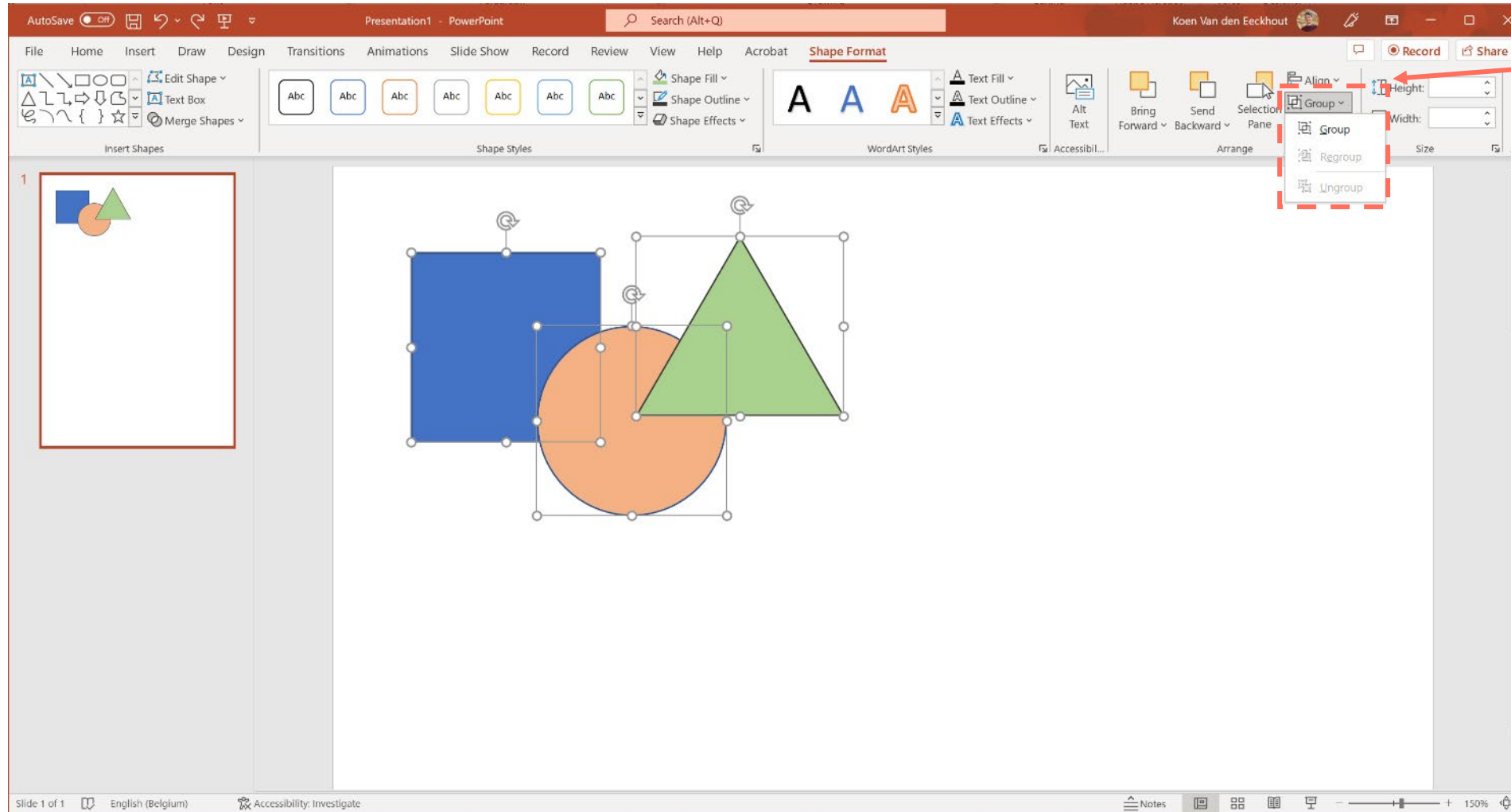


Use View > Show >  
Ruler and Gridlines  
for more precise  
alignment options



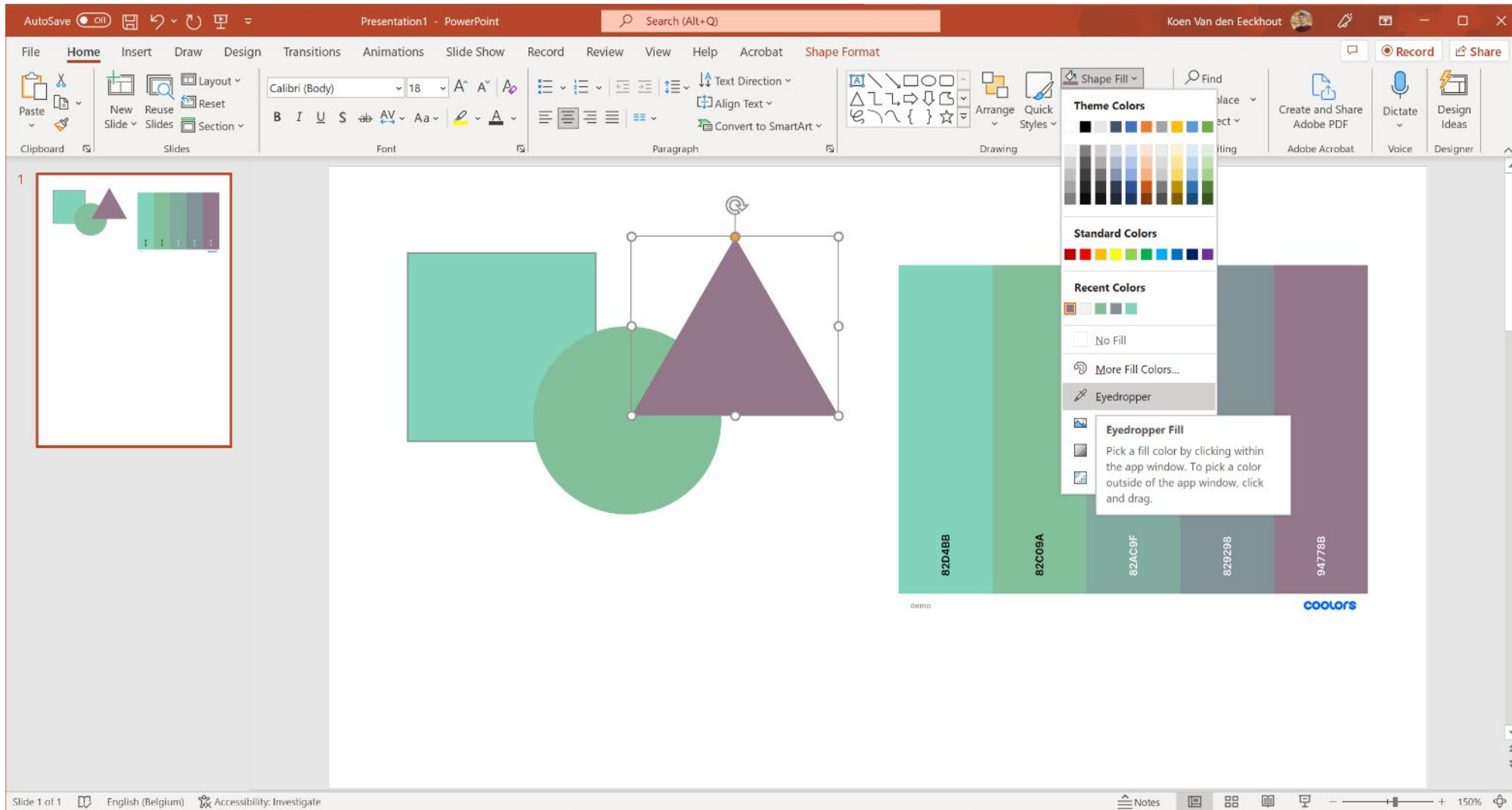
After inserting an svg image, use **Convert to Shape** to turn it into an editable group of objects

(make sure your version of PowerPoint is up to date)



Similar to Inkscape, you can group objects to keep them together





Quick tip: to use a color scheme (e.g. from Coolers):

- insert the color scheme image
- use the **Eyedropper** tool
- you can remove the image afterwards, PowerPoint will remember your recently used colors
- or use 'More Fill Colors' to enter the exact color values

# Freemium drag-and-drop tools



**Canva**

[canva.com](https://canva.com)

lots of templates,  
fonts, images,... -  
also in free version

limited chart options

paid version:  
€ 110/year



**Infogram**

[infogram.com](https://infogram.com)

better for charts, even  
real-time/interactive

no downloads in  
free version

paid version:  
\$ 228/year



**Piktochart**

[piktochart.com](https://piktochart.com)

pretty complete  
for starters, good  
chart options

limited number  
of visuals and  
downloads in  
free version

paid version:  
€ 168/year  
educational  
license: € 40/year



**Visme**

[visme.co](https://visme.co)

pretty complete  
for starters, good  
chart options

no downloads in  
free version

paid version:  
\$ 147/year

# Exercise: creating a poster

Use **Powerpoint**, **Inkscape** or **Paint.NET** to mimic this poster as closely as possible

Canvas size: 40 x 20 cm

Color: #1e152a, 30% transparent

Photo from Pixabay



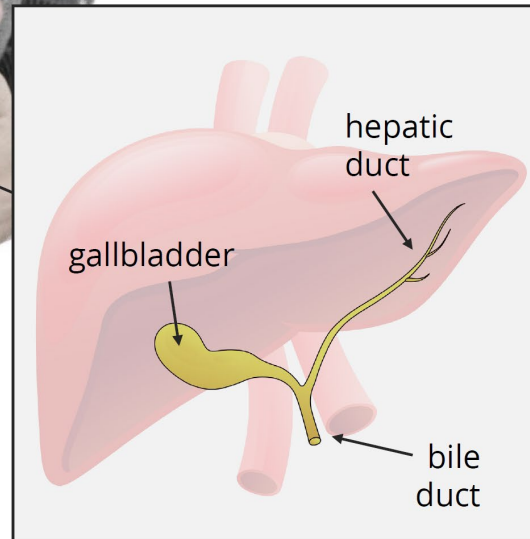
lower the saturation!



## GALLSTONES

### Common symptoms

- Abdominal pain on the right hand side of the abdomen
- High temperature
- Rapid heartbeat
- Yellowing of the skin
- Itchy skin
- Diarrhoea
- Loss of appetite



Open Sans Extrabold

Nunito light

Save as a pdf!

# Creating visuals about your research

Elements of powerful visuals

Visual communication  
principles

Editing vector images

lunch break

---

Graphical abstracts/posters

Design principles

**Bitmap images**

Graphs

Legal and ethical aspects



The background is a blurred, high-angle view of a newspaper page. At the top, a world map is visible. Below it, there are several small, square portrait photographs of men, likely Nobel laureates. To the right of these portraits, the text "The Nobel Prize" is partially visible, followed by "114 years, 108 prizes". The rest of the page is filled with dense, illegible text columns.

# Editing bitmap images





## Adobe Photoshop

“industry standard”

very powerful

steep learning curve

expensive subscription

[adobe.com/photoshop](https://adobe.com/photoshop)





## Affinity Photo

nearly as powerful  
as Adobe Photoshop

still a steep learning curve

one-off payment  
(currently € 75)

[affinity.serif.com](https://affinity.serif.com)





## GIMP

free alternative  
steep learning curve  
dated, complex interface

[gimp.org](https://gimp.org)





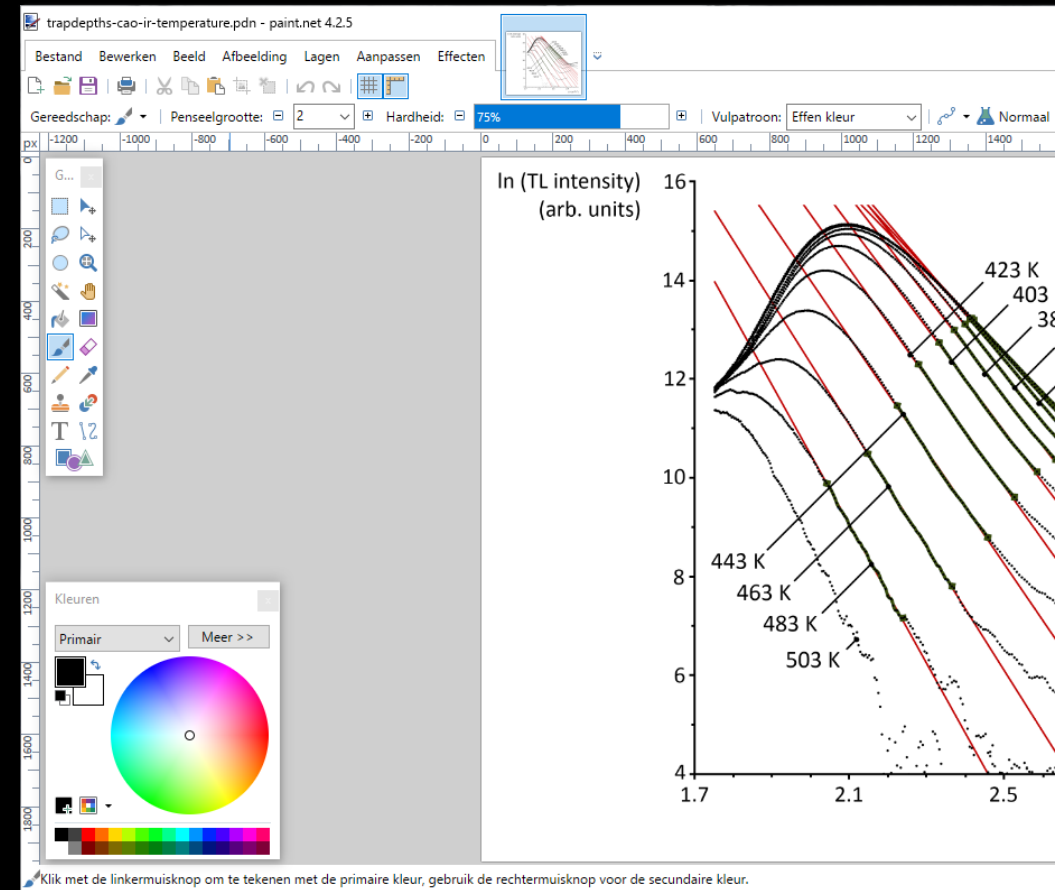
## Paint.NET

free alternative

“Paint on steroids”

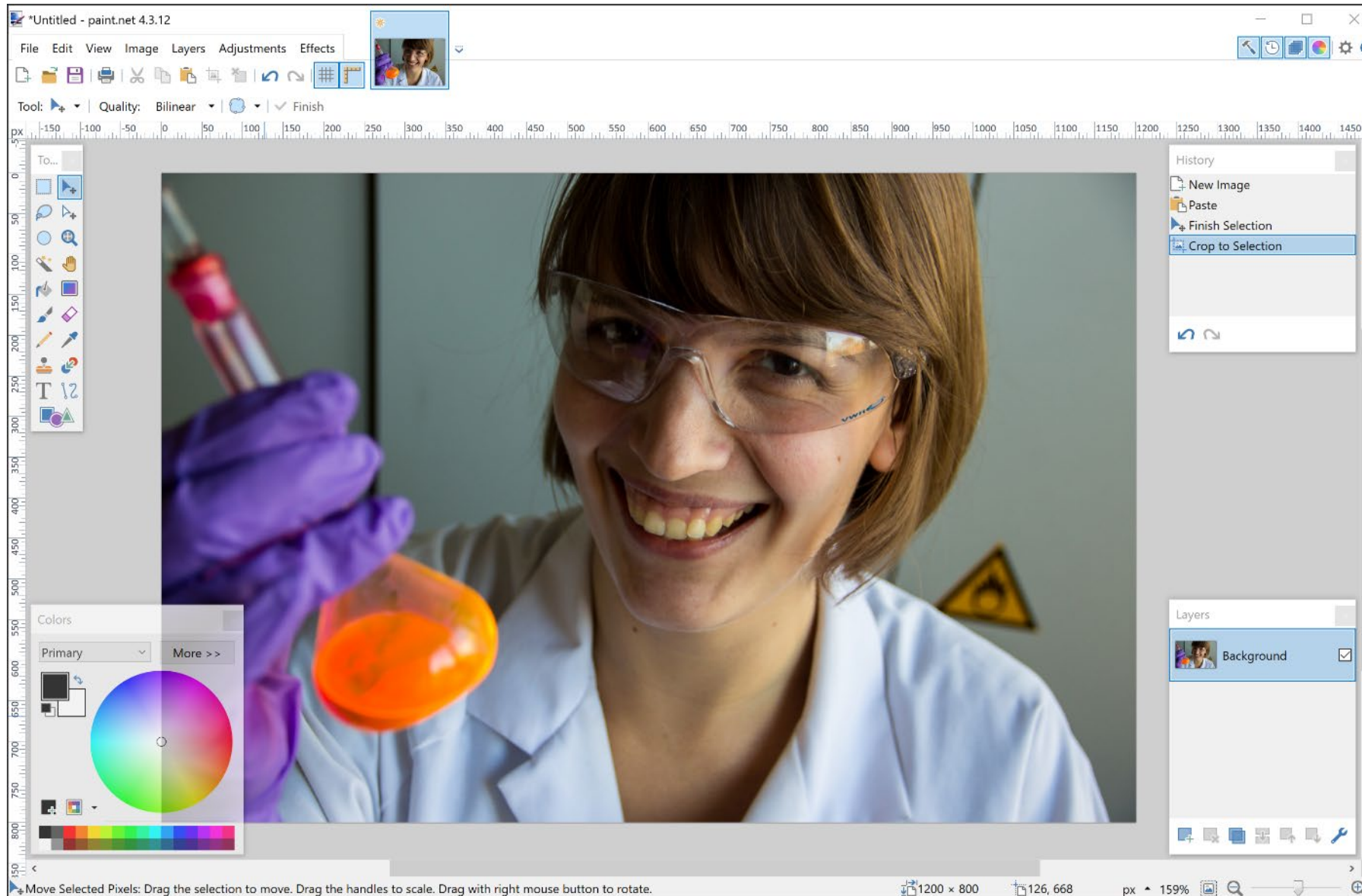
image editing with layers

[getpaint.net](http://getpaint.net)





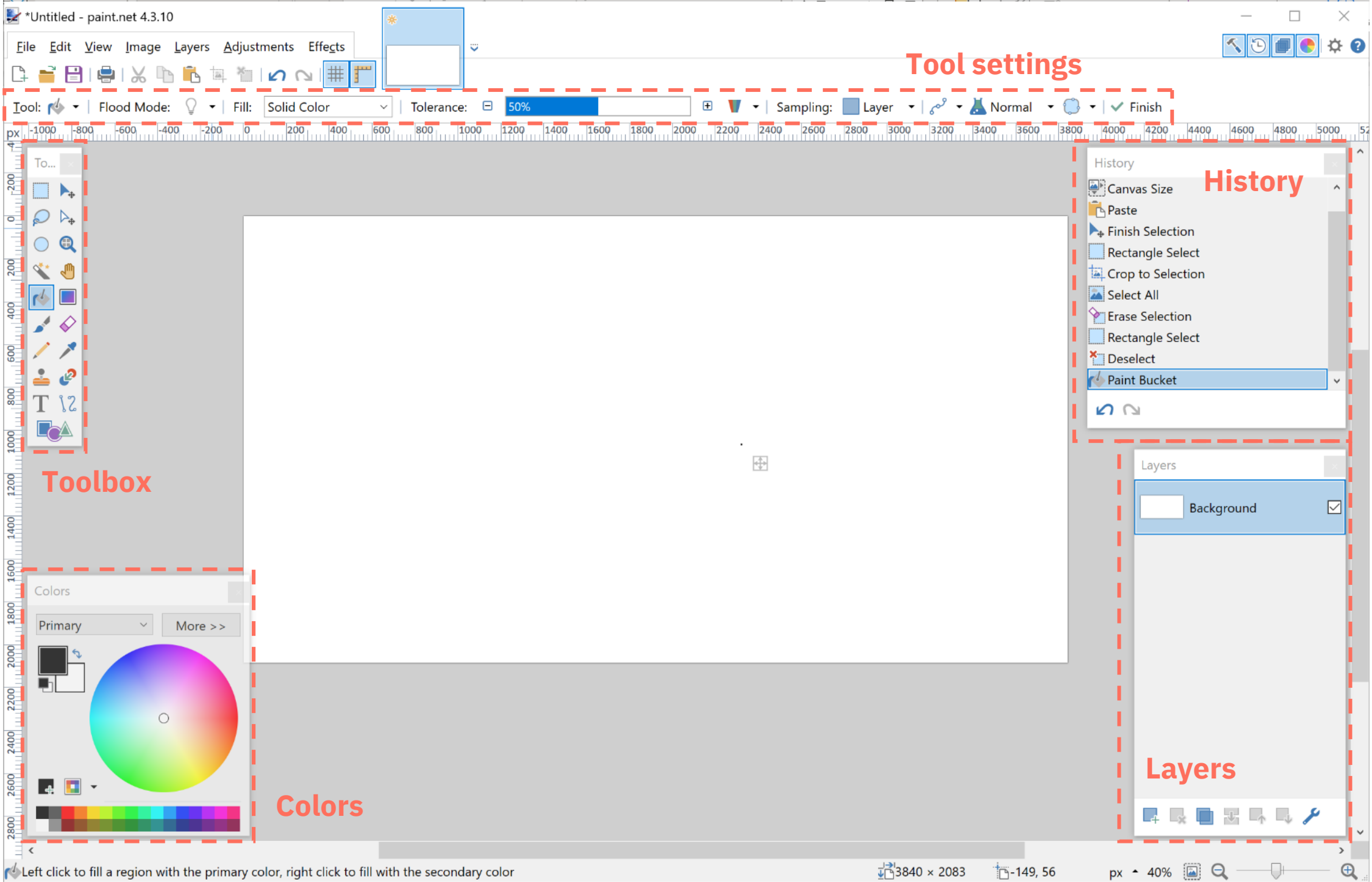
# Tool intro: Paint.NET



[getpaint.net](https://getpaint.net)

Mac/Linux alternative:  
[pinta-project.com](https://pinta-project.com)





# Resizing

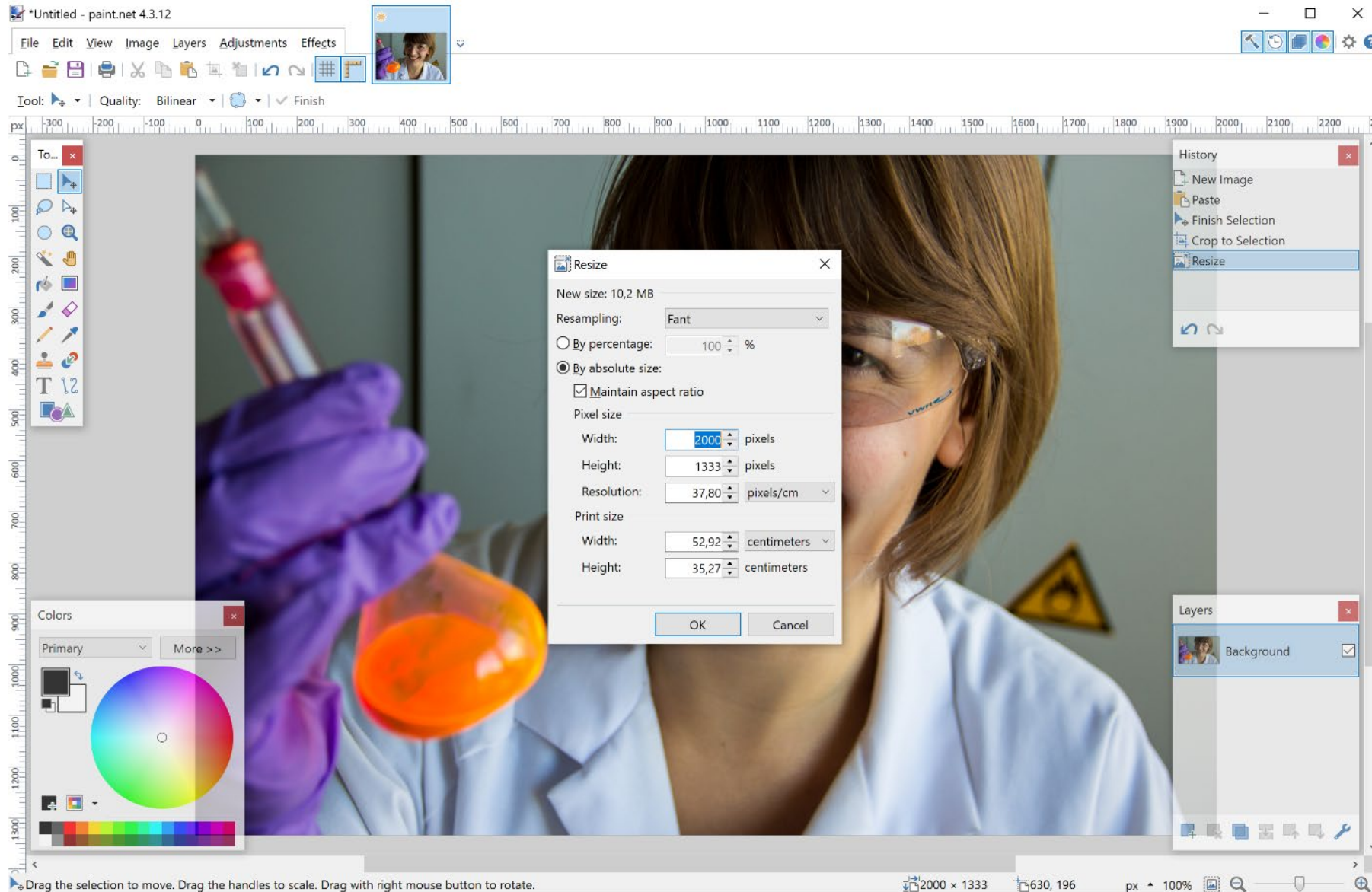


Image > Resize  
(Ctrl + R):  
resize the entire image

# Resolution

Resize

New size: 3,7 MB

Resampling: Fant

☐ By percentage: 100 %

☒ By absolute size:

☒ Maintain aspect ratio

Pixel size

Width: 1200 pixels

Height: 800 pixels

Resolution: 72,00 pixels/inch

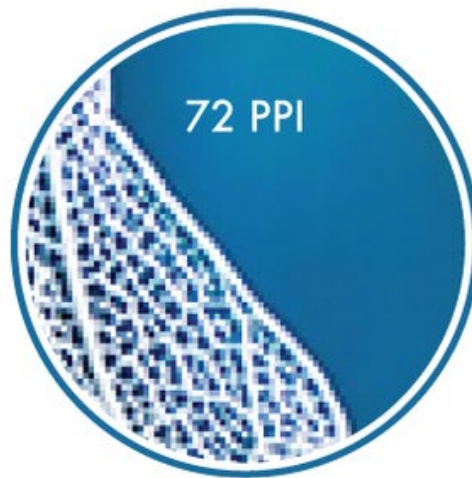
Print size

Width: 16,67 inches

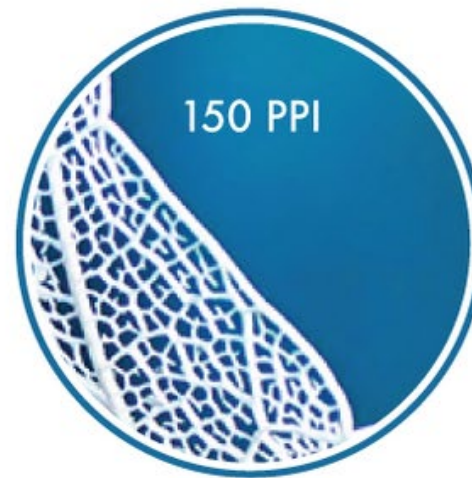
Height: 11,11 inches

OK Cancel

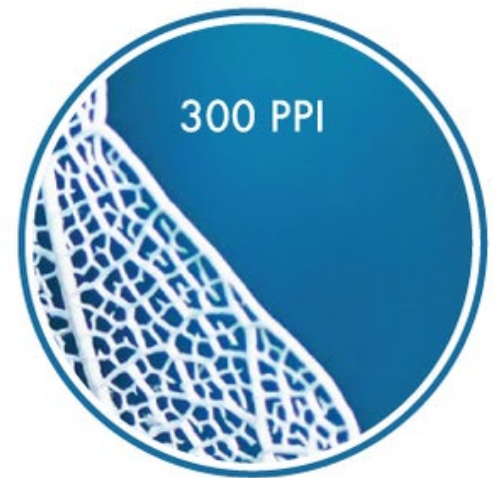
Okay for  
**screen use**



Okay for  
**presentations**



Ideal for  
**printing**

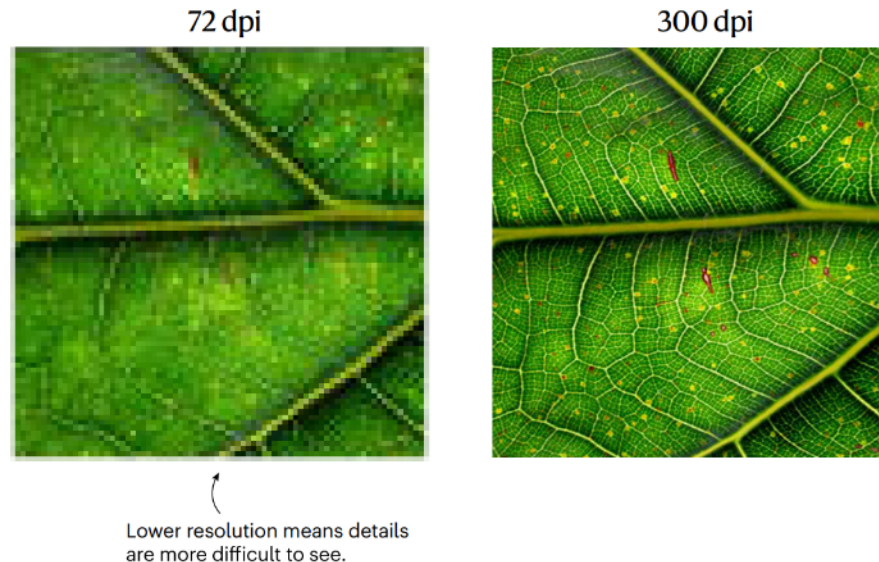


# Resolution

All photographic images must be supplied at a **minimum of 300 dpi** at the maximum size they can be used. The maximum we can output in online proofs is 450 dpi.

Artificially increasing an image's resolution in an artwork program will not improve its quality.

The example shows the difference between a low-resolution image and the same image at 300 dpi (the differences are more apparent the further you zoom in).





# Cropping

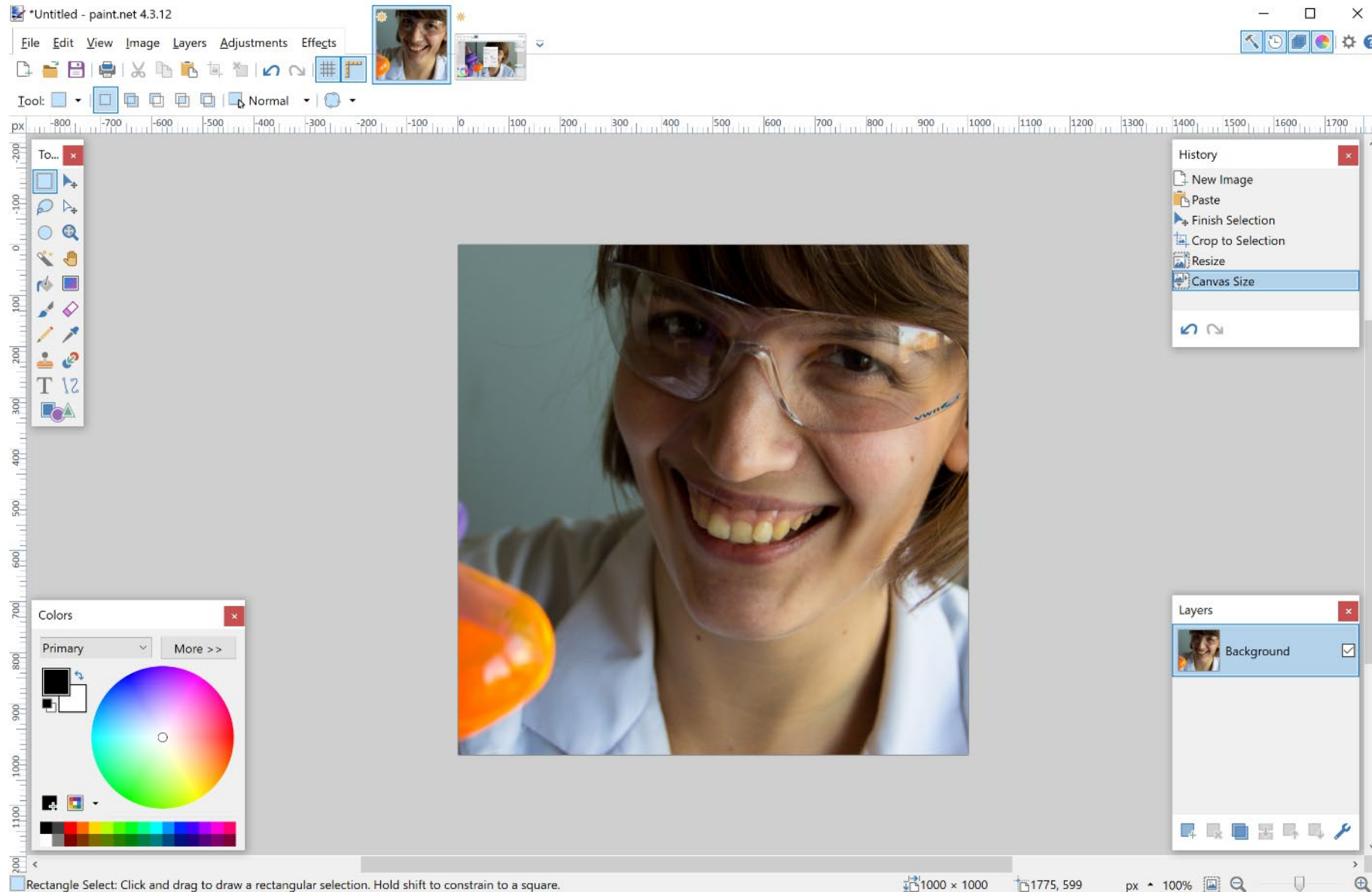
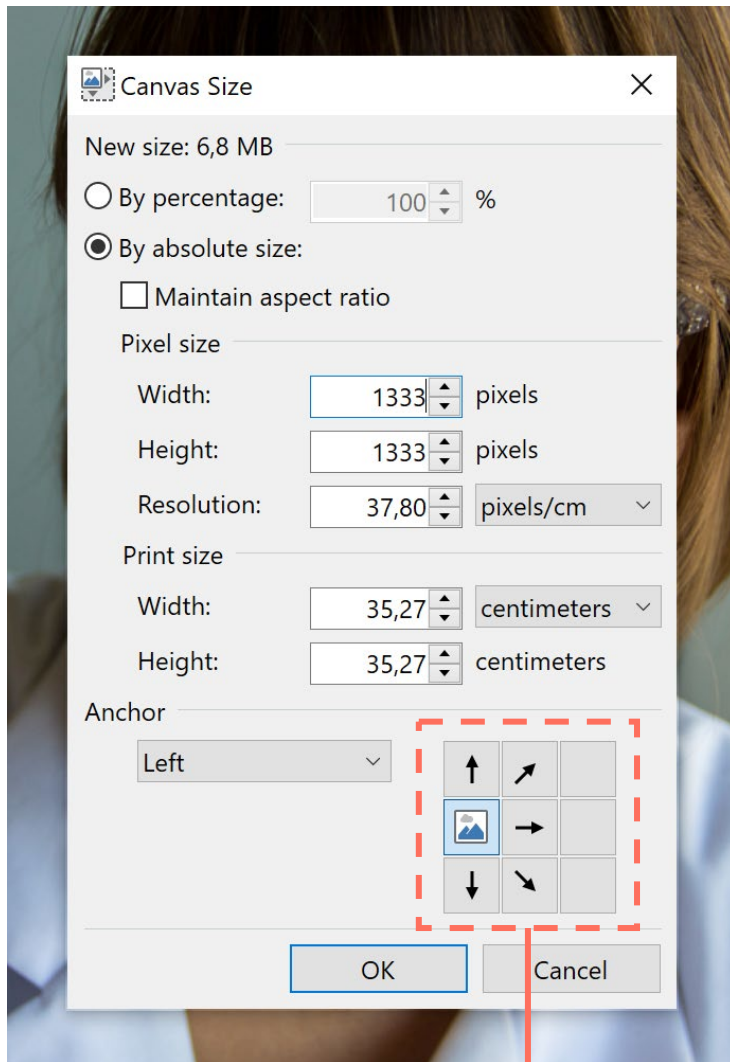
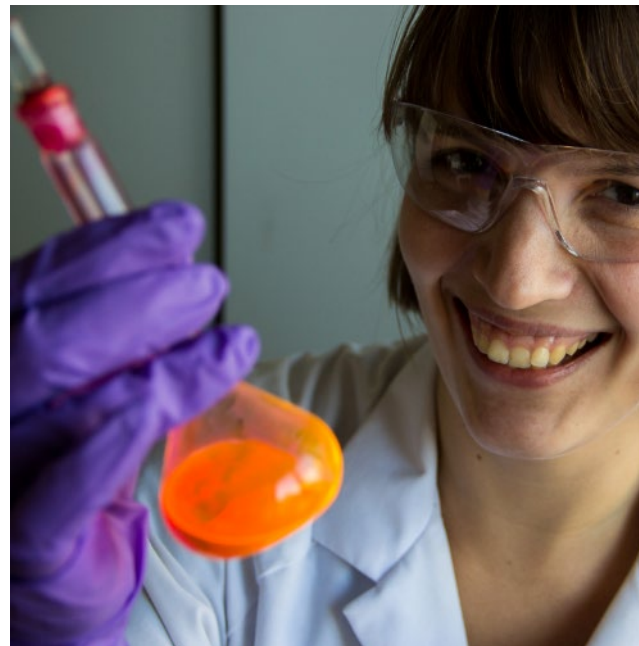
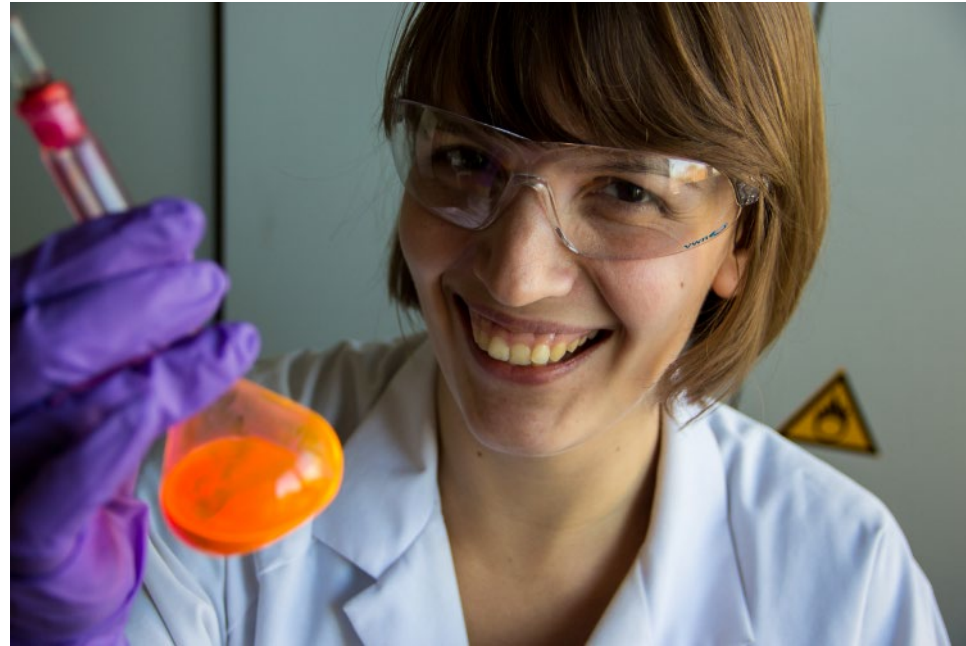


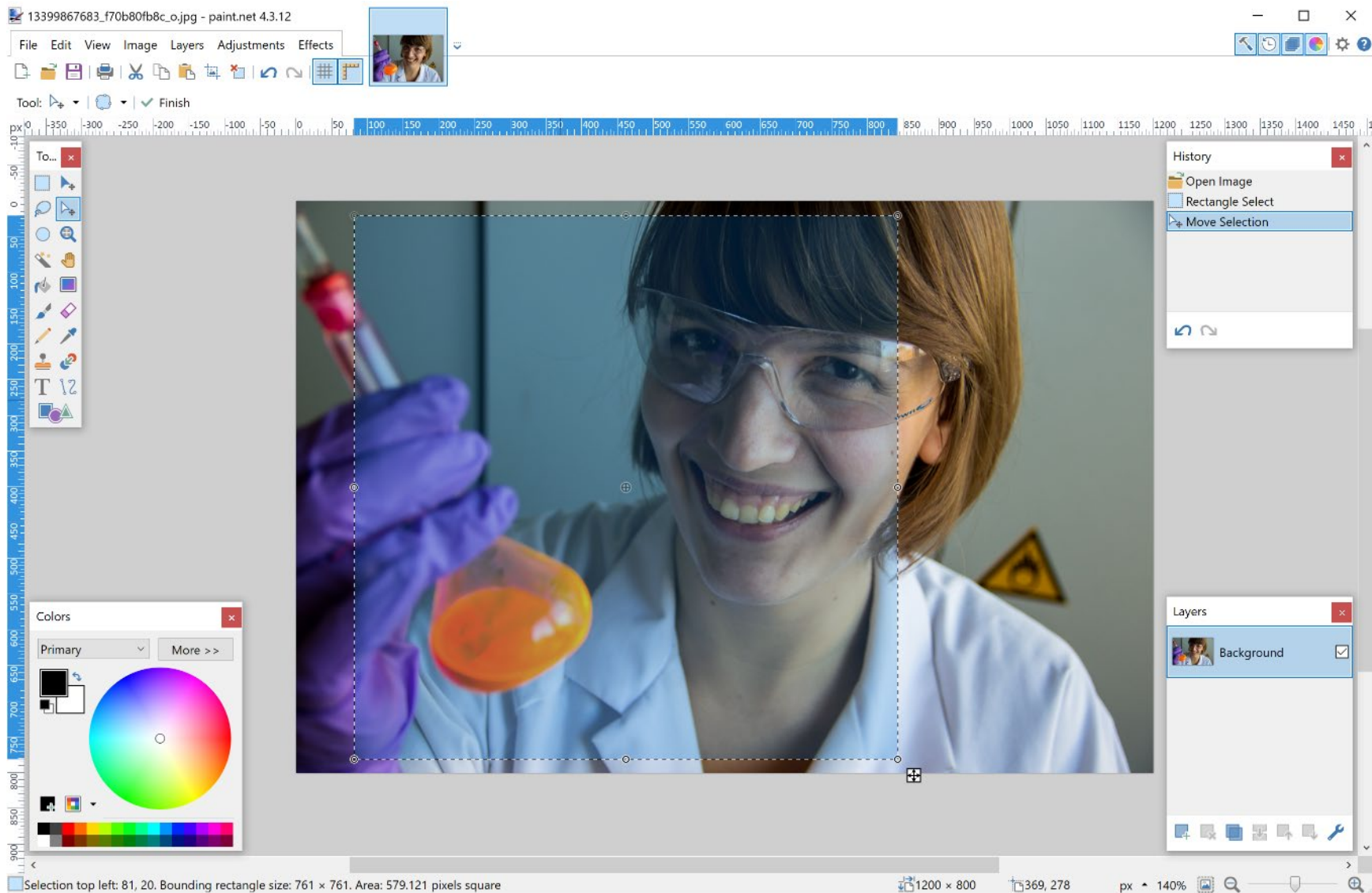
Image > Canvas Size  
(Ctrl + Shift + R):  
resize the canvas





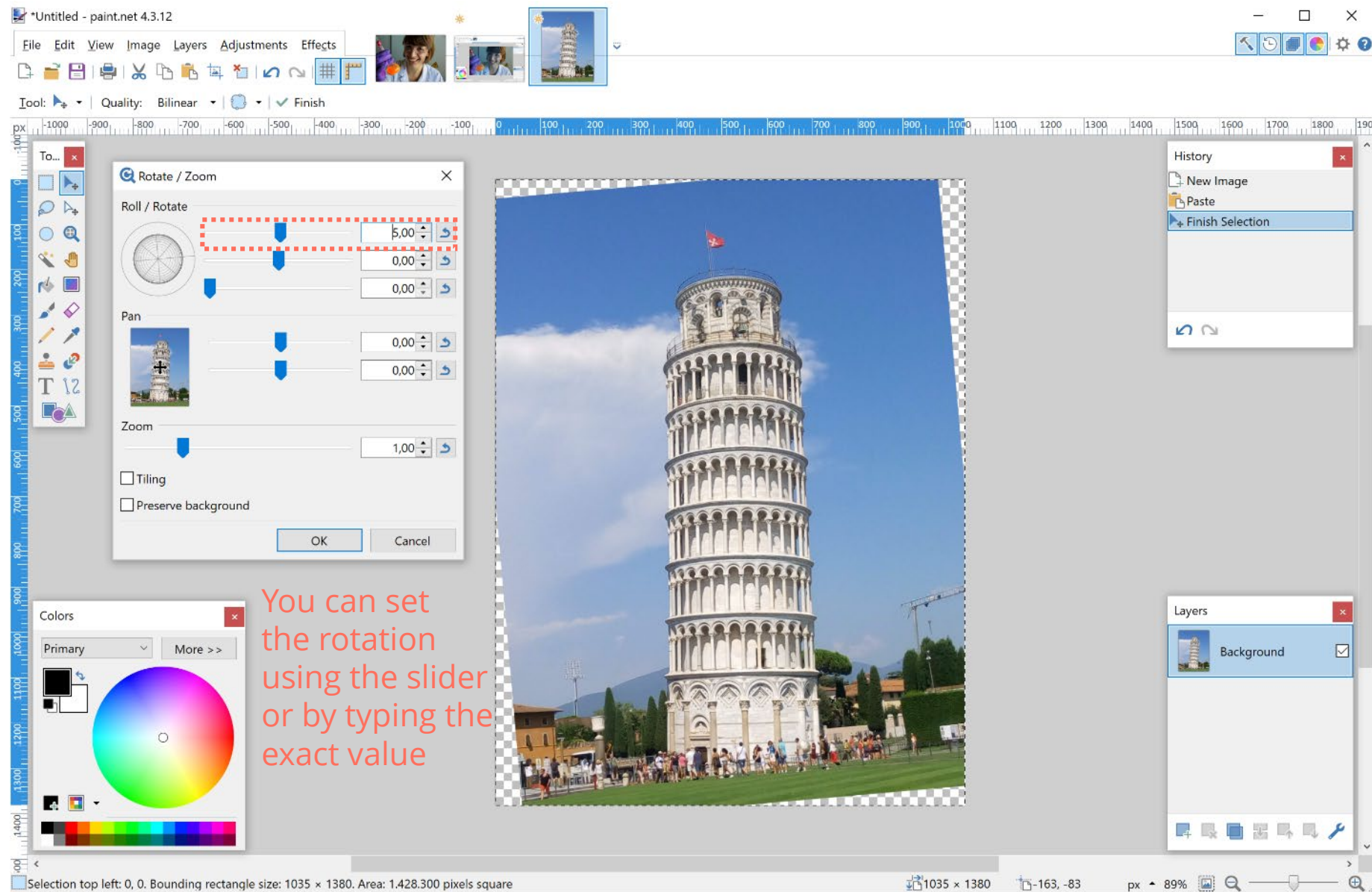
The anchor position determines how the canvas will be cropped





Alternative way to crop images:

- drag and drop using the **Rectangle Select** tool (hold *Shift* for a perfect square)
- move the Selection to the desired position using the **Move Selection** tool
- Image > **Crop to Selection**

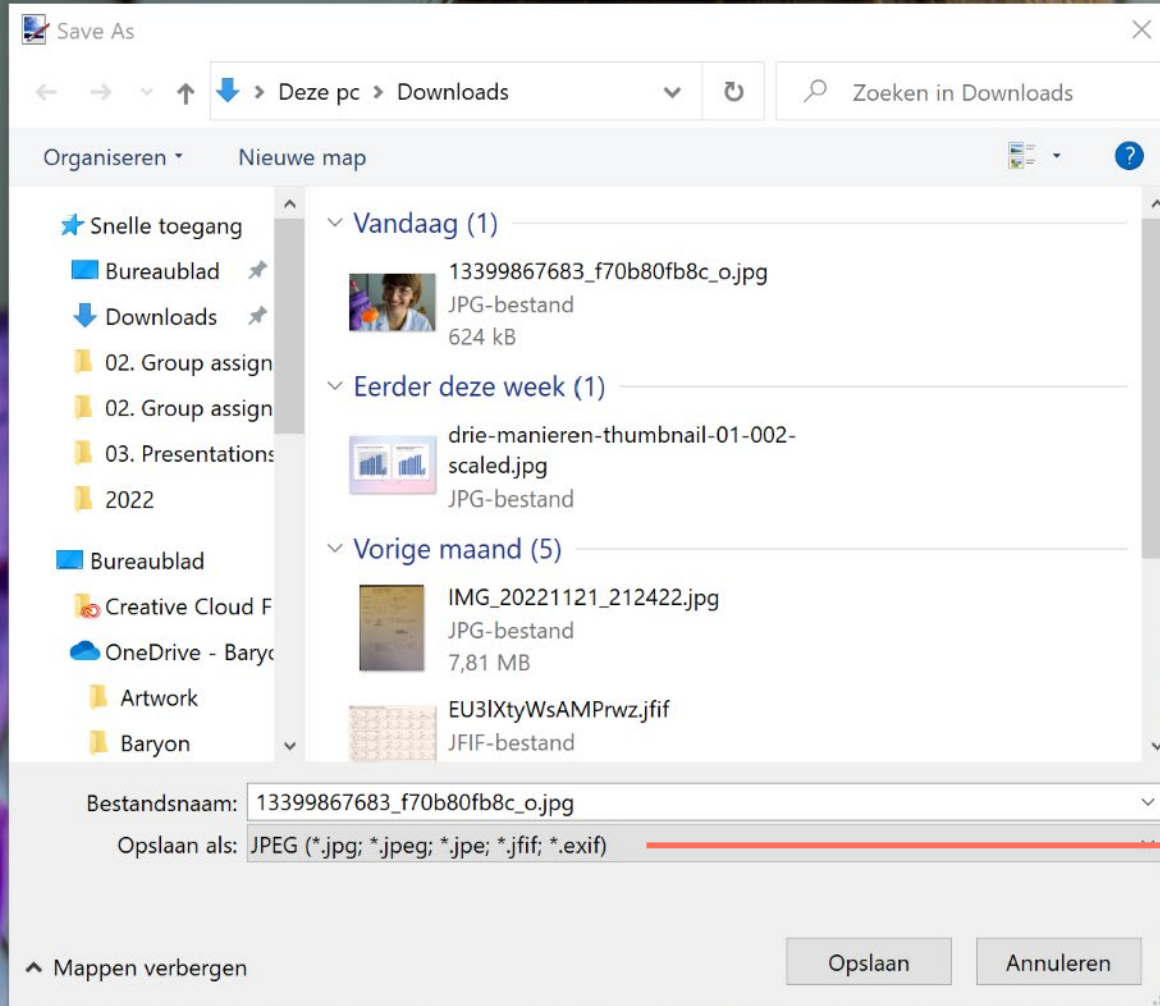


You can set the rotation using the slider or by typing the exact value

Layers > Rotate / Zoom

If you **rotate** your image, be aware that part of it might fall outside of the canvas!





### JPEG:

- doesn't support transparency
- smaller file size

### PNG:

- supports transparency
- larger file size
- lossless

### TIFF:

- very flexible regarding properties and compression
- not always well supported

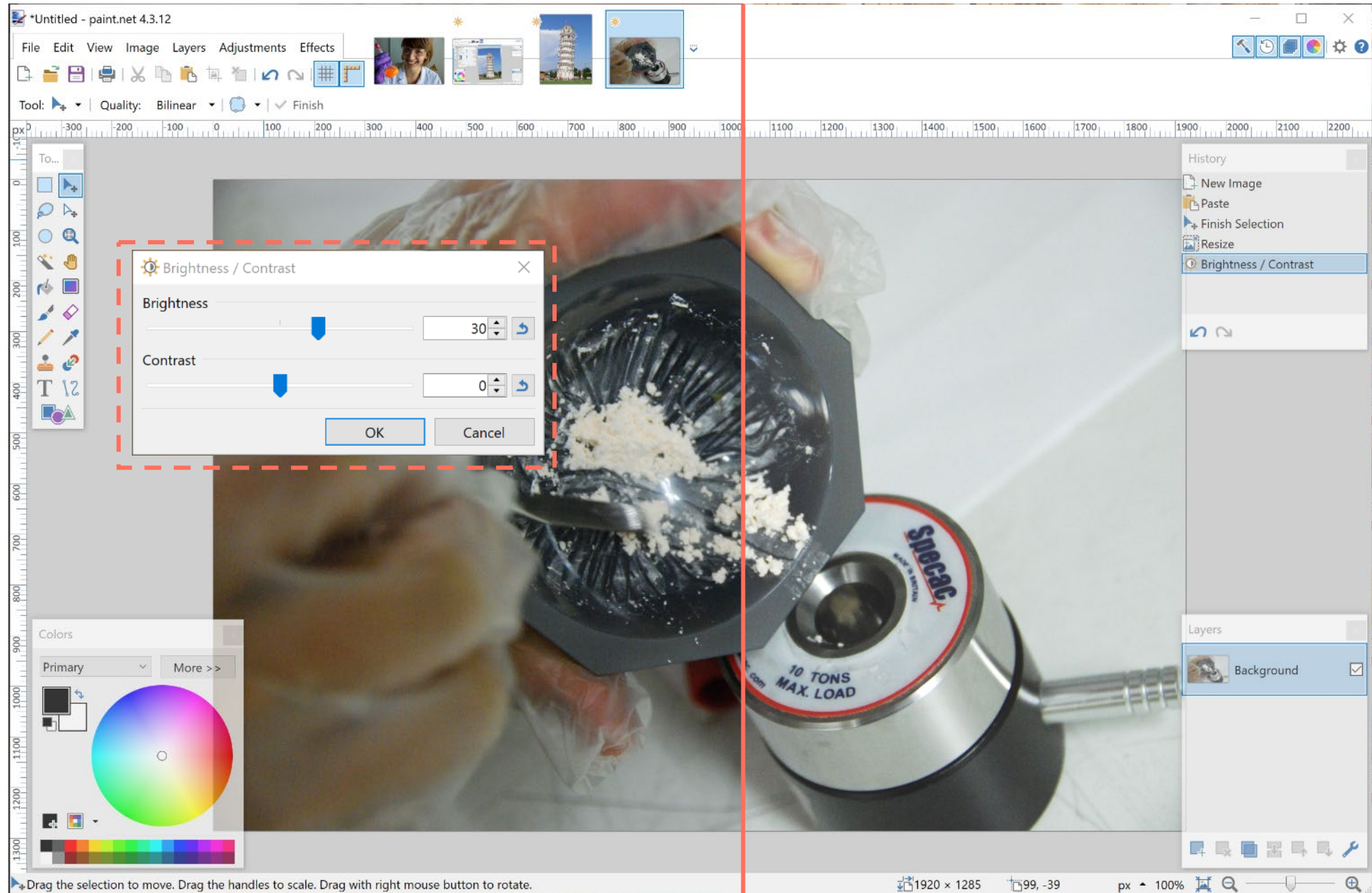
### PDN:

- if you want to continue working on it later

File > **Save As** to save your image

## Adjustments > Brightness / Contrast

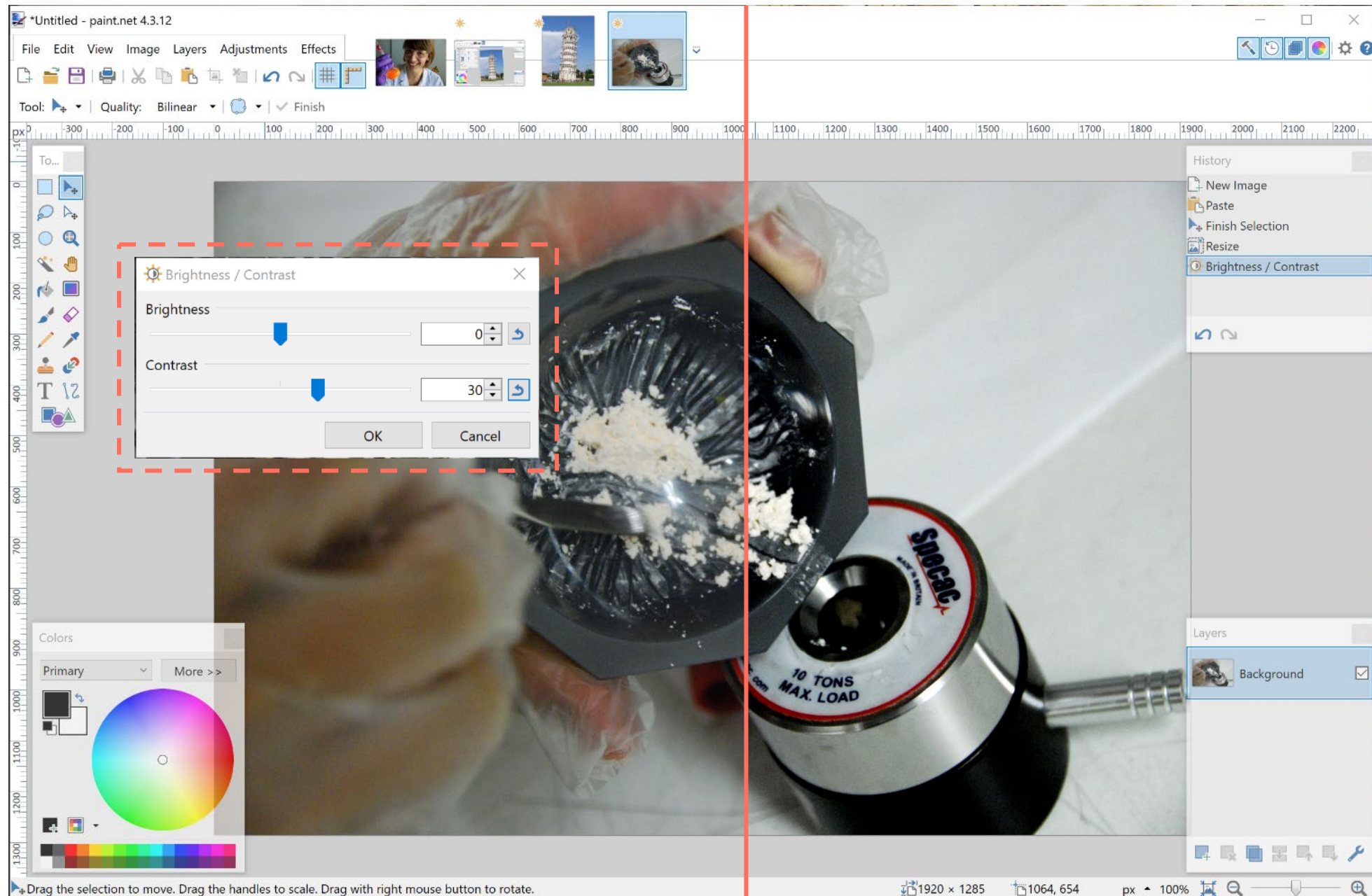
Brightness =  
make everything  
darker or brighter





## Adjustments > Brightness / Contrast

Contrast =  
light colors lighter,  
dark colors darker





Quick tip to give  
your pictures  
more 'punch':  
increase contrast  
and brightness  
by roughly  
the same amount

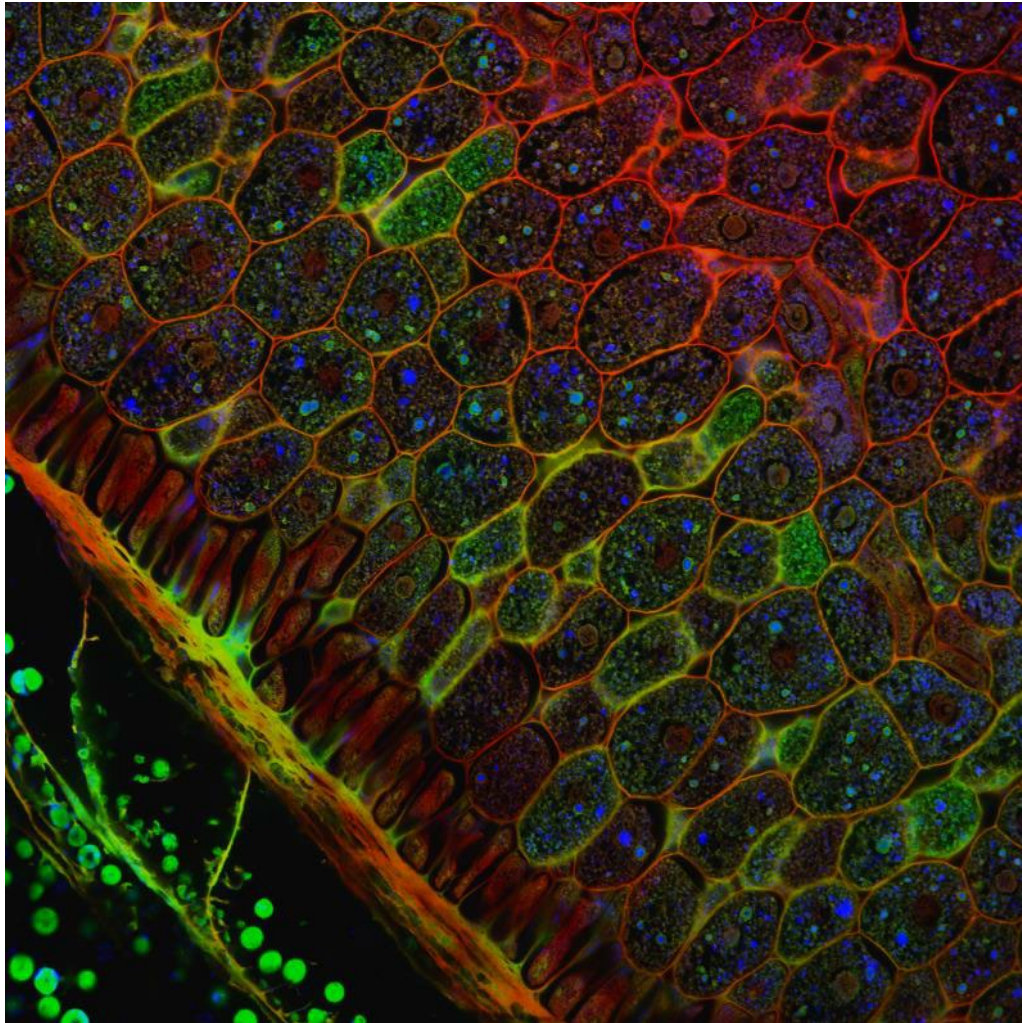
On the other hand,  
lowering the contrast  
of a dark image can  
reveal a bit more detail





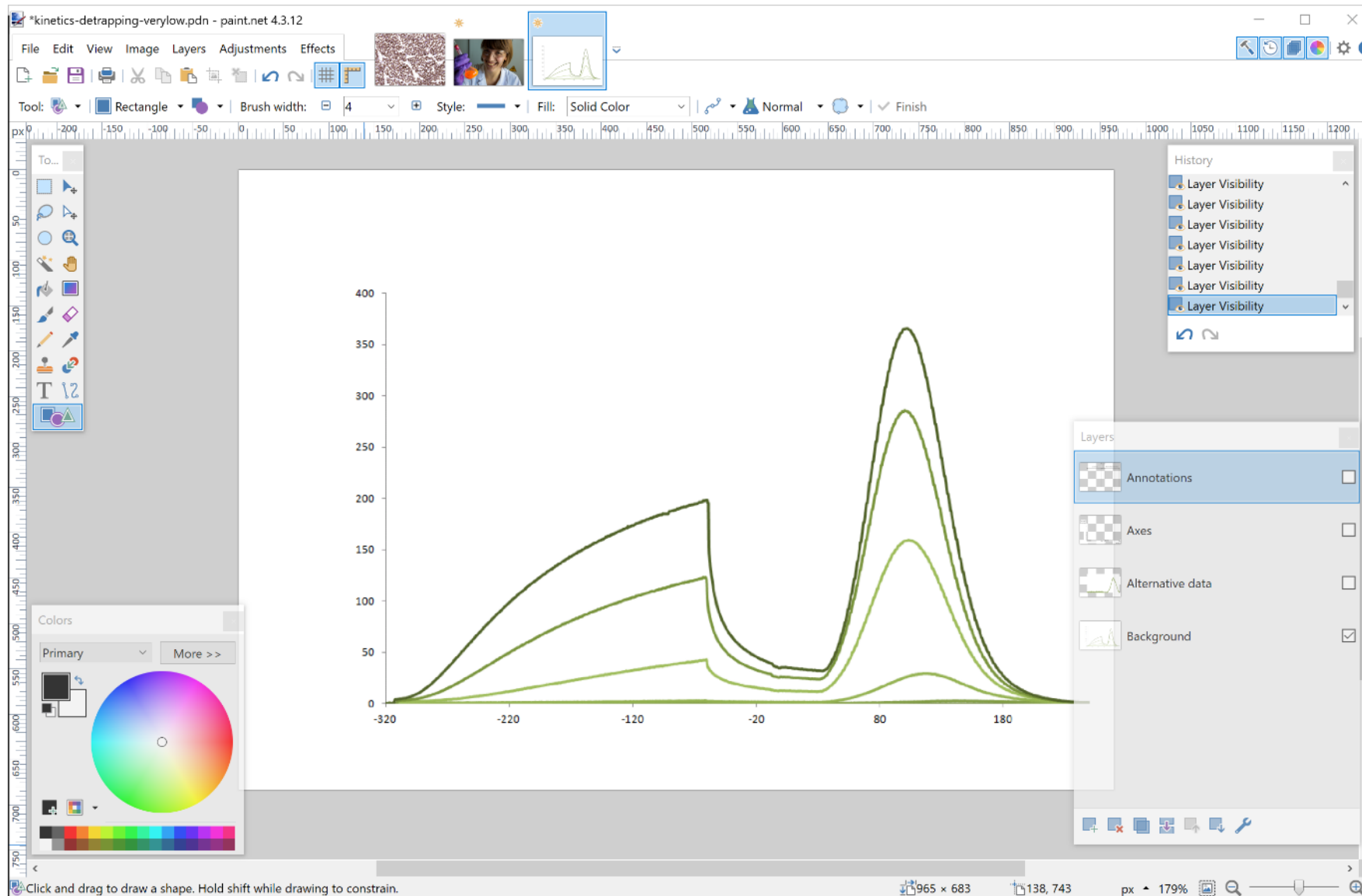
# Exercise: resolution, brightness, contrast

Download the following image at [baryon.be/files/workshop/visual-01.jpg](http://baryon.be/files/workshop/visual-01.jpg)

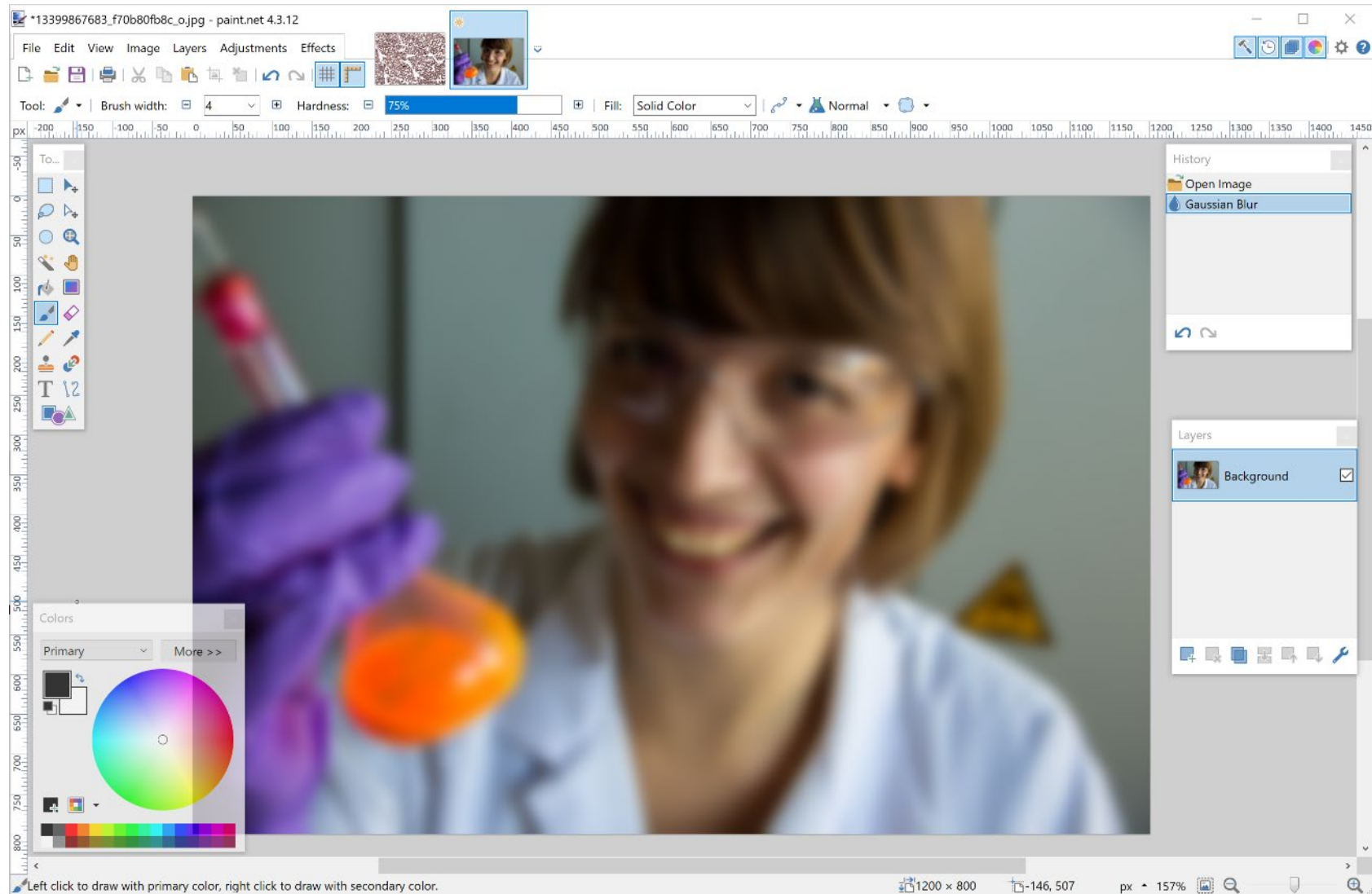


## Tasks:

- rotate this image 45 degrees
- crop an image of 600x600 pixels out of the original
- adjust brightness and contrast to your own opinion
- resize the image for a 300 PPI resolution and a 4 cm image width
- export as a PNG file

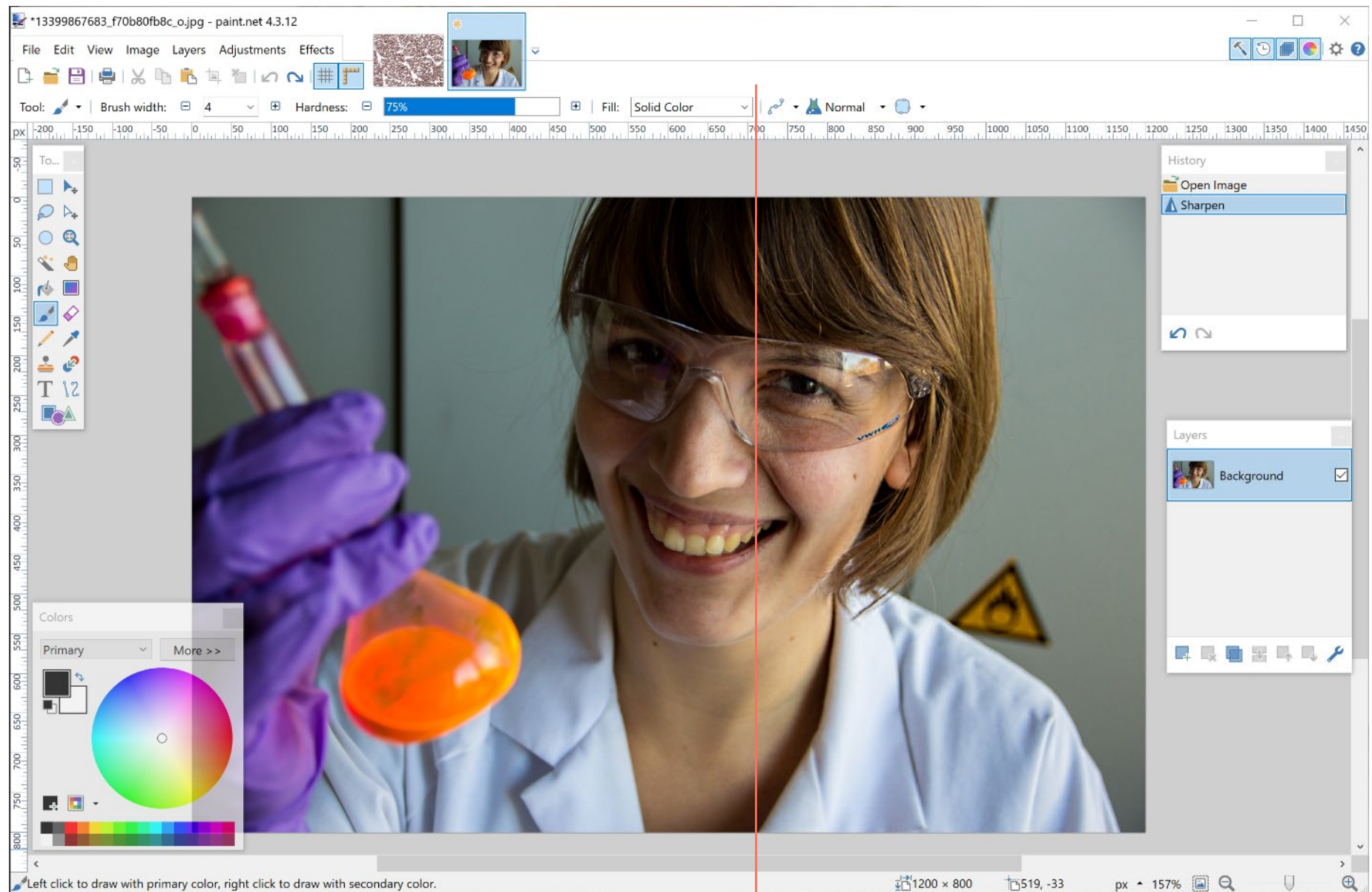


Further useful tools: **Working with layers**

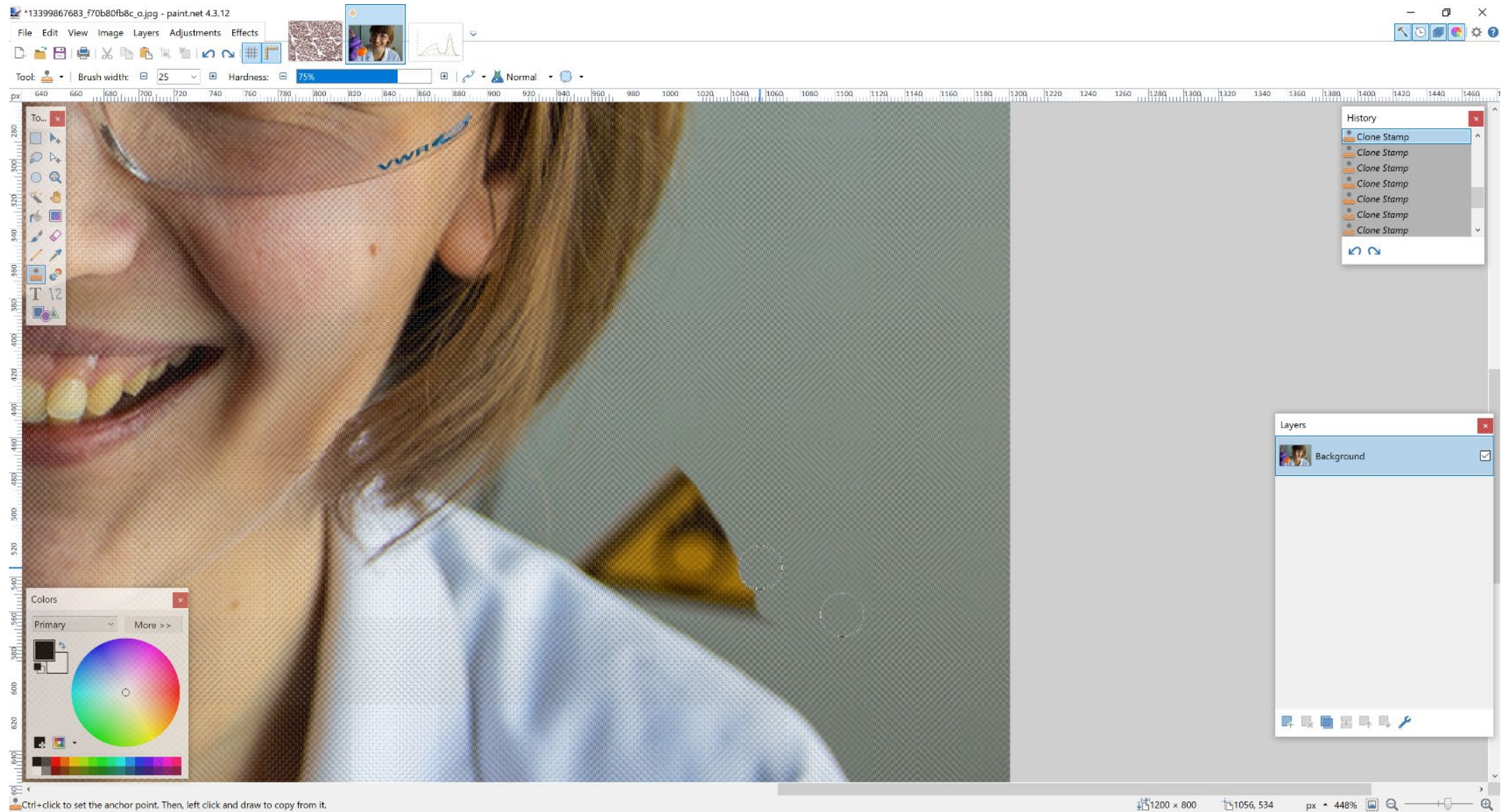


Further useful tools: Effects > Blurs > **Gaussian Blur**





Further useful tools: Effects > Photo > **Sharpen**



Further useful tools: **retouching** images using **Clone Stamp**

# Creating visuals about your research

Elements of powerful visuals

Visual communication  
principles

Editing vector images

lunch break

Graphical abstracts/posters

Design principles

Bitmap images

**Graphs**

Legal and ethical aspects



The background is a blue-tinted, slightly blurred image of a newspaper page. At the top, a world map is visible. Below it, there's a large headline that reads "The Nobel Prize" followed by some smaller text. To the right of the headline, there are several small, square portrait photographs of people. The overall layout suggests a historical or significant news event.

# Graphs

# **Guidelines for graphs**

define your goal



# What do we want to show?

## **comparison**

part-to-whole comparison

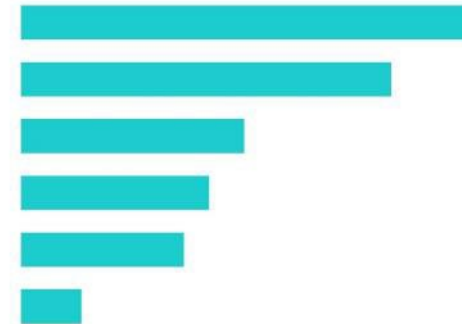
distribution

spatial distribution

correlation

evolution

hierarchy



**comparison**

# What do we want to show?

comparison

**part-to-whole comparison**

distribution

spatial distribution

correlation

evolution

hierarchy



**part-to-whole  
comparison**

# What do we want to show?

comparison

part-to-whole comparison

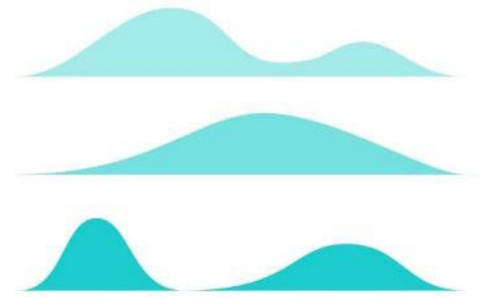
**distribution**

spatial distribution

correlation

evolution

hierarchy



**distribution**

# What do we want to show?

comparison

part-to-whole comparison

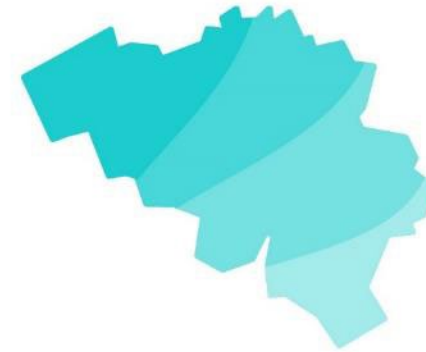
distribution

**spatial distribution**

correlation

evolution

hierarchy



**spatial  
distribution**

# What do we want to show?

comparison

part-to-whole comparison

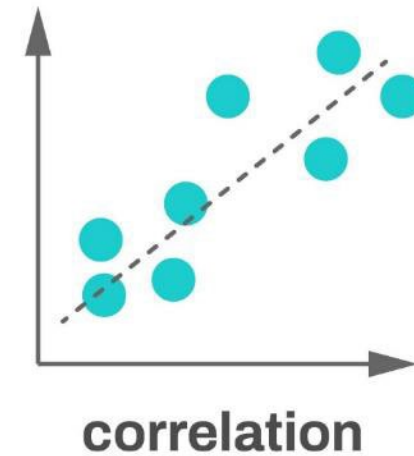
distribution

spatial distribution

**correlation**

evolution

hierarchy





# What do we want to show?

comparison

part-to-whole comparison

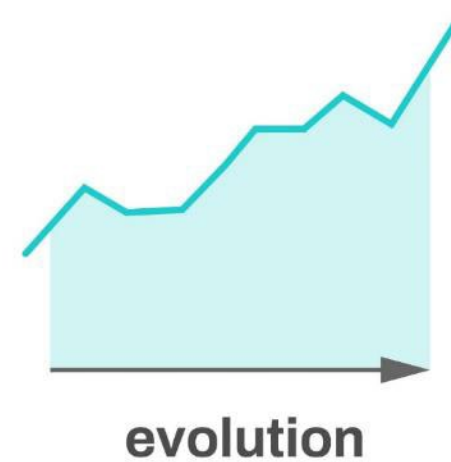
distribution

spatial distribution

correlation

**evolution**

hierarchy



# What do we want to show?

comparison

part-to-whole comparison

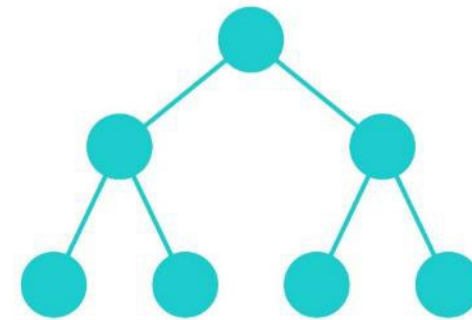
distribution

spatial distribution

correlation

evolution

**hierarchy**



**hierarchy**

## 1) Choose your chart

What would you like to show?



## 2) Design your chart

Let your data speak



Use this chart for: analysing, communicating, monitoring, confusing

Find more tips to choose and design your Perfect Chart at:

[www.ChartGuide/poster](http://www.ChartGuide/poster)

[info@ChartGuide](mailto:info@ChartGuide)

[/ChartGuide](https://www.facebook.com/ChartGuide)

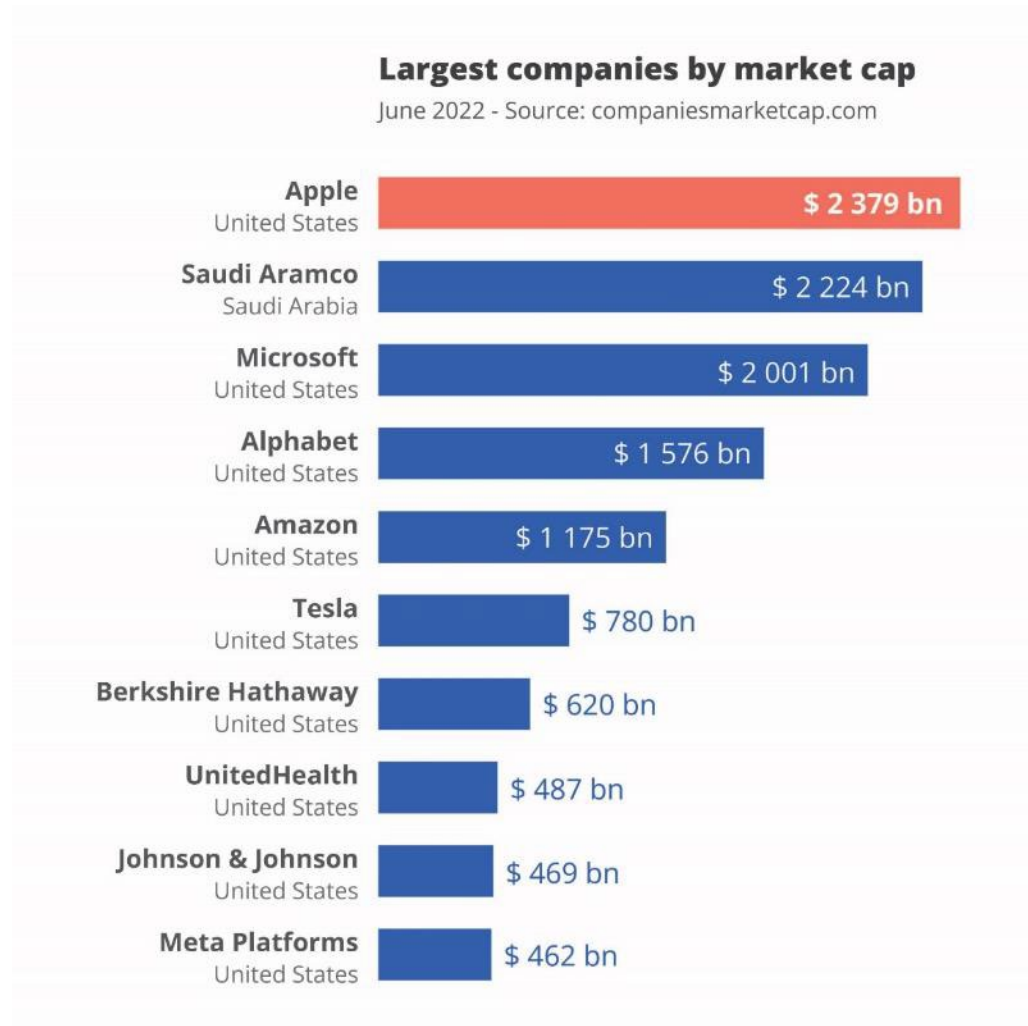
[@Chart\\_Guide](https://twitter.com/Chart_Guide)

[/ChartGuide](https://www.pinterest.com/ChartGuide)

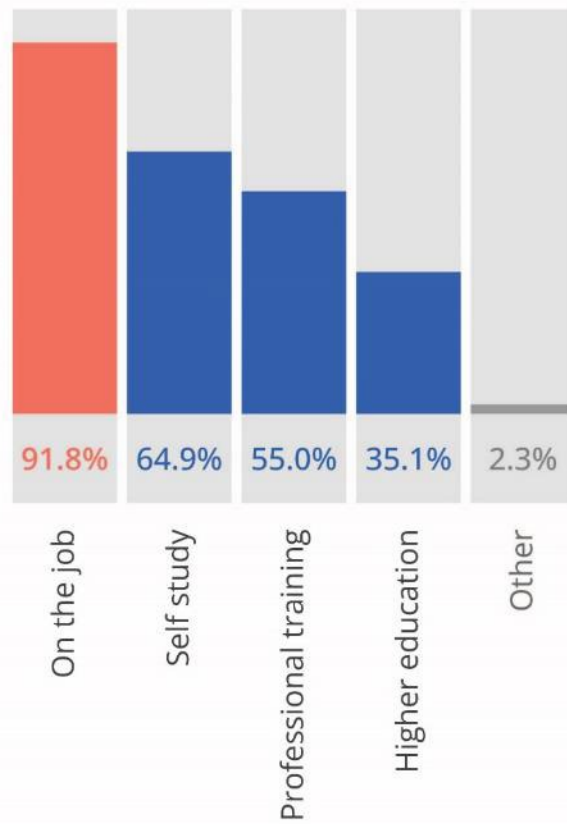
[chart.guide](http://chart.guide)

# Common chart types

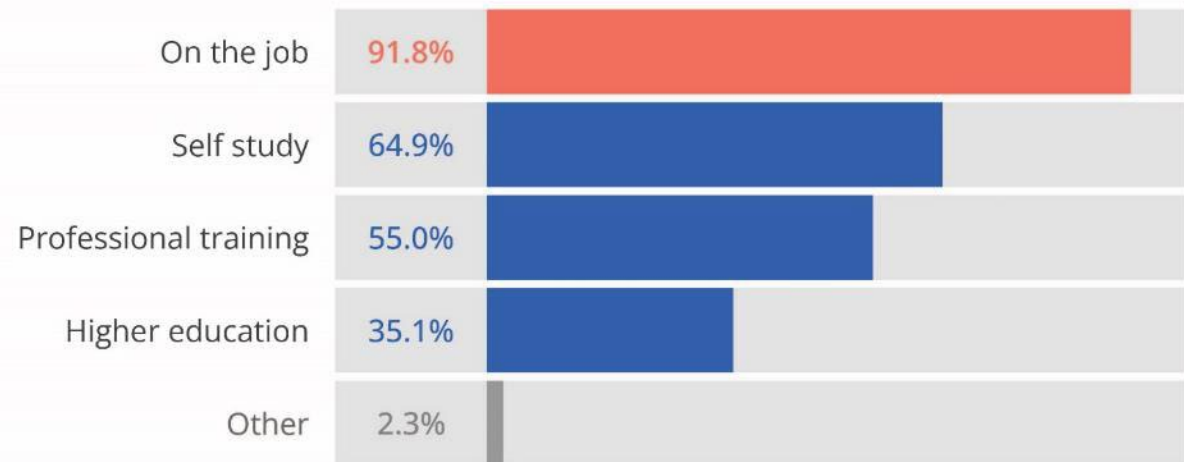
## Bar charts: comparison



Where did you learn your skills?



Where did you learn your skills?



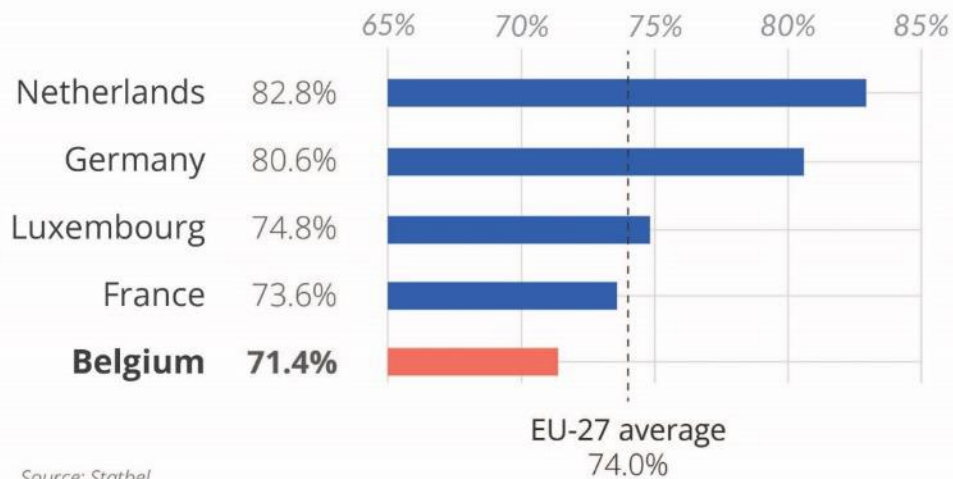


# Pitfall

Bar charts not starting from zero

## Employment rate

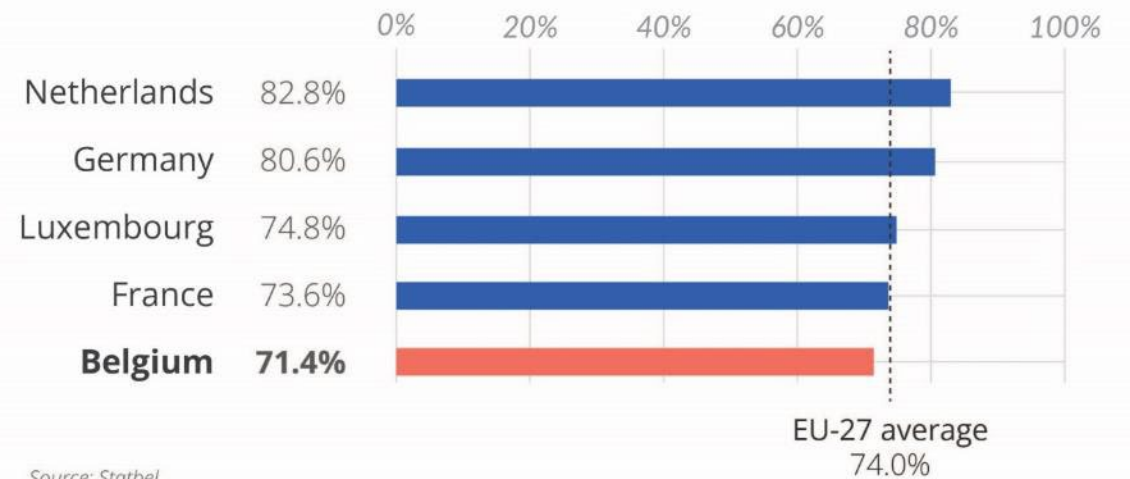
2021 Q3, citizens aged 20 to 64



Source: Statbel

## Employment rate

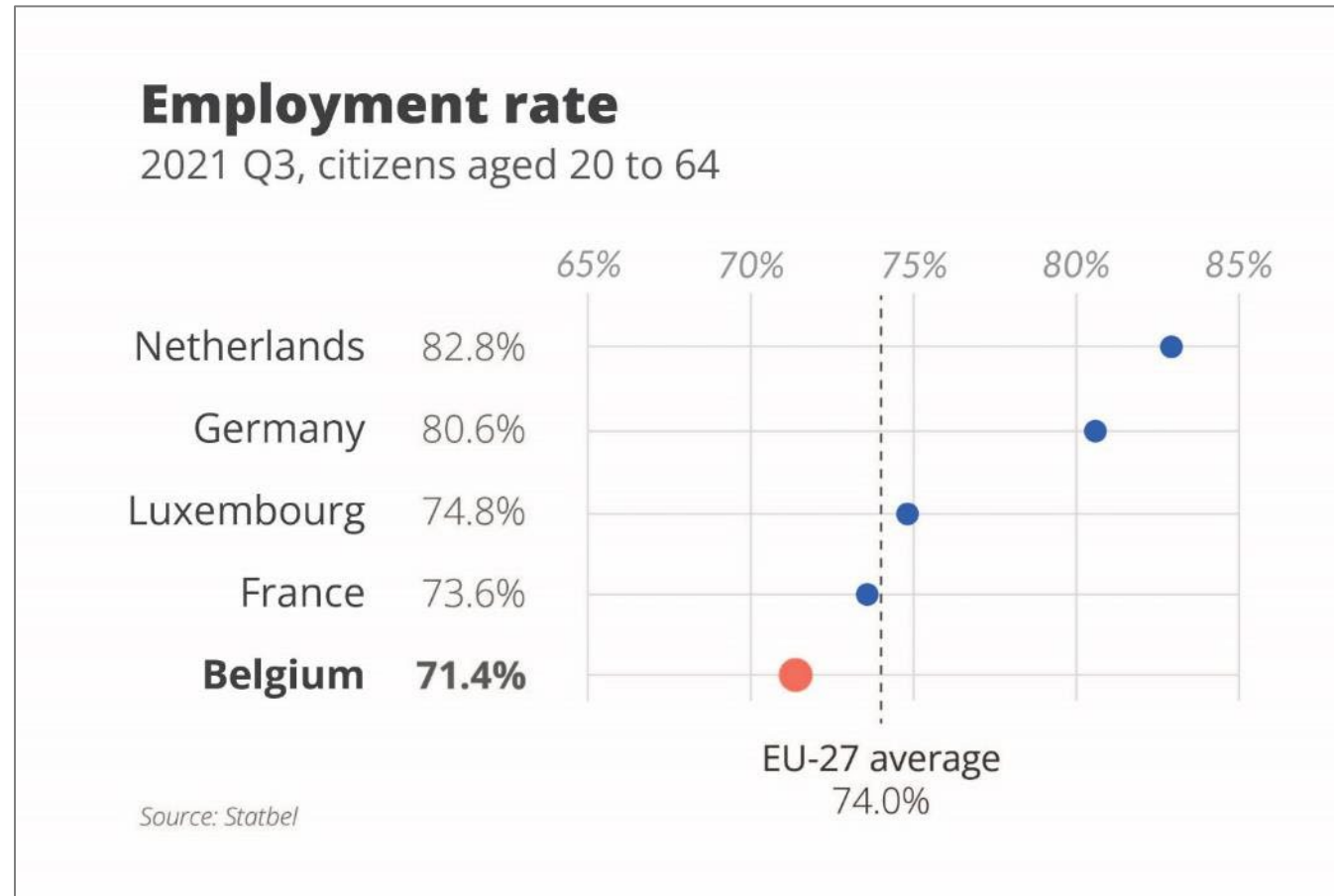
2021 Q3, citizens aged 20 to 64



Source: Statbel

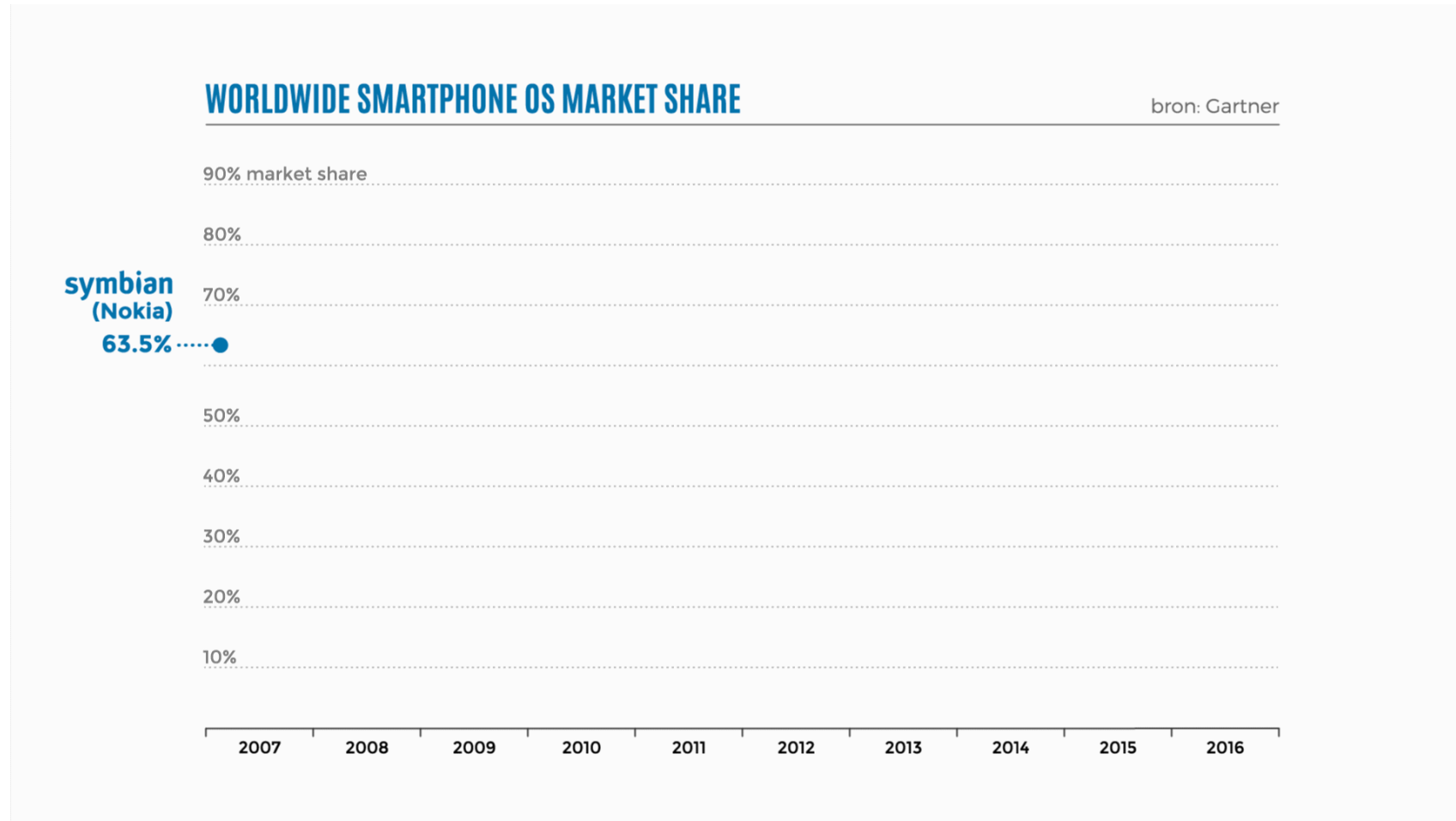
# Alternative solution

Use a dot plot



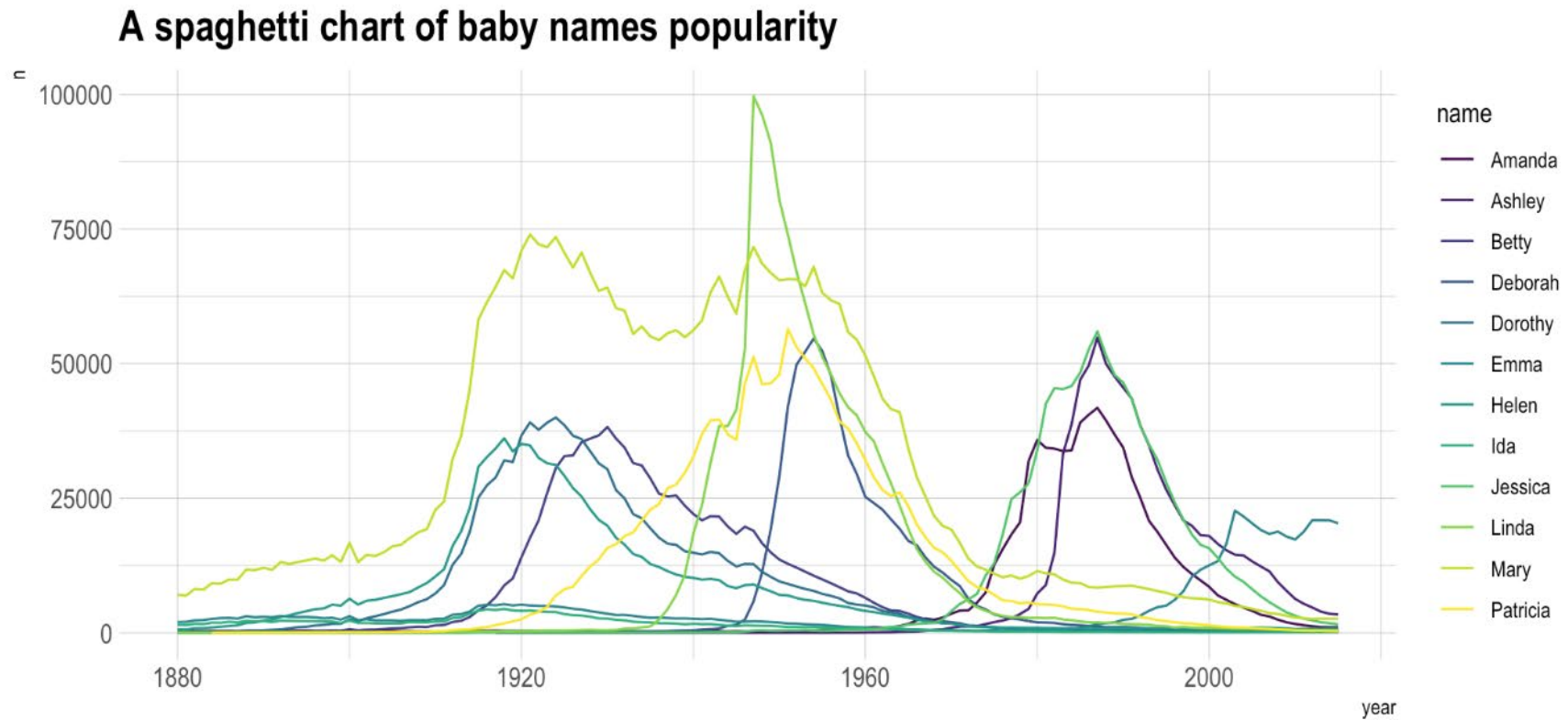
# Common chart types

## Line charts: evolution



# Pitfall

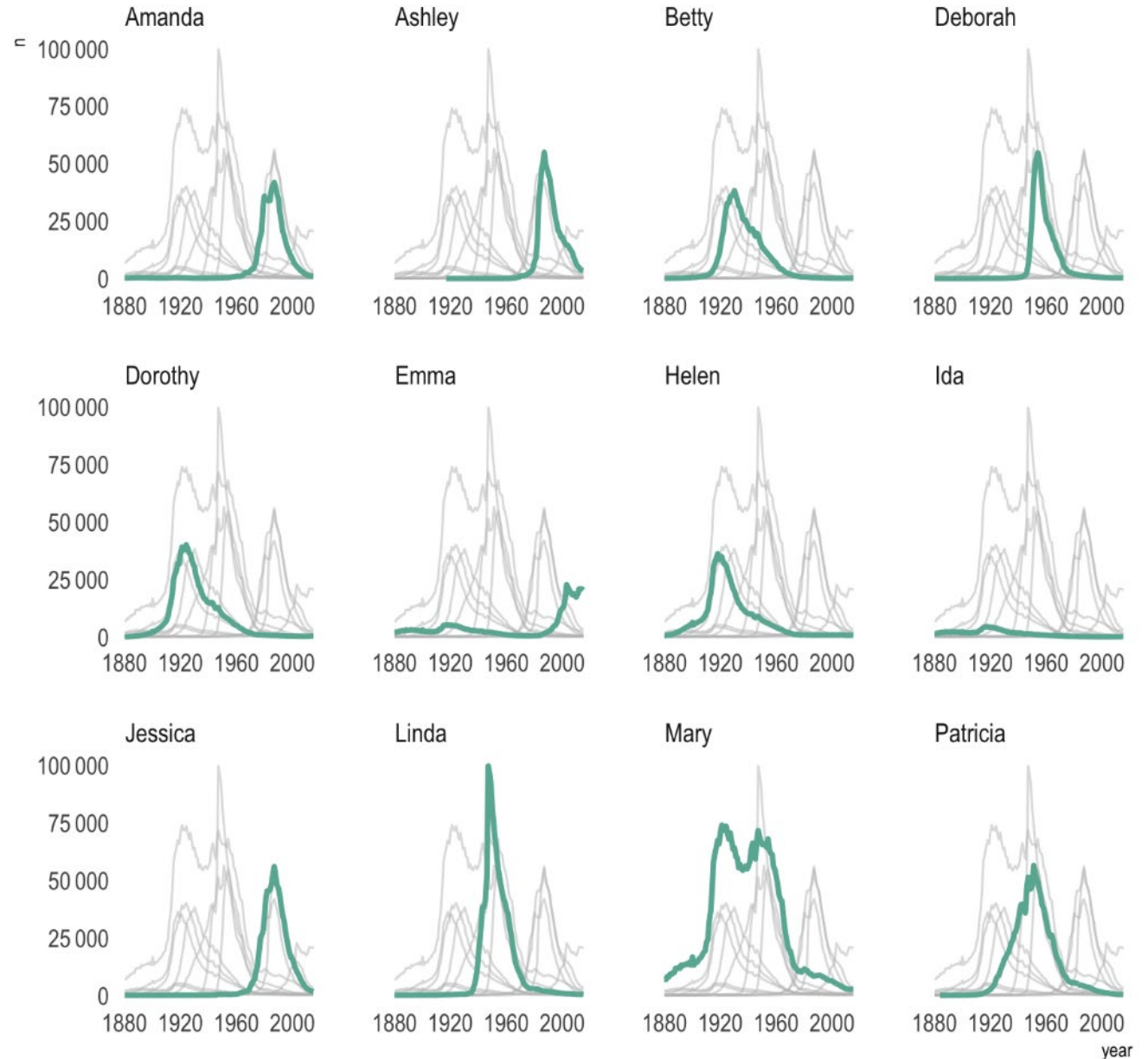
## Line chart spaghetti



# Alternative solution

Make one line stand out

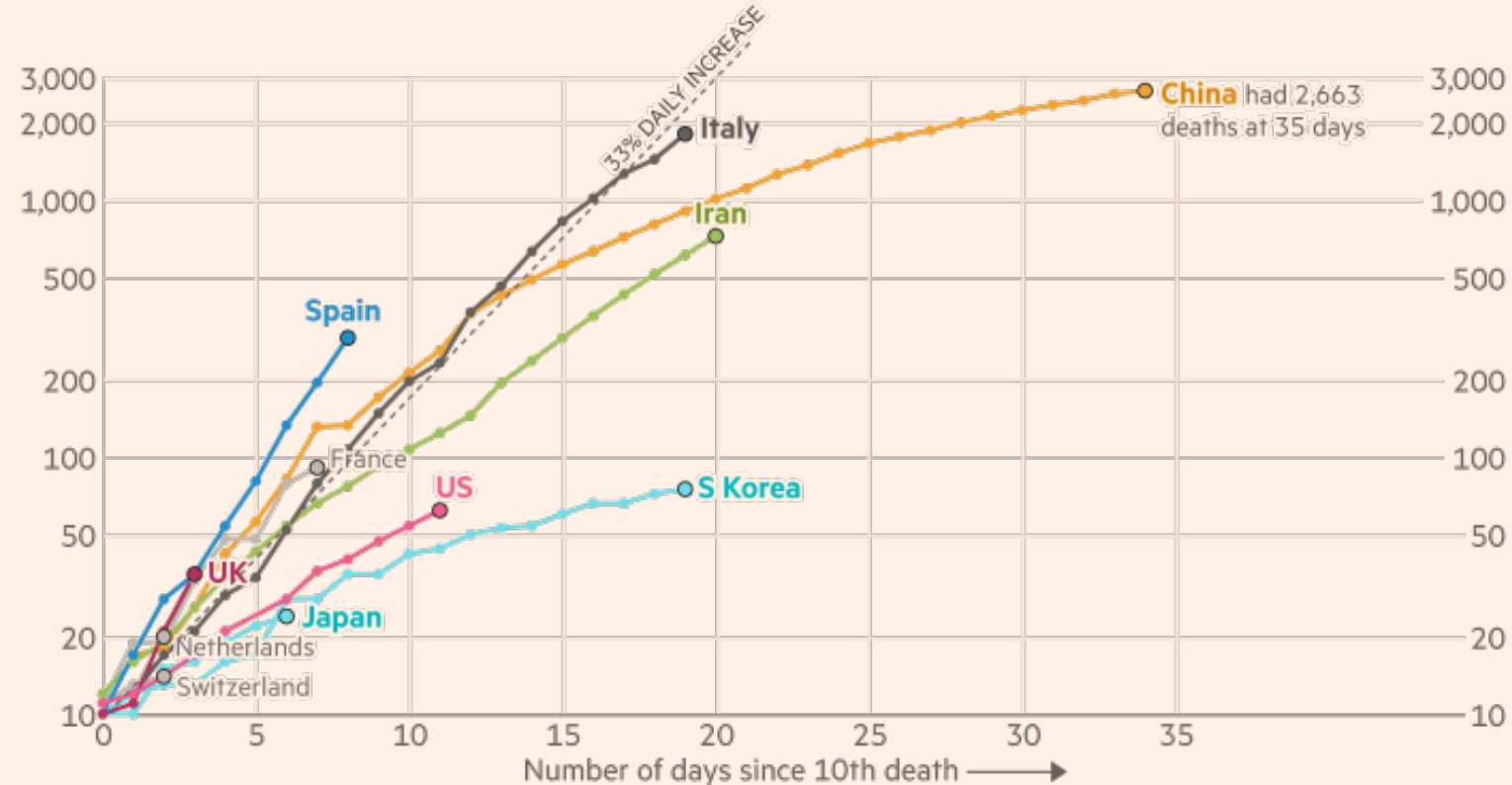
A spaghetti chart of baby names popularity





## Coronavirus deaths in Italy and Spain are increasing much more rapidly than they did in China

Cumulative number of deaths, by number of days since 10th death



FT graphic: John Burn-Murdoch / @jburnmurdoch

Source: FT analysis of Johns Hopkins University, CSSE. Data updated March 15, 17:00 GMT

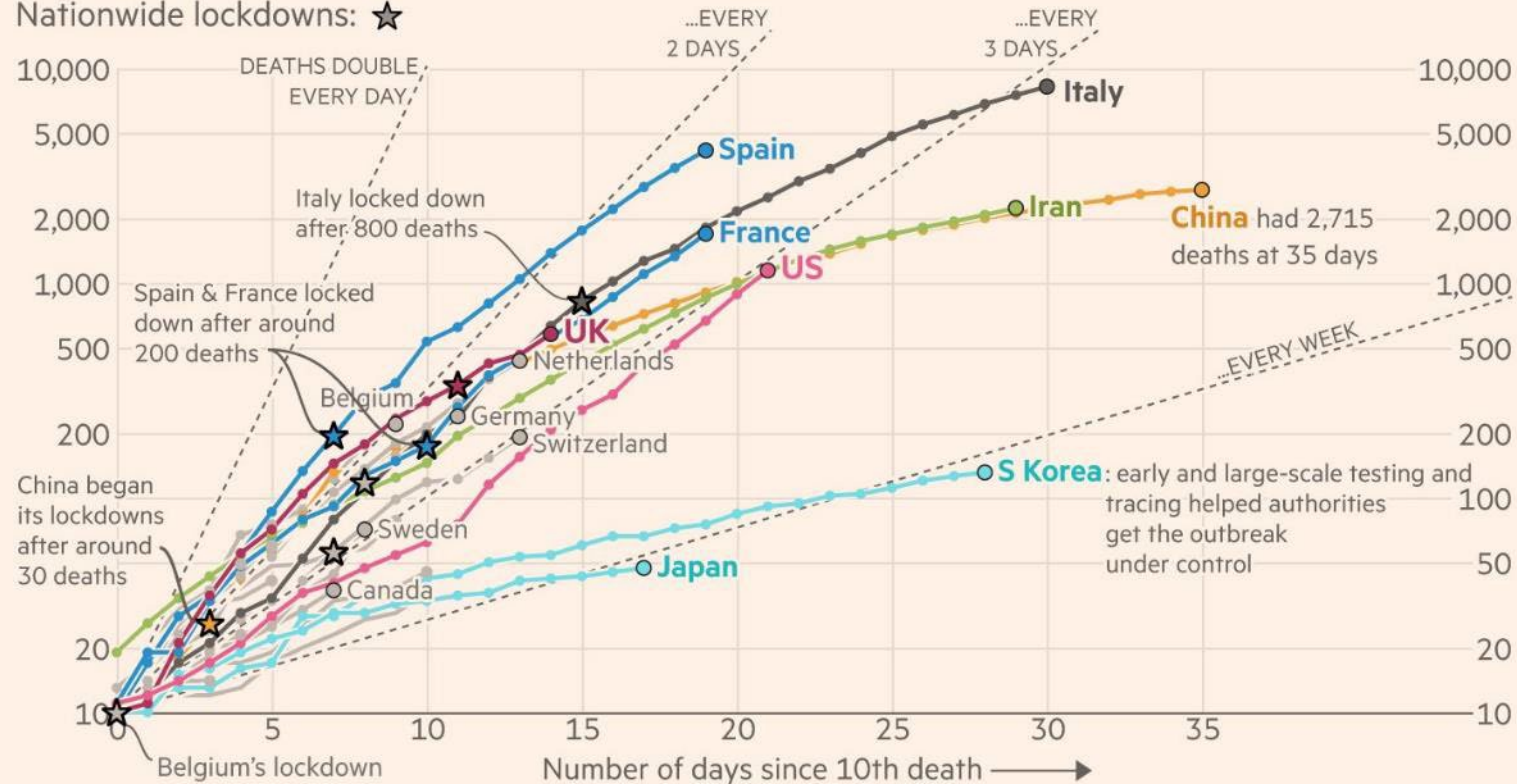
© FT

Financial Times,  
March 15, 2020

## Coronavirus deaths in Italy, Spain, the UK and US are increasing more rapidly than they did in China

Cumulative number of deaths, by number of days since 10th death

Nationwide lockdowns: ★



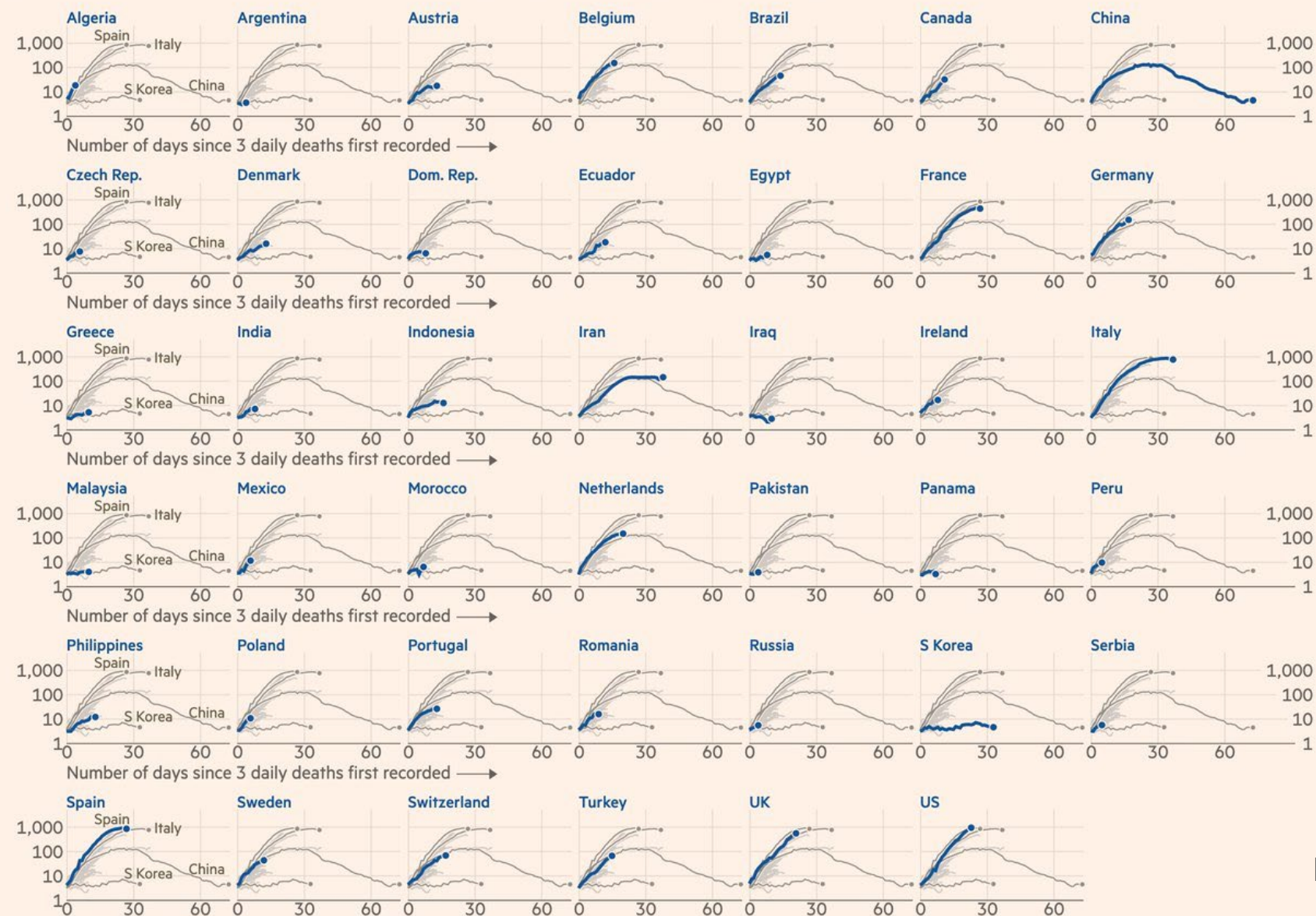
FT graphic: John Burn-Murdoch / @jburnmurdoch

Source: FT analysis of Johns Hopkins University, CSSE; Worldometers; FT research. Data updated March 26, 19:00 GMT

© FT

Financial Times,  
March 26, 2020

Daily deaths with coronavirus (7-day rolling average), by number of days since 3 daily deaths first recorded



FT graphic: John Burn-Murdoch / @jburnmurdoch

Source: FT analysis of European Centre for Disease Prevention and Control; Worldometers; FT research. Data updated April 05, 19:00 GMT

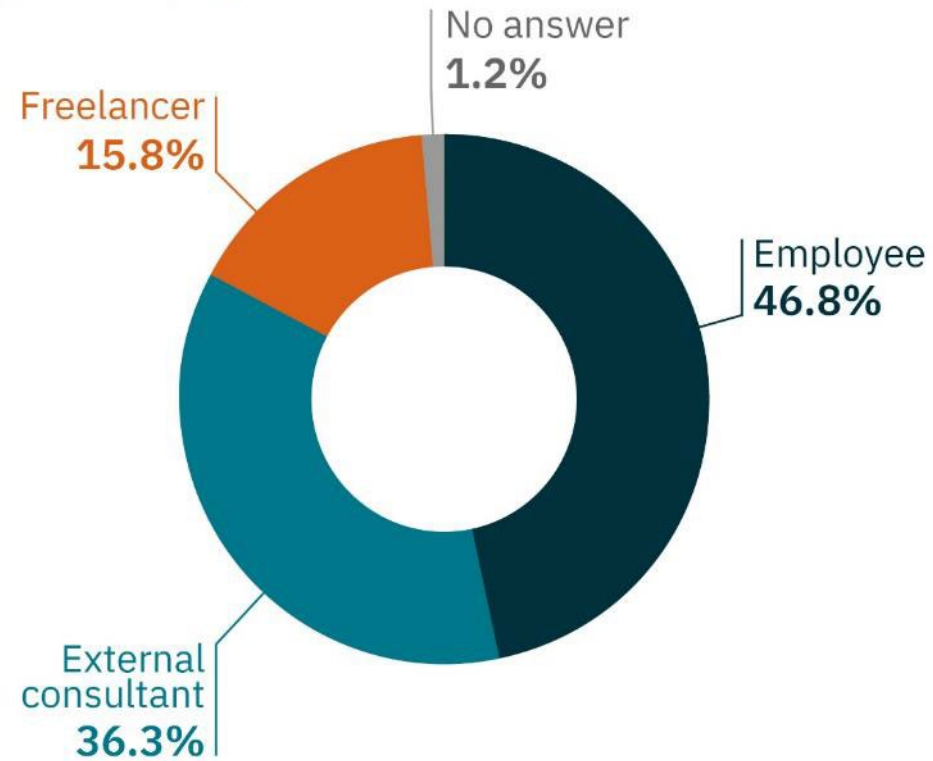
© FT

Financial Times,  
**April 5, 2020**

# Common chart types

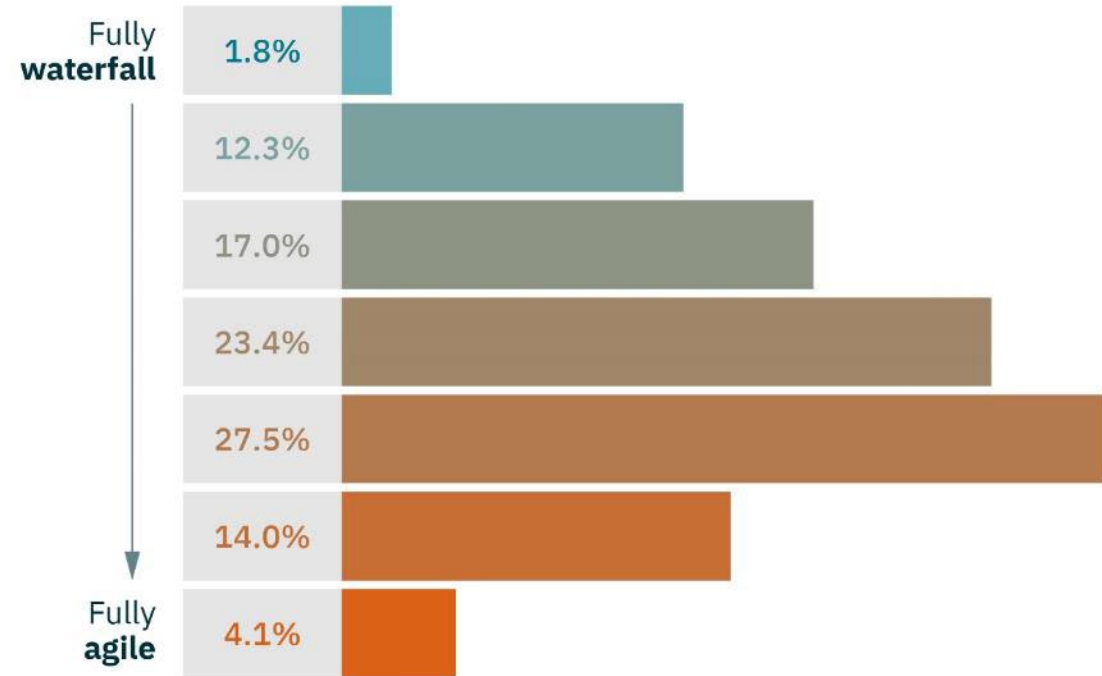
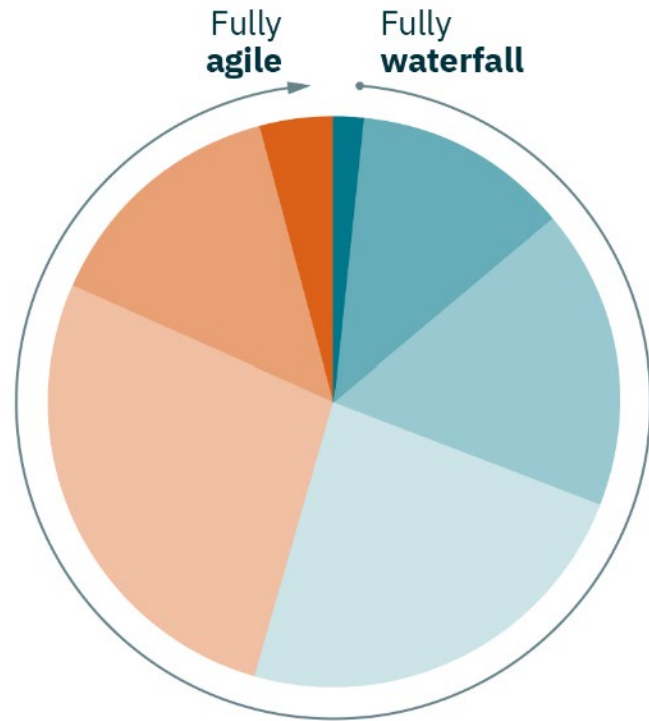
Pie charts: **part-to-whole comparison**

**Type of employment**



# Pie charts

Not well suited to compare data

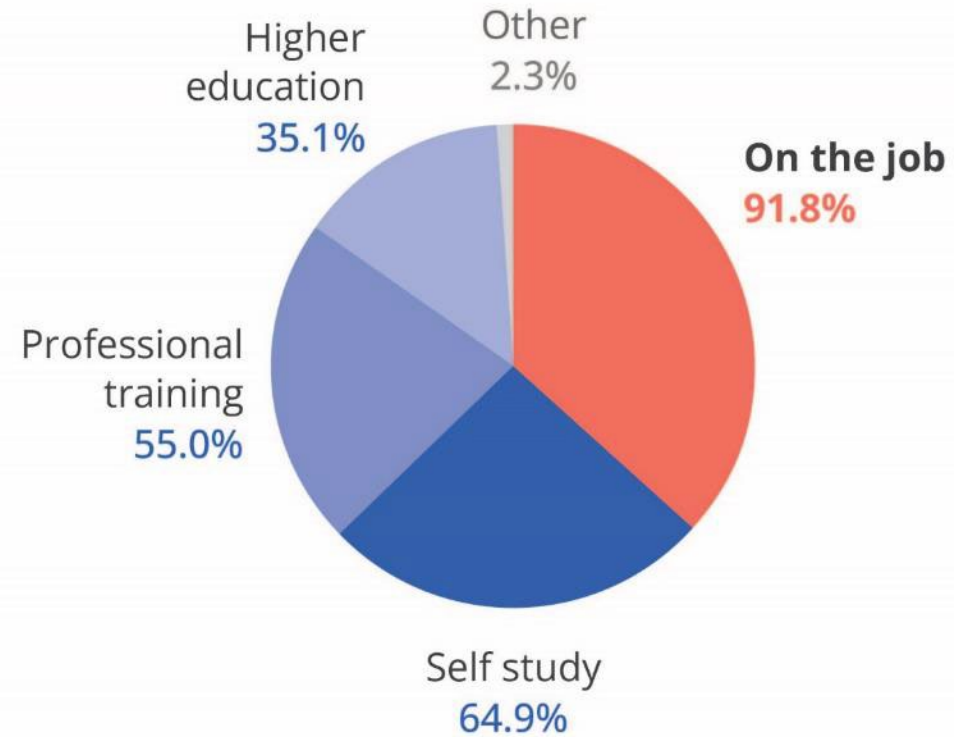




# Pitfall

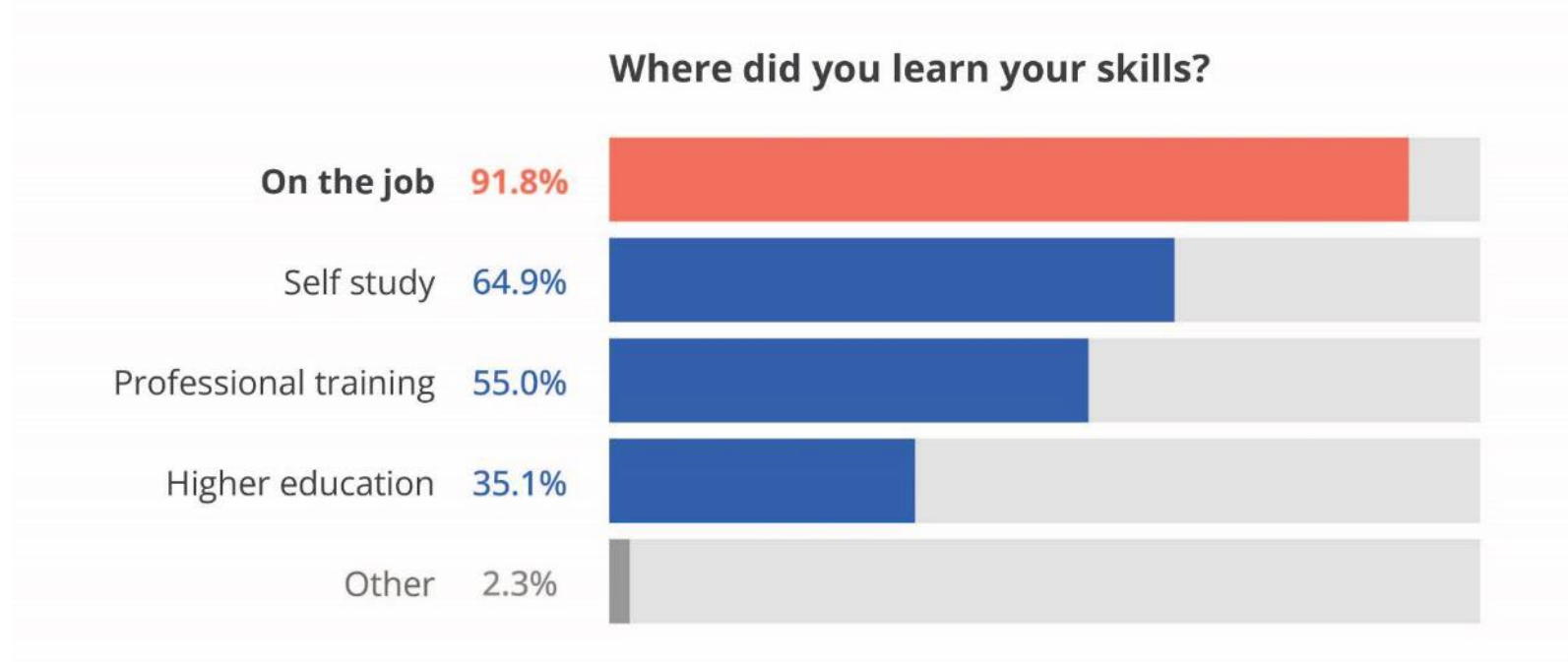
It doesn't add up

Where did you learn your skills?



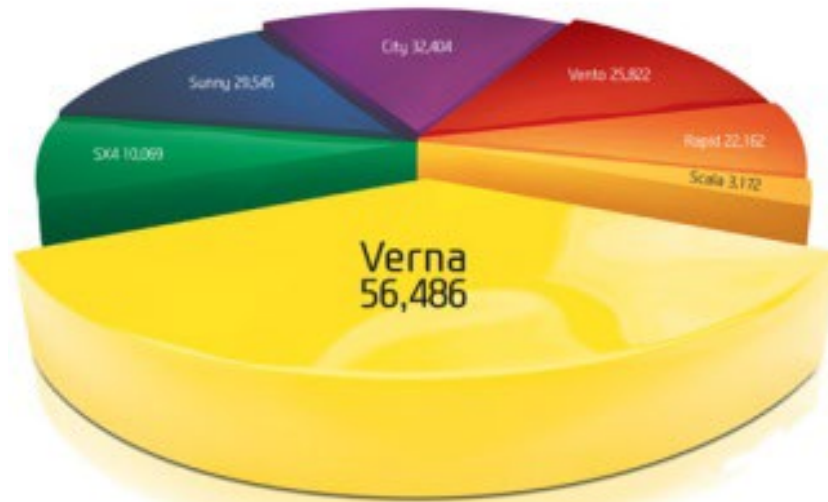
# Alternative solution

Use a bar chart



# Pitfall

## 3D pie charts



JAN-DEC 2012  
Cumulative Sales Figures  
Source: SIAM Data

The new **FLUIDIC**  
**VERNA**  
It sets you thinking

## The chartbuster rules.

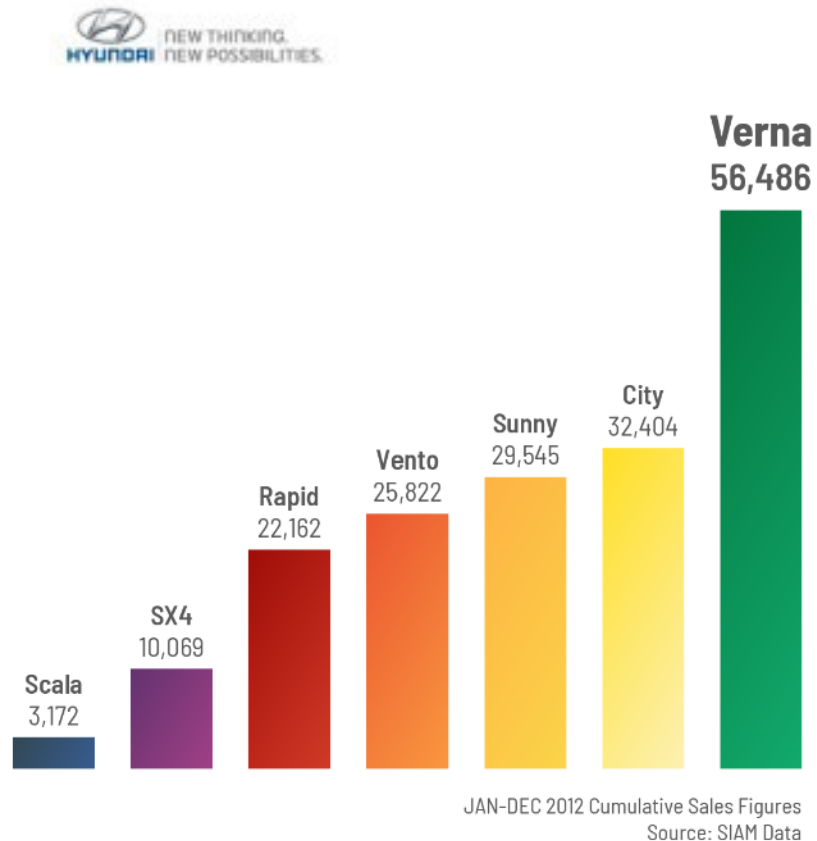
The Verna stays the undisputed No. 1 in its segment.

With its inimitable styling and superior design, the Verna has emerged as the largest selling car in its segment by a large margin. And it's not just the car that's made us the leader, it's also discerning people like you. No wonder the competition's been left behind. Far far behind.



# Alternative solution

Use a bar chart



The new FLUIDIC  
**VERNA**  
It sets you thinking

## The chartbuster rules.

The Verna stays the undisputed No. 1 in its segment.

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# Guidelines for graphs

define your goal

don't settle for the default chart



Search by Function

View by List



[www.datavizcatalogue.com](http://www.datavizcatalogue.com)

# Treemap



## Description

Treemaps are an alternative way of visualising the hierarchical structure of a [Tree Diagram](#) while also displaying quantities for each category via area size. Each category is assigned a rectangle area with their subcategory rectangles nested inside of it.

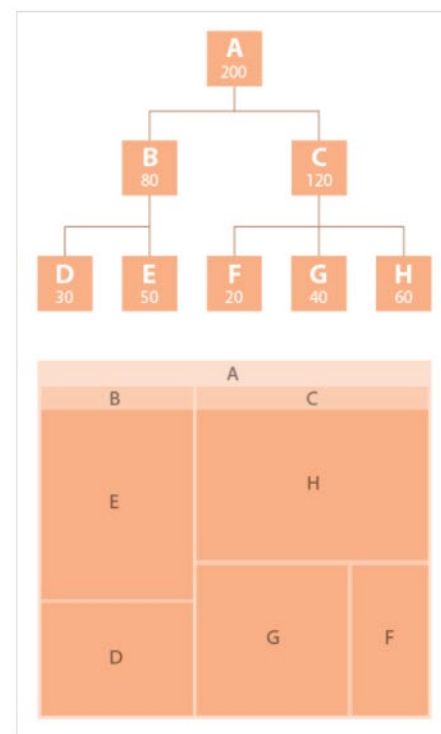
When a quantity is assigned to a category, its area size is displayed in proportion to that quantity and to the other quantities within the same parent category in a part-to-whole relationship. Also, the area size of the parent category is the total of its subcategories. If no quantity is assigned to a subcategory, then it's area is divided equally amongst the other subcategories within its parent category.

The way rectangles are divided and ordered into sub-rectangles is dependent on the tiling algorithm used. Many tiling algorithms have been developed, but the "squarified algorithm" which keeps each rectangle as square as possible is the one commonly used.

Ben Shneiderman originally developed Treemaps as a way of visualising a vast file directory on a computer, without taking up too much space on the screen. This makes Treemaps a more compact and space-efficient option for displaying hierarchies, that gives a quick overview of the structure. Treemaps are also great at comparing the proportions between categories via their area size.

The downside to a Treemap is that it doesn't show the hierarchal levels as clearly as other charts that visualise hierarchal data (such as a Tree Diagram or Sunburst Diagram).

## Anatomy



## Functions

Comparisons Hierarchy Part-to-a-whole Proportions

## Similar Charts



Circle Packing



Marimekko Chart



Sunburst Diagram

## Tools to Generate Visualisation

[AnyChart \(code\)](#)

[amCharts \(code\)](#)

[D3 \(code\)](#)

[Datamatic](#)

[Google Charts \(code\)](#) or [Google Docs](#)

[Infogram](#)

[jChartFX \(JavaScript plugin\)](#)

[JSCharting \(JS Library\)](#)

[RAWGraphs](#)

[Slemma](#)

[Vega \(code\)](#)

[Vizzlo](#)

[ZingChart \(code\)](#)

## Examples

[Region-wise Literacy Rates in 2015, World Population - FusionCharts](#)

[Top 10 Chinese Exports to the World - AnyChart](#)

[Treemap - Datamatic](#)



Need to access this page offline?  
Download the eBook from here.



Merchandise & other related dataviz  
products can be found at the store



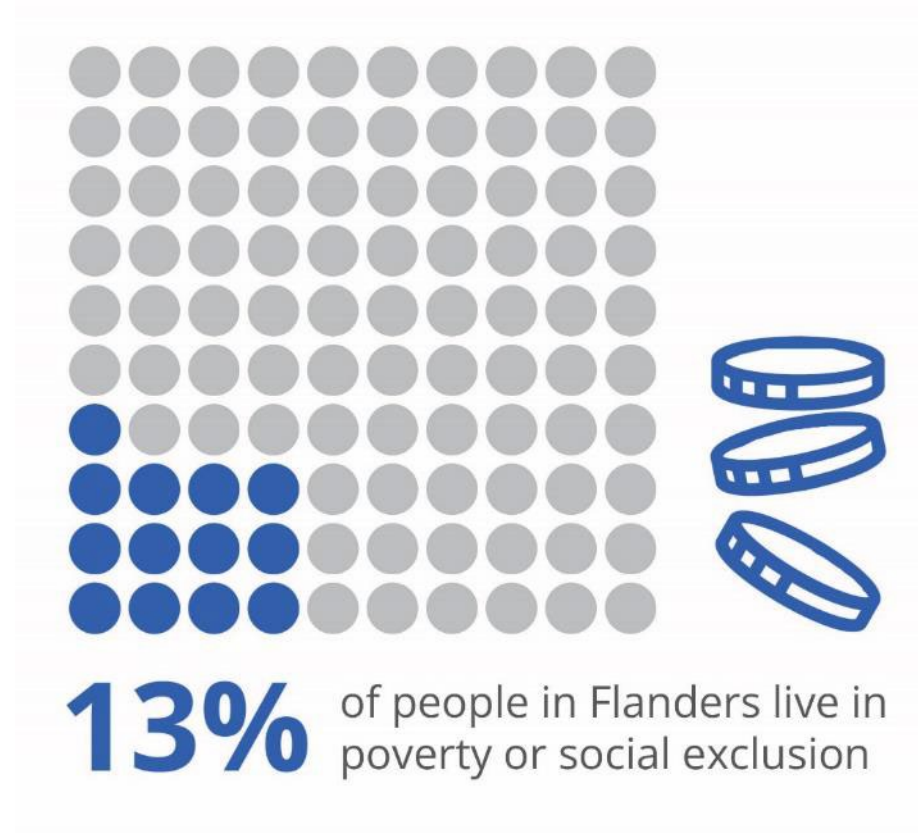
Filter by chart name or AKA

Reference Type: Example Solution | Chart Families: Categorical Hierarchical Relational Temporal Spatial

	Amazon QuickSight	ArcGIS	ChartJS	Charticulator	D3.js	Data Illustrator	Datawrapper	Flourish	FusionCharts	Gephi	Google Charts	Google Data Studio	Highcharts	Infogram	JetPack Data	JMP	Keshif	Kibana	Leaflet.js	Mapbox	Matplotlib
Bar chart	●			●	●●●	○	●●●	○	○		●●	○	●●●	○	○	●	●	●			○●○
Clustered bar chart	●				●	○	●●●	○	○		●●				○	●	●	●			●
Bullet chart				●	●		●●		○							●					
Waterfall chart				●	●				○		●		○	○							
Radar chart			○		●				○				○								○
Polar chart			●	●	●								○								○
Connected dot plot					●●	○	●●●	●													
Pictogram					○									○				●			
Proportional shape chart					●●●	○		○	○		●										
Word cloud					●			○						○	●			●			●●
Heat map	●			●	○	○			○				○			●		●			●●
Matrix chart				●	○			○				○					●				
Dot plot					●		●●	●								●●		○			

# Less common chart types

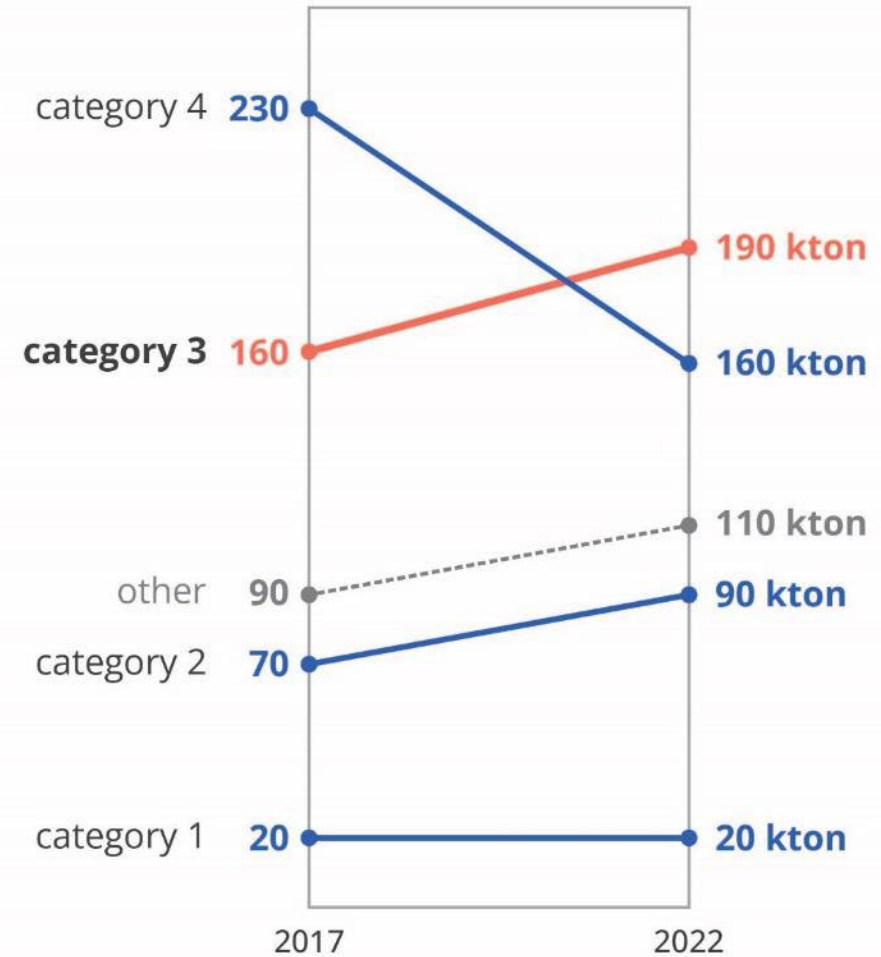
## Waffle charts



# Less common chart types

## Slopegraphs

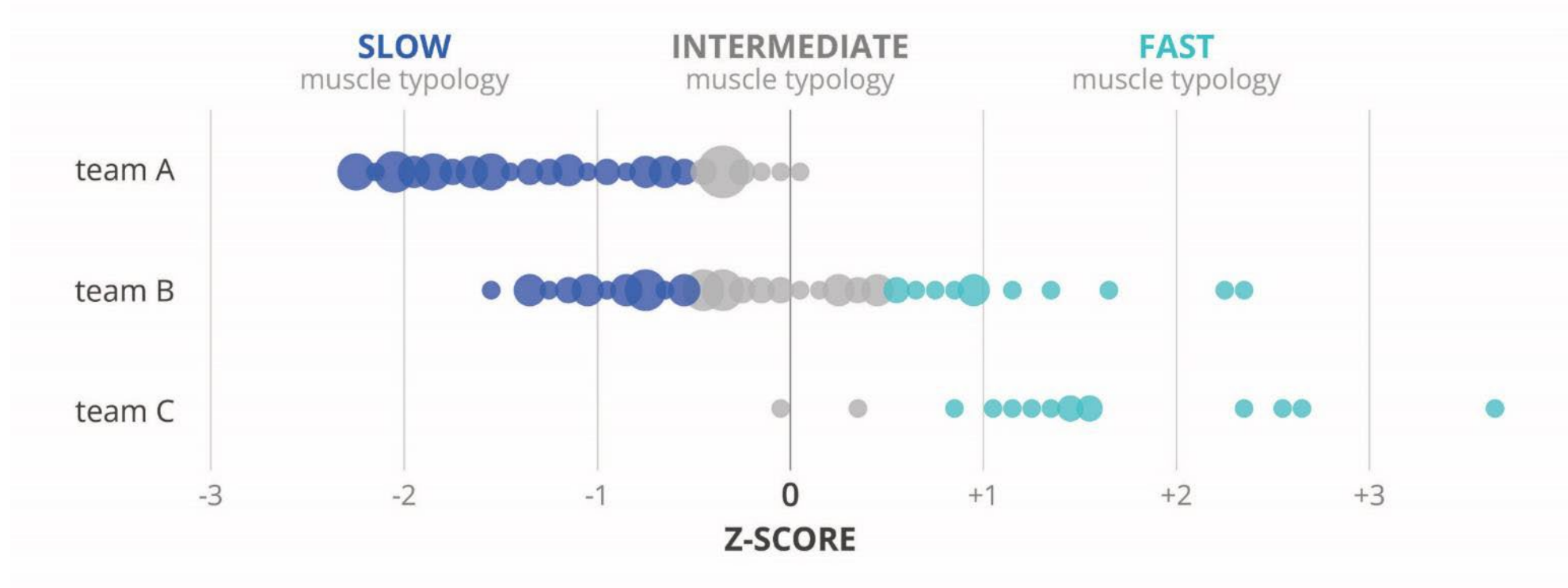
**The market demand for category 3  
has grown to become the most important**





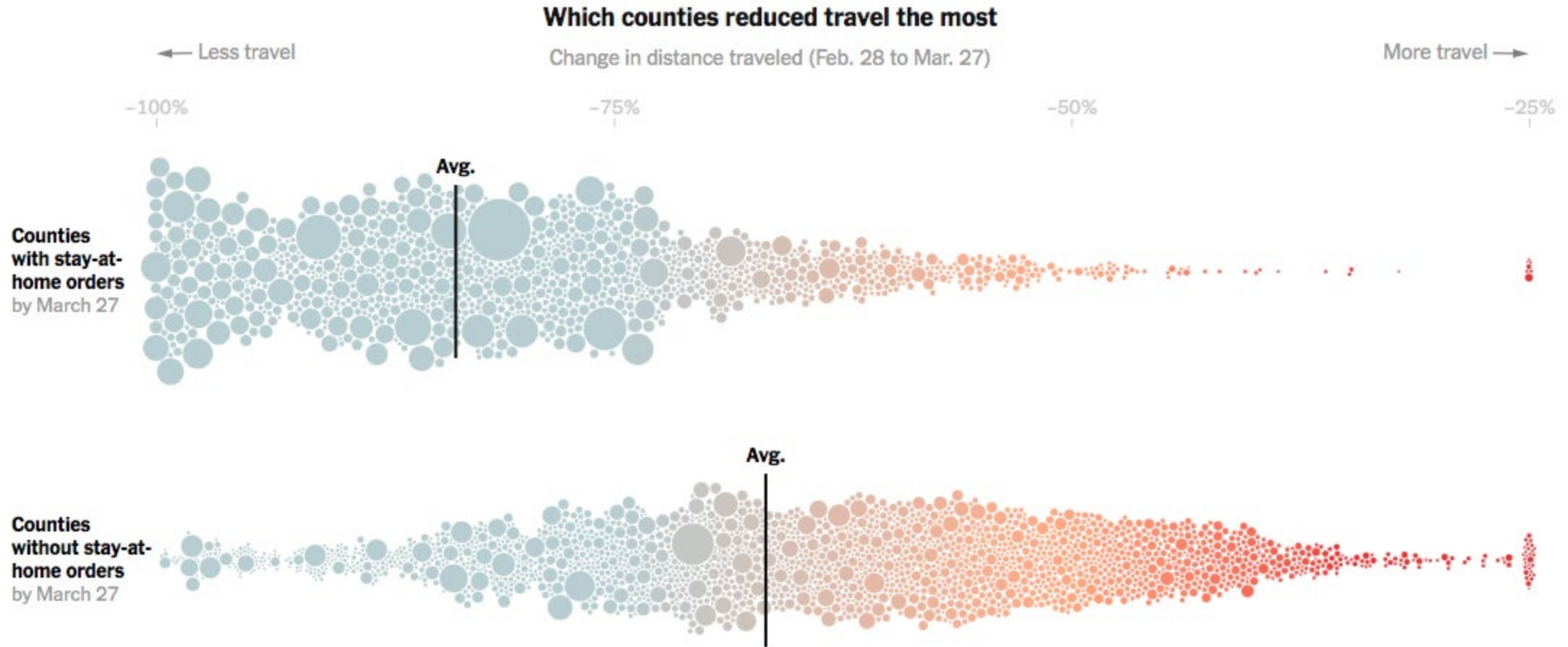
# Less common chart types

## Strip charts



# Less common chart types

## Beeswarm plots

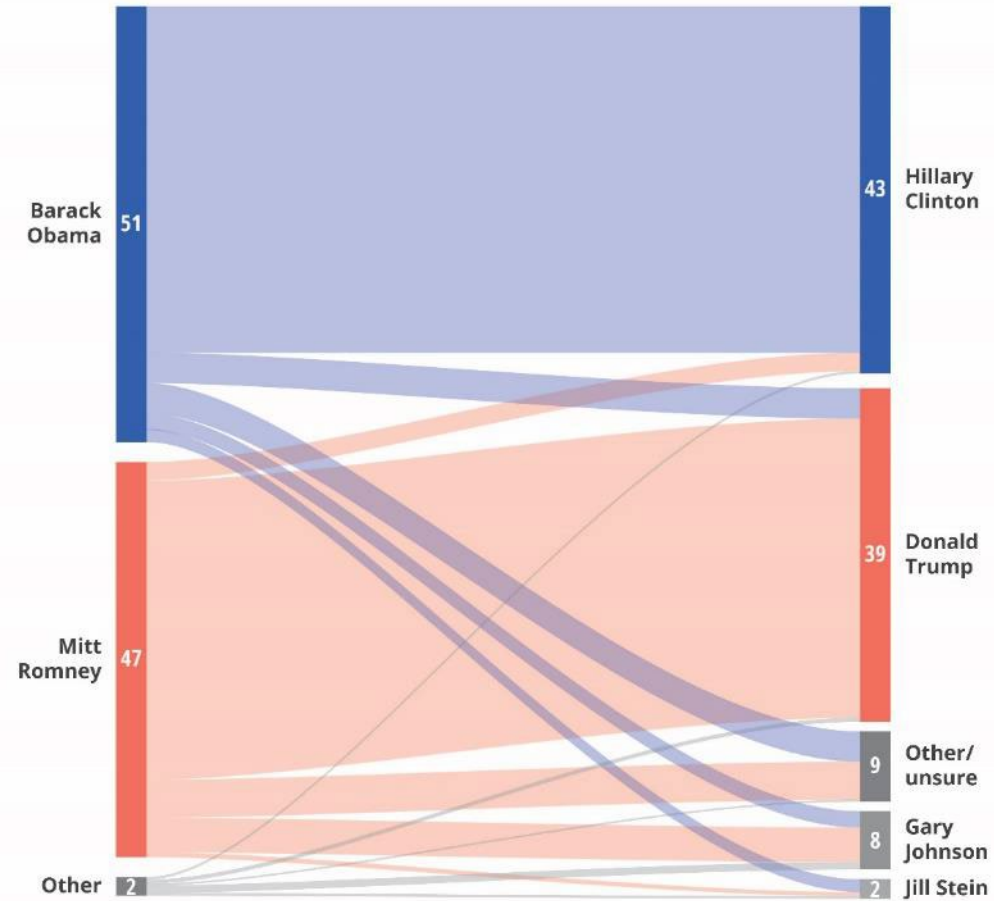


# Less common chart types

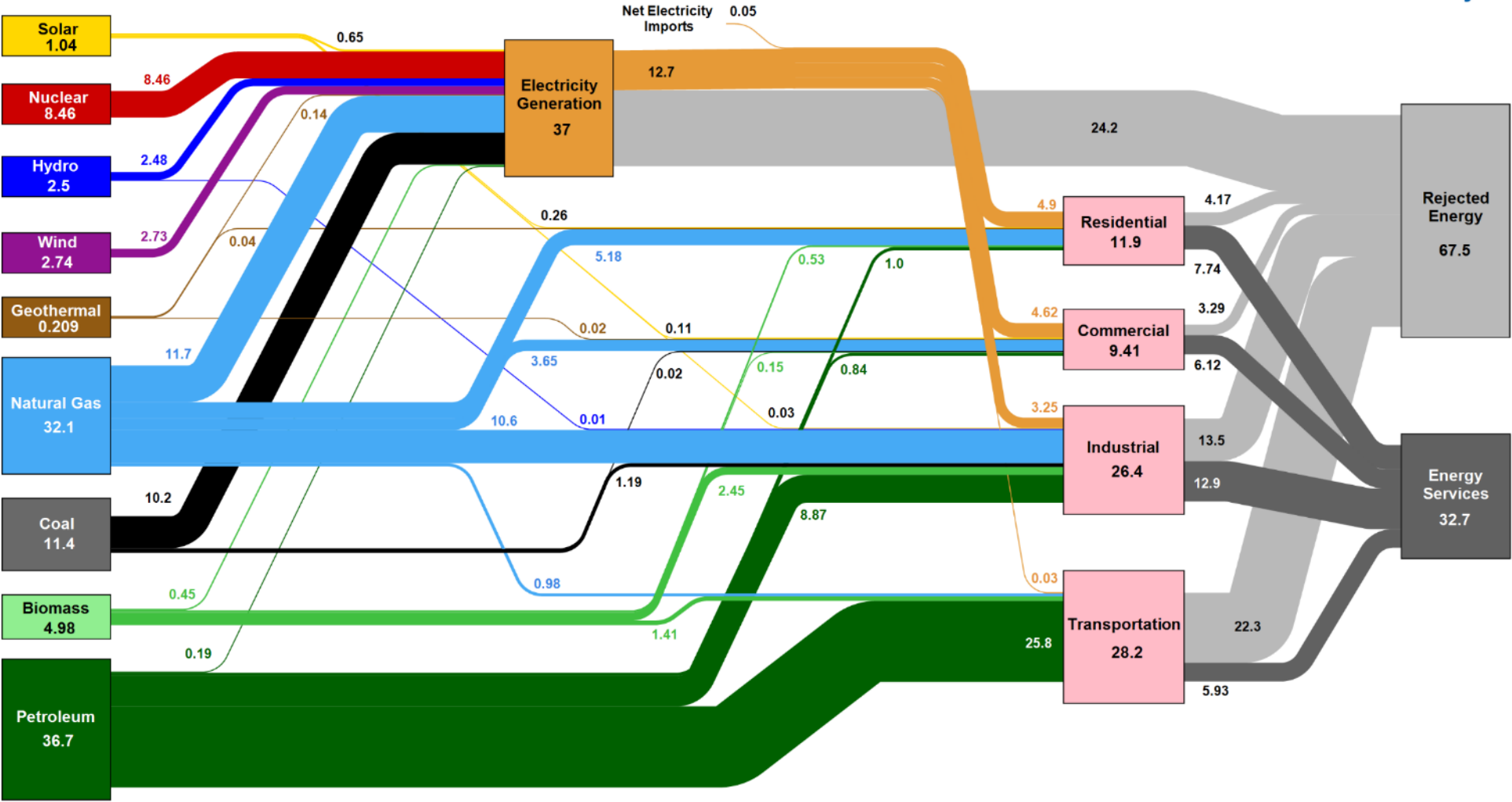
## Sankey diagrams

### Voting shifts

Candidate support in the 2012 presidential election, and 2016 voting intentions.  
Source: YouGov | Adapted from The Economist



Estimated U.S. Energy Consumption in 2019: 100.2 Quads



Source: LLNL March, 2020. Data is based on DOE/EIA MER (2019). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 21% for the transportation sector and 49% for the industrial sector, which was updated in 2017 to reflect DOE's analysis of manufacturing. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

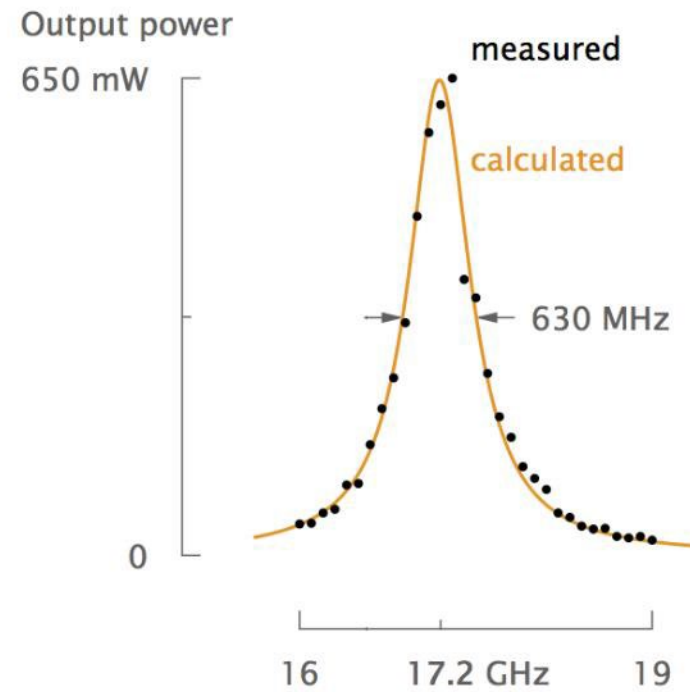
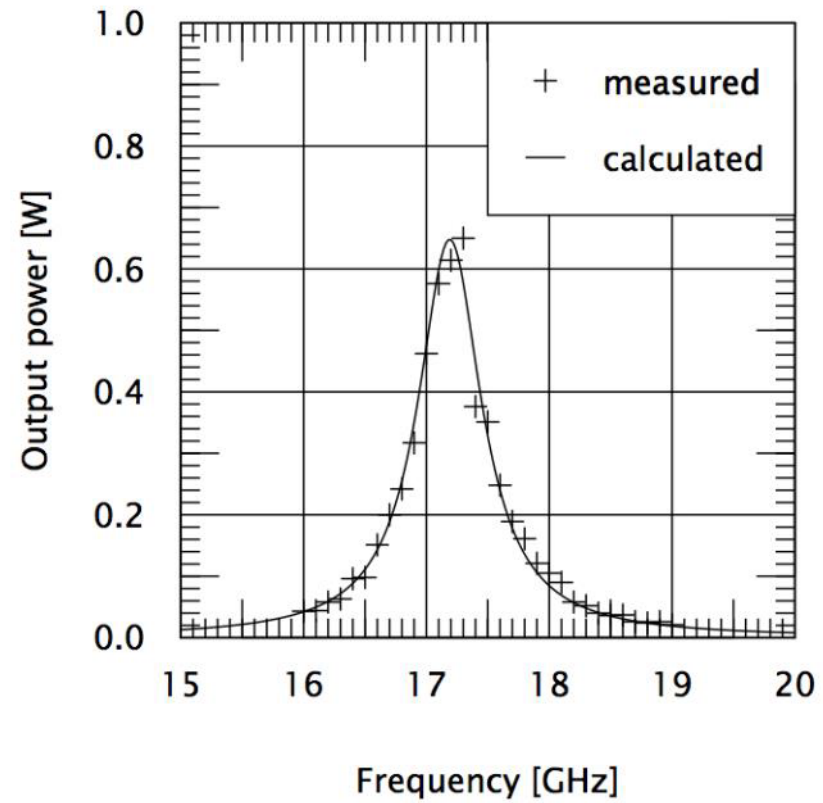
# Guidelines for graphs

define your goal

don't settle for the default chart

maximize the signal-to-noise ratio





**Noise = physical noise**

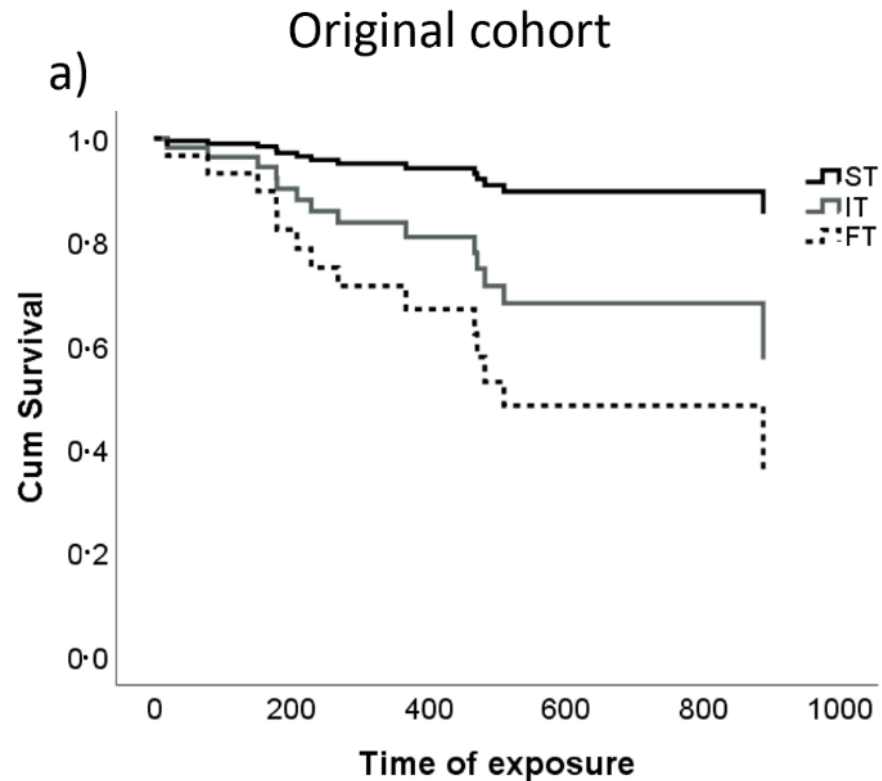
elements which are on the visual  
but are not helpful

**+ mental noise**

thinking work required  
from your audience

# How would you do it?

Write down at least 5 things you would change to improve this visual



## ORIGINAL

Increased injury  
fast-twitch mus

80% of athletes inju

talking about injuries,  
not 'survival'

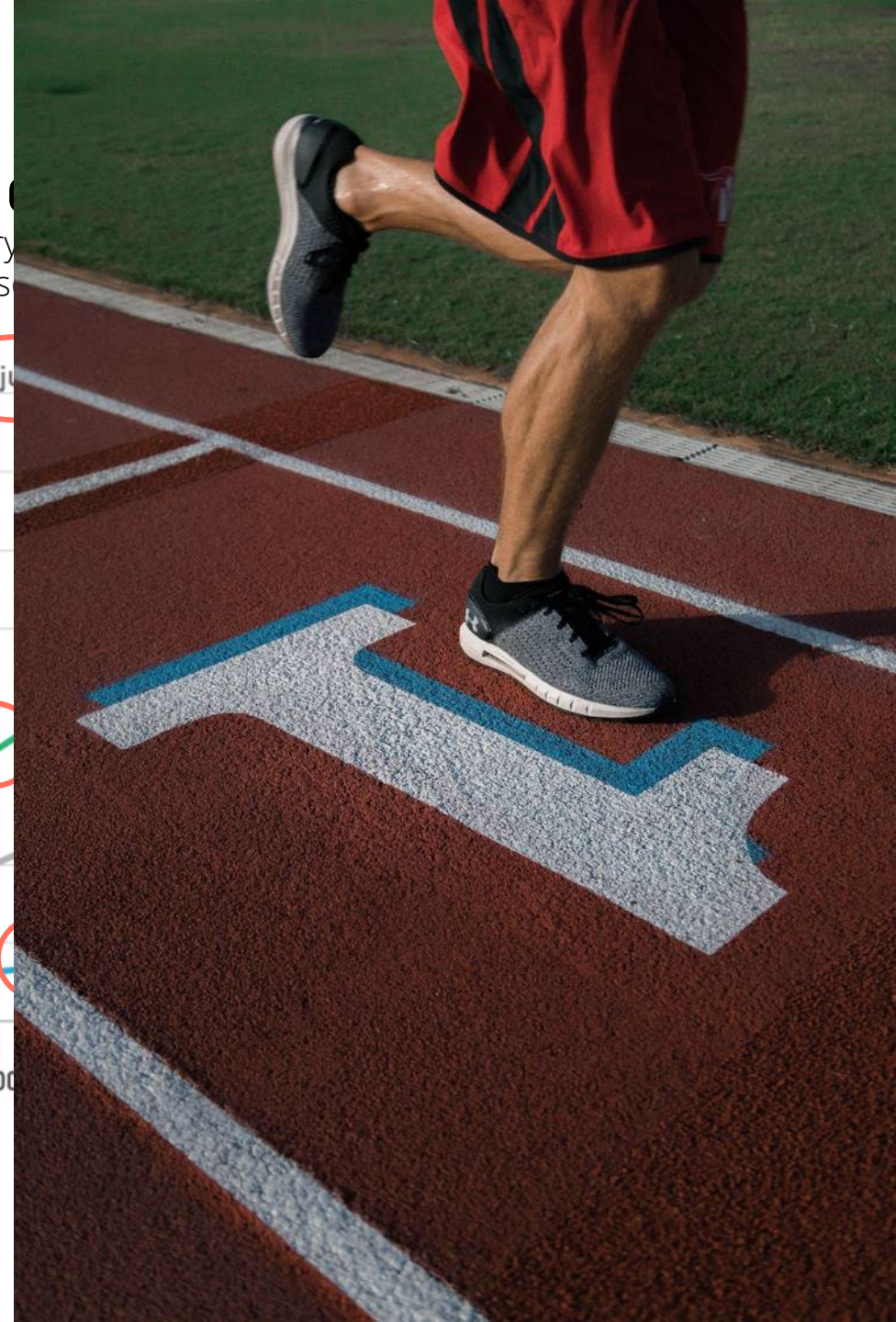
60%

linear interpolation  
gives a better idea  
than stepwise

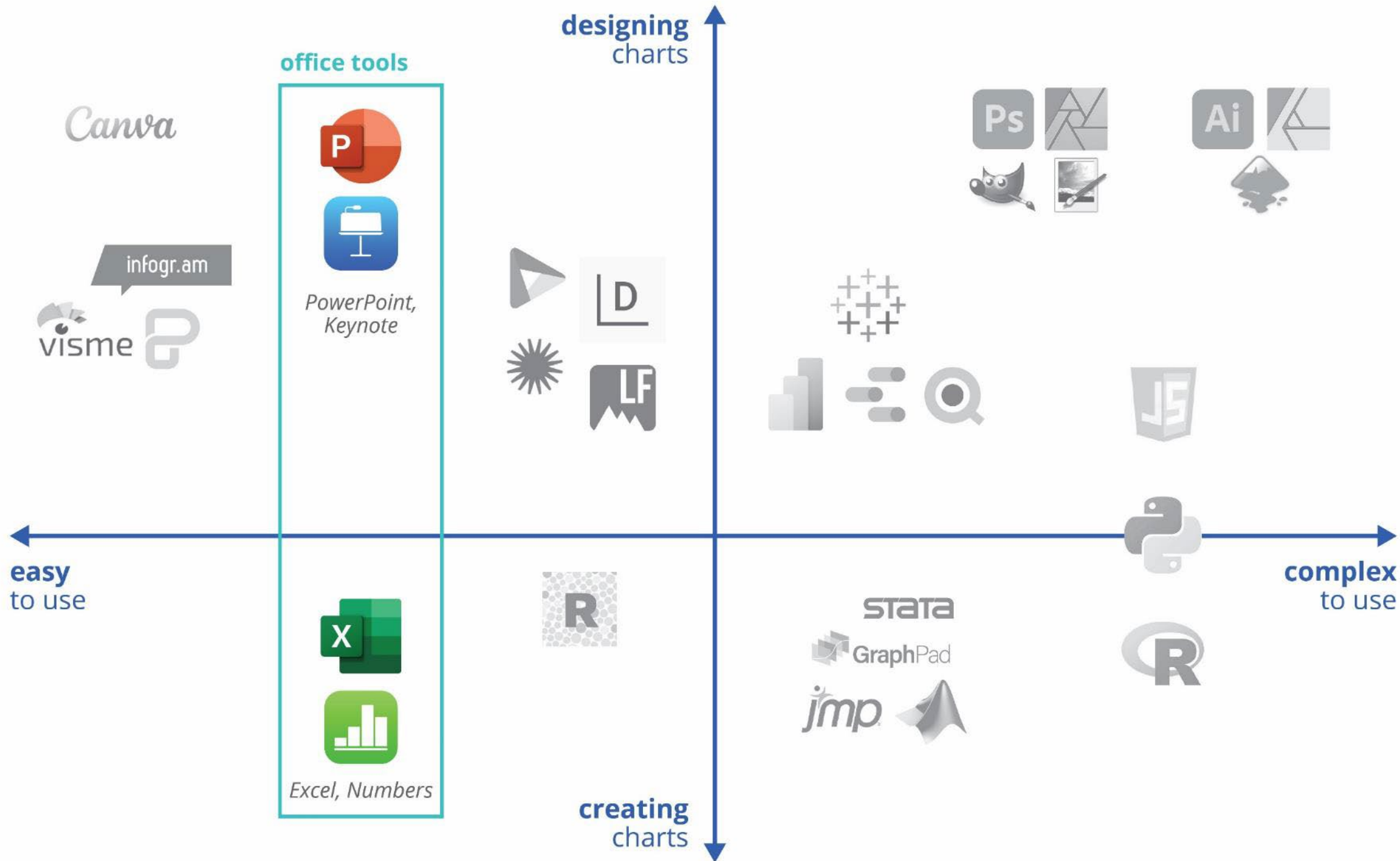
20%

0 400

add color to better  
differentiate lines



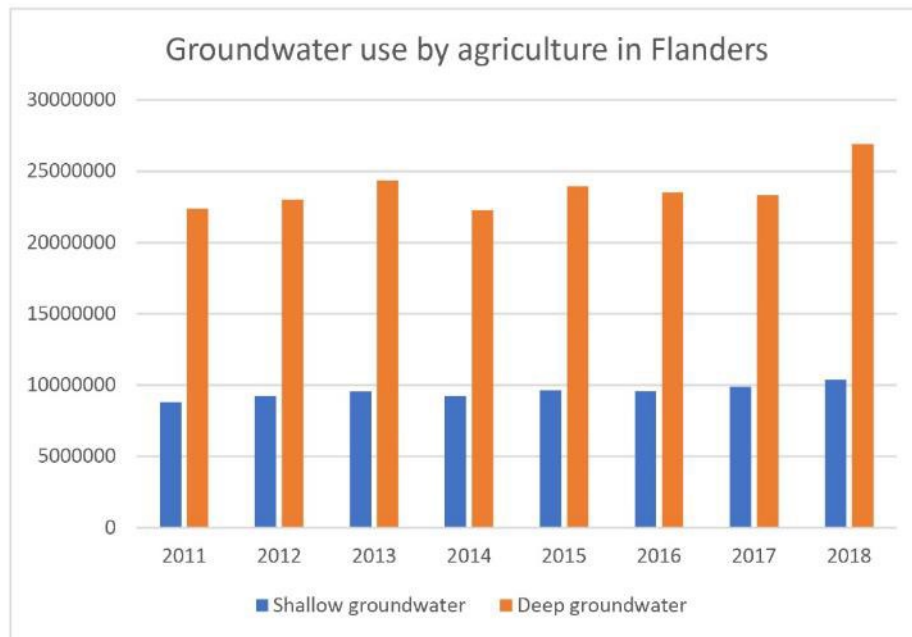






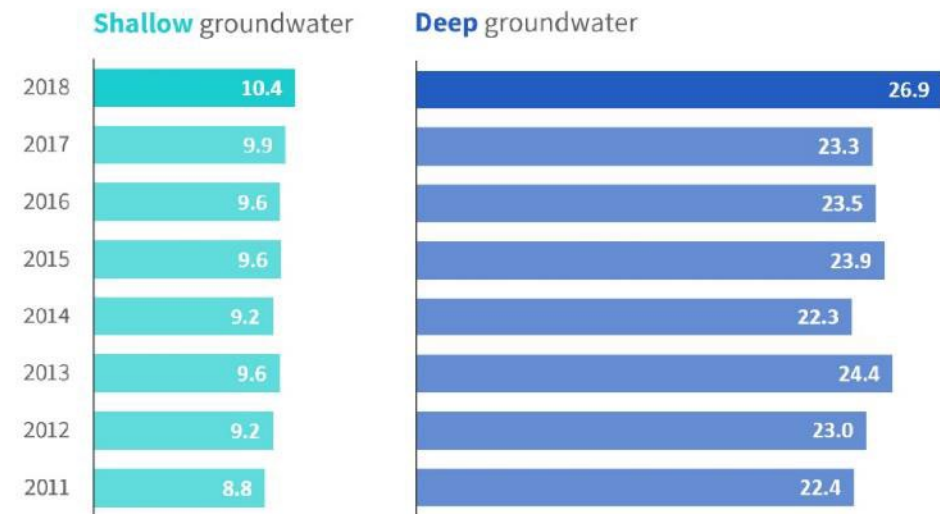
# Available tools

## Spreadsheet tools



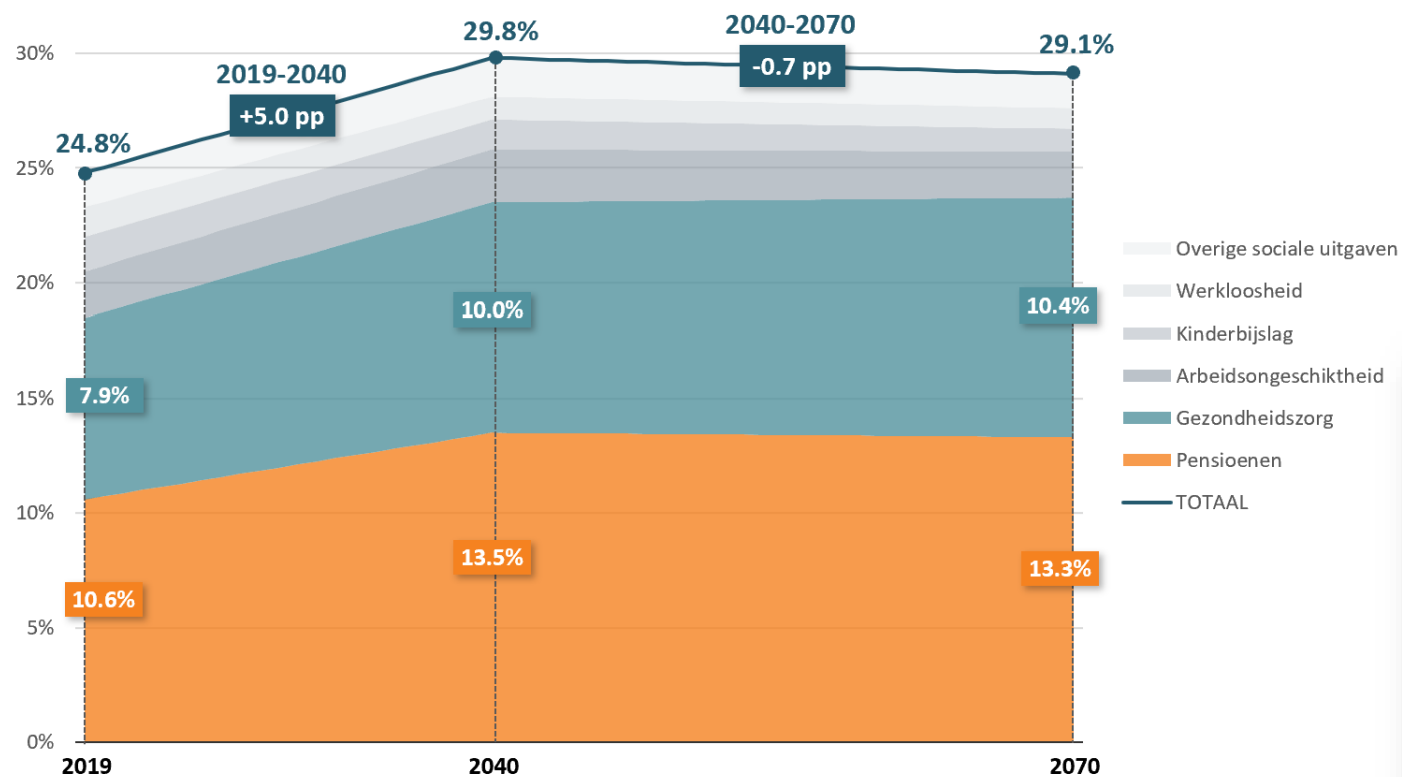
### Groundwater use has never been higher

groundwater used by agriculture in Flanders | in million m<sup>3</sup>



## Evolutie van de budgettaire kosten van de vergrijzing op lange termijn

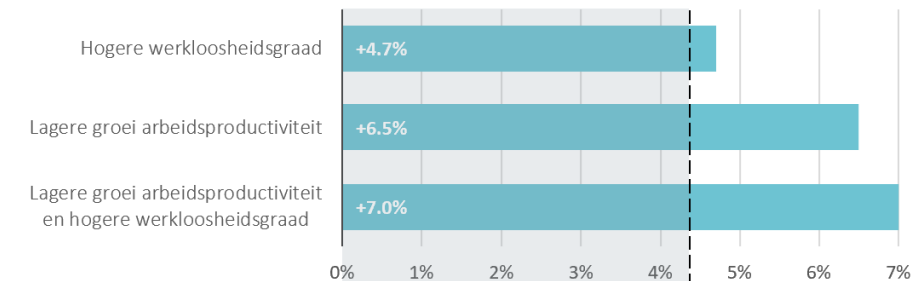
Volgens het SCvV-referentiescenario van juli 2020  
in procent van het bbp



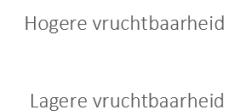
## Evolutie van de budgettaire kosten van de vergrijzing tussen 2019 en 2070

Volgens het referentie- en alternatieve scenario's  
in procentpunt van het bbp

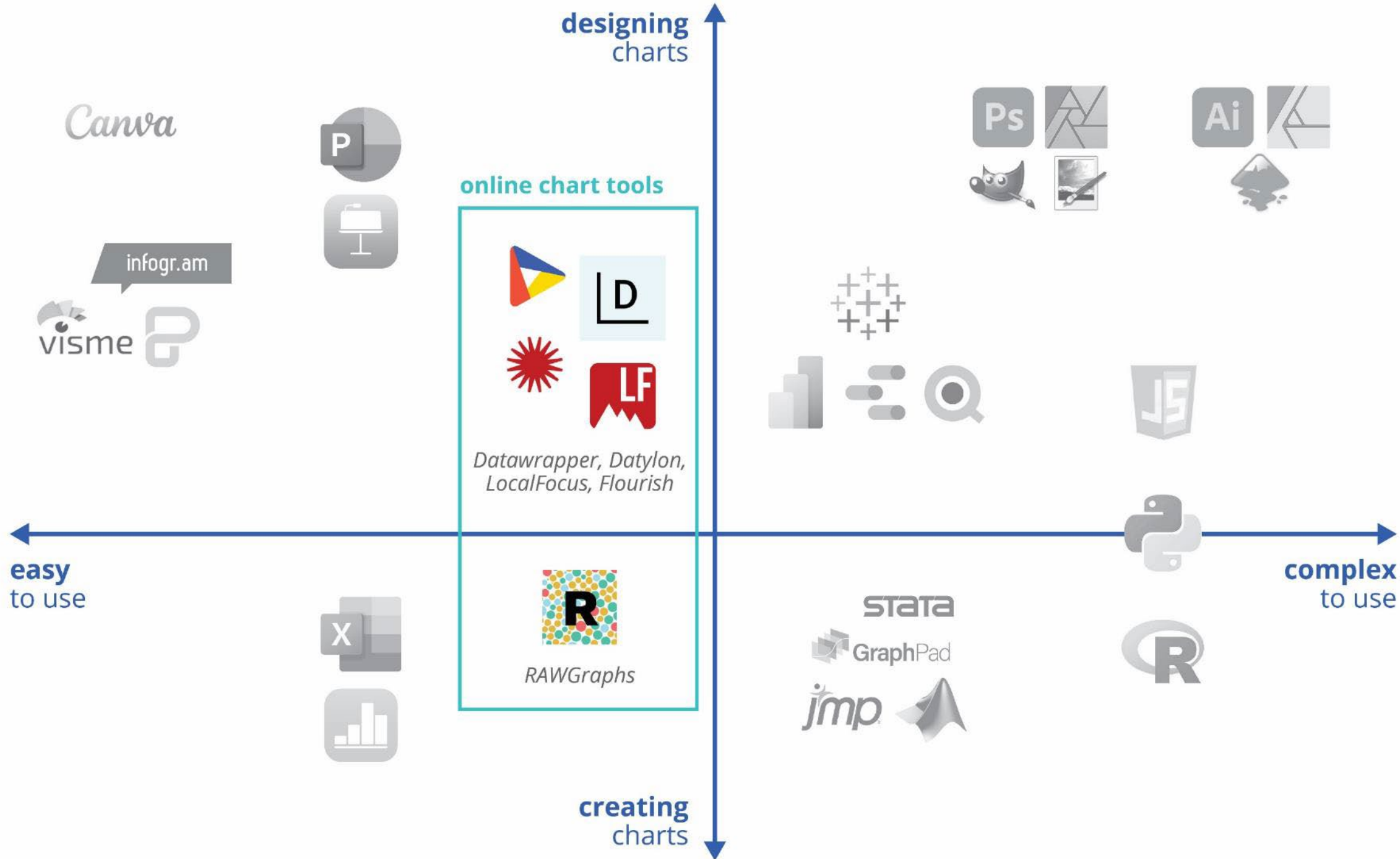
### Macro-economische factoren



### Demografische factoren



Referentiescenario  
+4.3%



## 1. Load your data

### DATA PARSING OPTIONS

Column separator Thousands separator Decimals separator Date Locale 

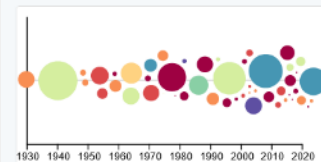
### DATA TRANSFORMATION

Stack on [Reset](#)[Change data](#)

#	year	state	state_po	party_simplified	party_detailed	number of votes
1	1976	Alabama	AL	Democrat	Democrat	659178
2	1976	Alabama	AL	Republican	Republican	584878
3	1976	Alabama	AL	Other	American Independent	9198
4	1976	Alabama	AL	Other	Prohibition	6669
5	1976	Alabama	AL	Other	Communist Party Use	1954
6	1976	Alabama	AL	Libertarian	Libertarian	1481
7	1976	Alabama	AL	Other		388

4287 rows (30009 cells) have been successfully parsed, now you can choose a chart!

## 2. Choose a chart

Show 

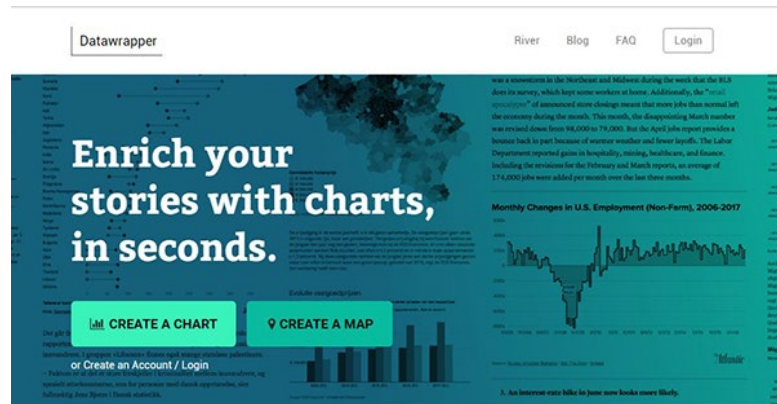
### Beeswarm plot

It displays the distribution of items over a continuous dimensions. Each (line) is represented with a dot placed on the horizontal axis. The vertical dimension is used to avoid overlaps among circles, showing their distribution. The area of dots can be used to encode a further quantitative dimension and a quantitative or categorical dimension with color.

[Code](#) [Tutorial](#)**Alluvial Diagram**  
Correlations, proportions**Arc Diagram**  
Networks**Bar chart**  
Correlations**Multi-set bar chart**  
Correlations, proportions**Stacked bar chart**  
Correlations, proportions**Beeswarm plot**  
Distributions, time series, proportions**Box plot**  
Distributions**Bubble chart**  
Correlations, proportions**Bumpchart**  
Time series, correlations, proportions**Circle Packing**  
Hierarchies, proportions**Circular dendrogram**  
Hierarchies, proportions**Contour plot**  
Correlations, distributions**Convex hull**  
Correlations, proportions**Linear dendrogram**  
Hierarchies, proportions**Hexagonal binning**  
Correlations, distributions**Line chart**  
Time series, correlations**Matrix Plot**  
Correlations, time series, proportions**Radar Chart**  
Correlations

# Available tools

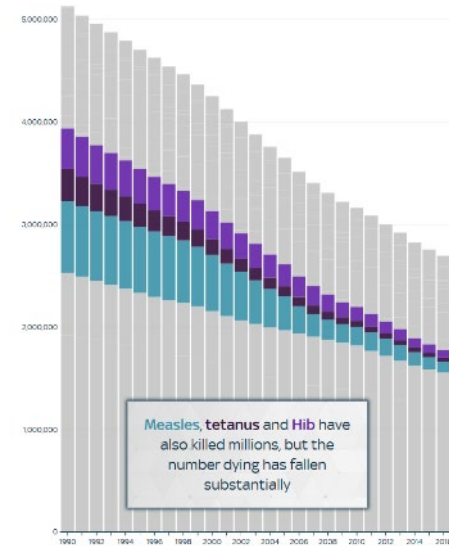
## Interactive chart tools



**Datawrapper**

[datawrapper.de](https://datawrapper.de)

charts to embed in a website,  
charts with tooltips



**Flourish**

[flourish.studio](https://flourish.studio)

storytelling  
with charts

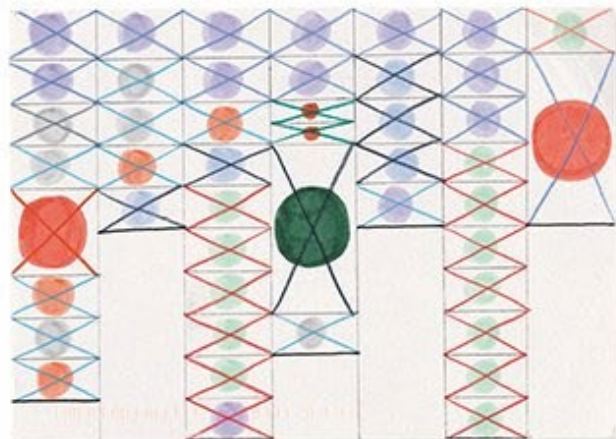
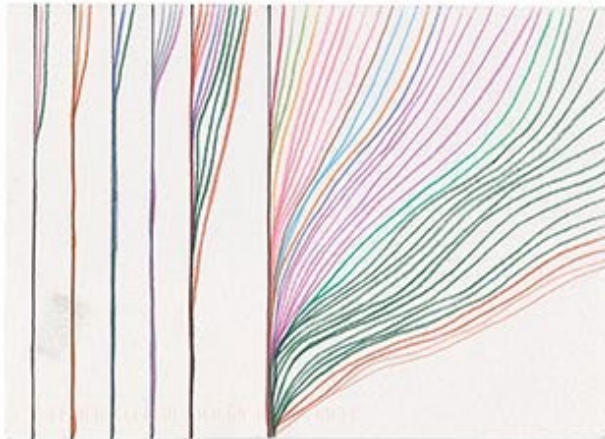
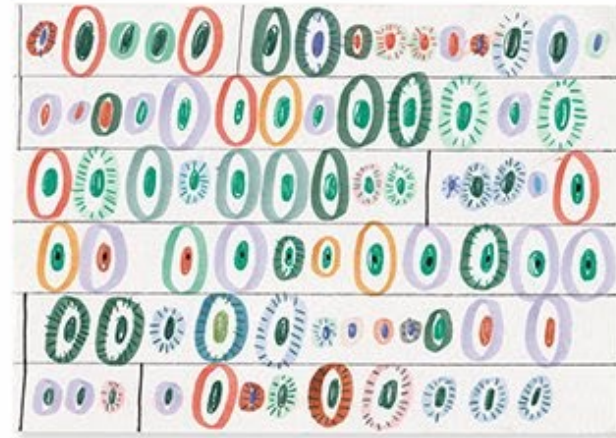
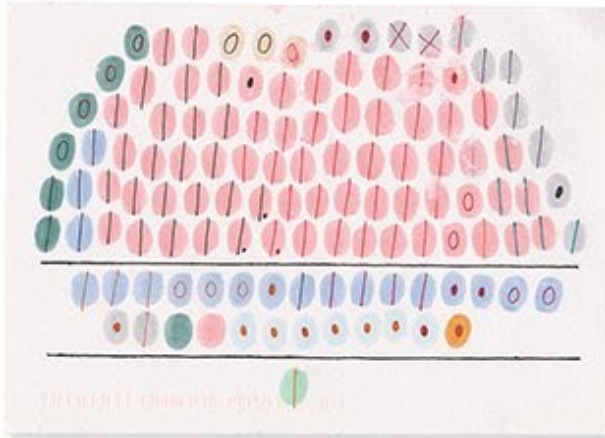
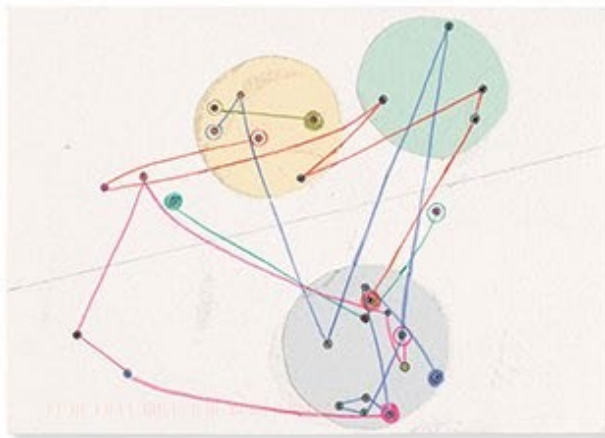
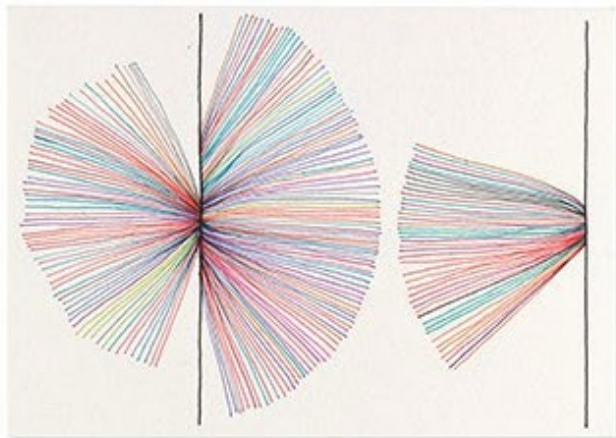


# Peak Month of Flu Viruses



Mona Chalabi







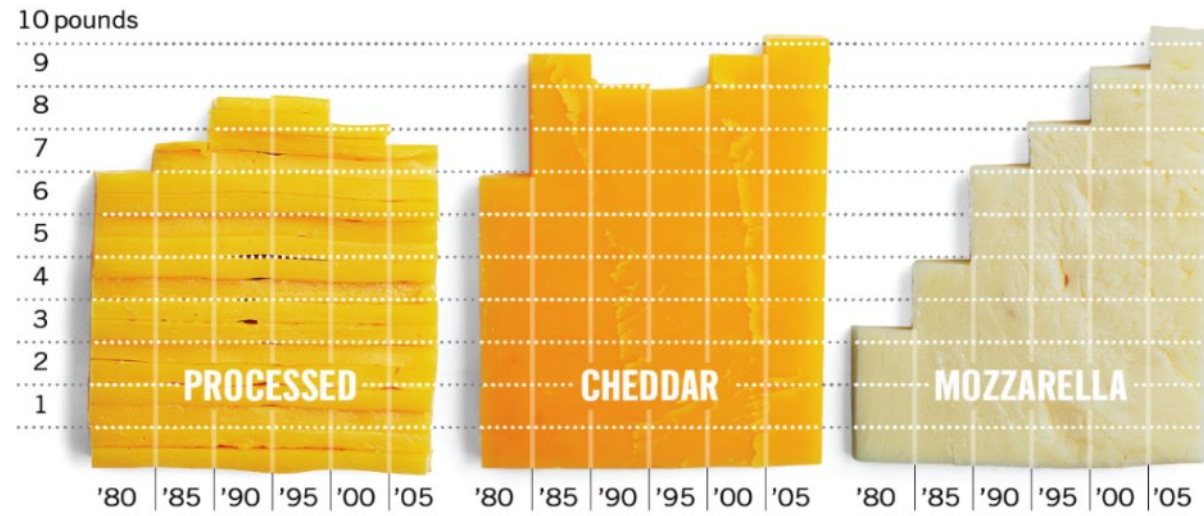
**Fish Pharm**  
These pills represent the relative amounts of four pharmaceutical drugs found in fish pulled from Chicago's North Shore Channel and tested by Baylor scientists.

The traditional foe of water quality is waste from factories and farms, but now environmental regulators are eyeing a new pollution source: our medicine chests. Fish caught downstream from sewage treatment plants in five U.S. cities contained traces of pharmaceuticals and toiletries, Baylor University researchers found in a recent study. You'd have to eat tons of fish for such small concentrations to affect human health, but the products could pose a threat to marine life. To assess the risk, the EPA has expanded monitoring to 100 sites, with results due in 2011.

PHARMACEUTICALS: COURTESY OF BAYLOR; FISH: UNIVERSITY OF CHICAGO; ART: BY MICHAEL AND JAMES RAYMOND; PHOTO: JAMES RAYMOND



## Per capita cheese consumption in the U.S.



## REASONS I LOVE CHEESE BURGERS



- BREAD
- MEAT
- KETCHUP
- CHEESE

# Visualizing 40 Years of Music Industry Sales



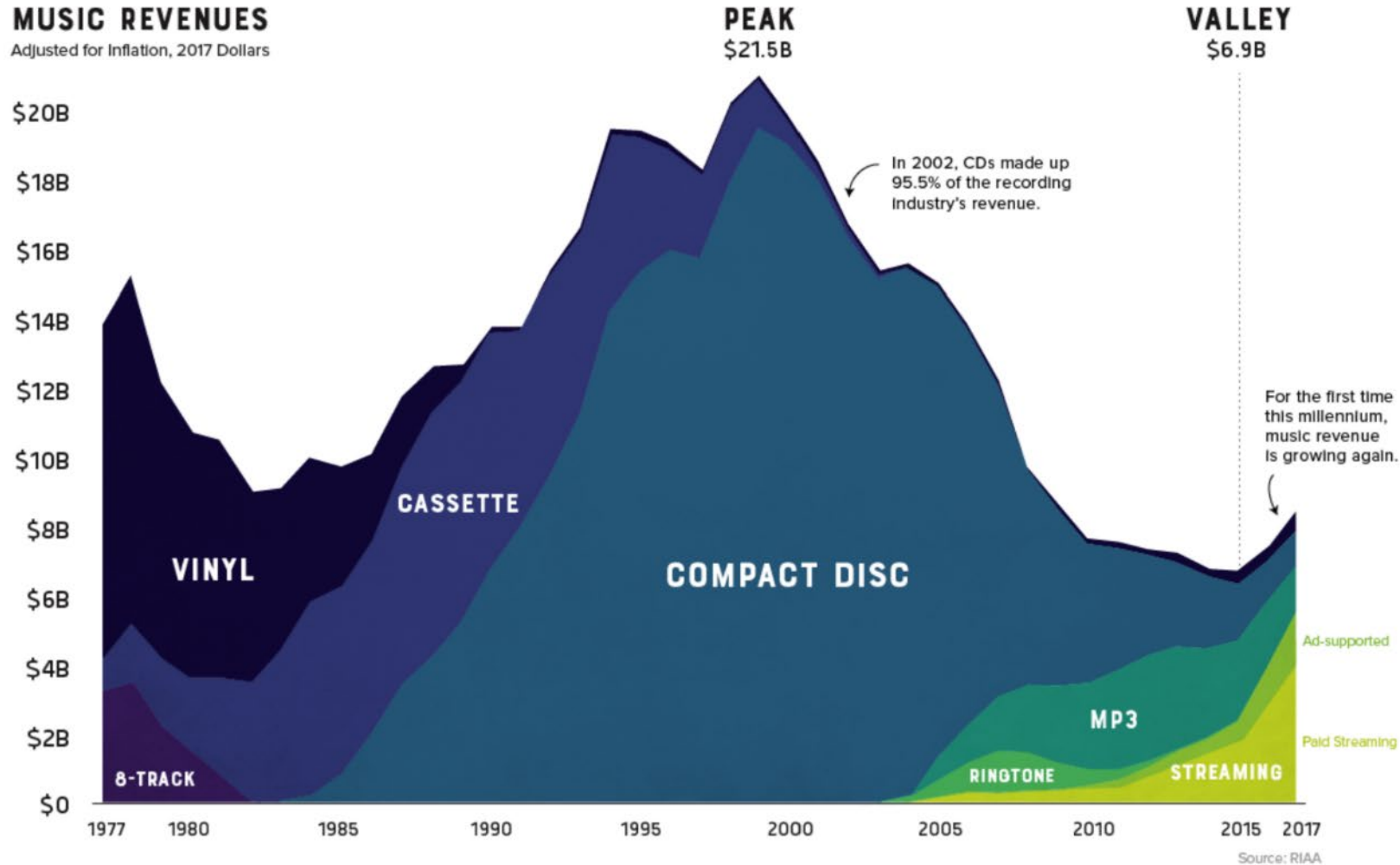
Published 3 years ago on October 6, 2018

By Nick Routley



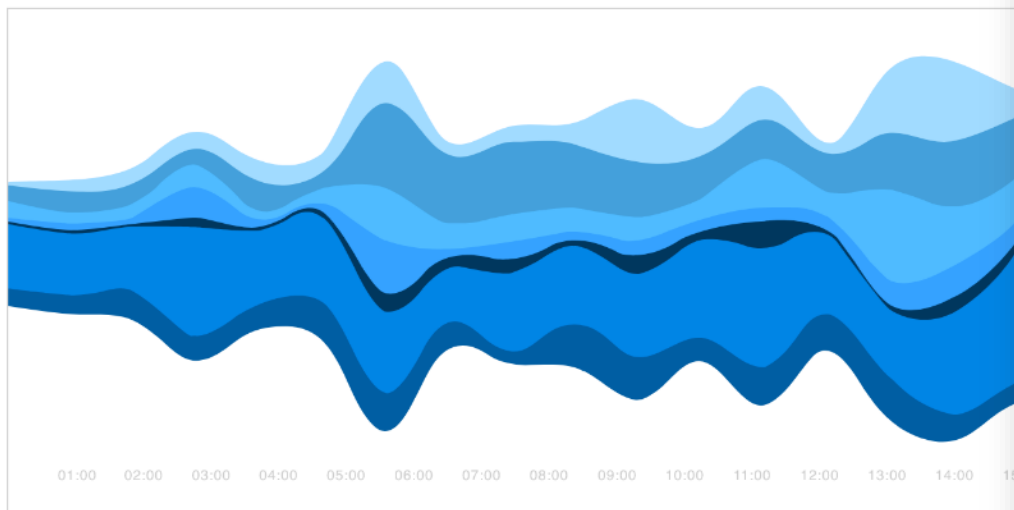
## MUSIC REVENUES

Adjusted for Inflation, 2017 Dollars





## Stream Graph



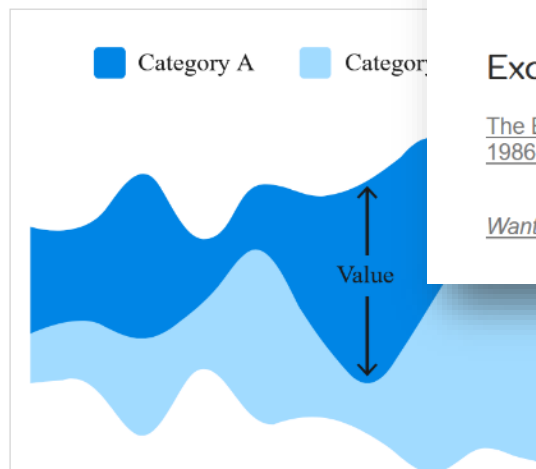
### Description

Also known as a *ThemeRiver*.

This type of visualisation is a variation of a [Stacked Area Graph](#), but instead of plotting values against a fixed, straight axis, a Stream Graph has values displaced around a varying central baseline. Stream Graphs display the changes in data over time of different categories through the use of flowing, organic shapes that somewhat resemble a river-like stream. This makes Stream Graphs aesthetically pleasing and more engaging to look at.

In a Stream Graph, the size of each individual stream shape is proportional to the values in each category. The axis that a Stream Graph flows parallel to, is used for the timescale. Colour can be used to either distinguish each

### Anatomy



## Functions

[Data over time](#) [Patterns](#)

## Similar Charts



[Stacked Area Graph](#)

## Tools to Generate Visualisation

[Bob Rudis' GitHub \(code\)](#)

[D3 \(code\)](#)

[Infogram](#)

[JSFiddle \(code\)](#)

[Lee Byron's GitHub \(code\)](#)

[NVD3.js \(code\)](#)

[plotDB](#)

[RAWGraphs](#)

[Stream graph generator \(code\)](#)

## Examples

[The Ebb and Flow of Movies: Box Office Receipts 1986-2008, The New York Times](#)

[Want your work linked on this list? Click Here](#)



Need to access this page offline?  
[Download the eBook from here.](#)



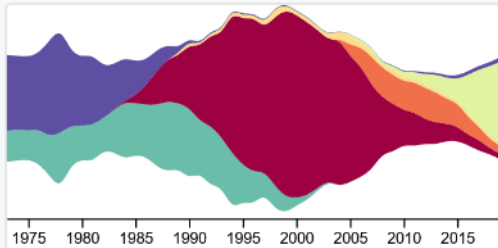
Merchandise & other related dataviz  
products can be found at the store

# RAWGraphs

RAWGraphs 2.0 beta

Ab

## 2. Choose a chart



### Streamgraph (area chart)

It allows the comparison of multiple categories over a continuous dimension.

[Code](#) [Tutorial](#)

Show All charts ▼



**Alluvial Diagram**  
Correlations, proportions



**Arc Diagram**  
Networks



**Bar chart**  
Correlations



**Multi-set bar chart**  
Correlations, proportions



**Stacked bar chart**  
Correlations, proportions



**Beeswarm plot**  
Distributions, time series, proportions



**Box plot**  
Distributions



**Bubble chart**  
Correlations, proportions



**Bumpchart**  
Time series, correlations, proportions



**Circle Packing**  
Hierarchies, proportions



**Circular dendrogram**  
Hierarchies, proportions



**Contour plot**  
Correlations, distributions



**Convex hull**  
Correlations, proportions



**Linear dendrogram**  
Hierarchies, proportions



**Gantt chart**  
Time series, correlations



**Hexagonal binning**  
Correlations, distributions



**Horizon graph**  
Time series, correlations



**Line chart**  
Time series, correlations



# Time to play

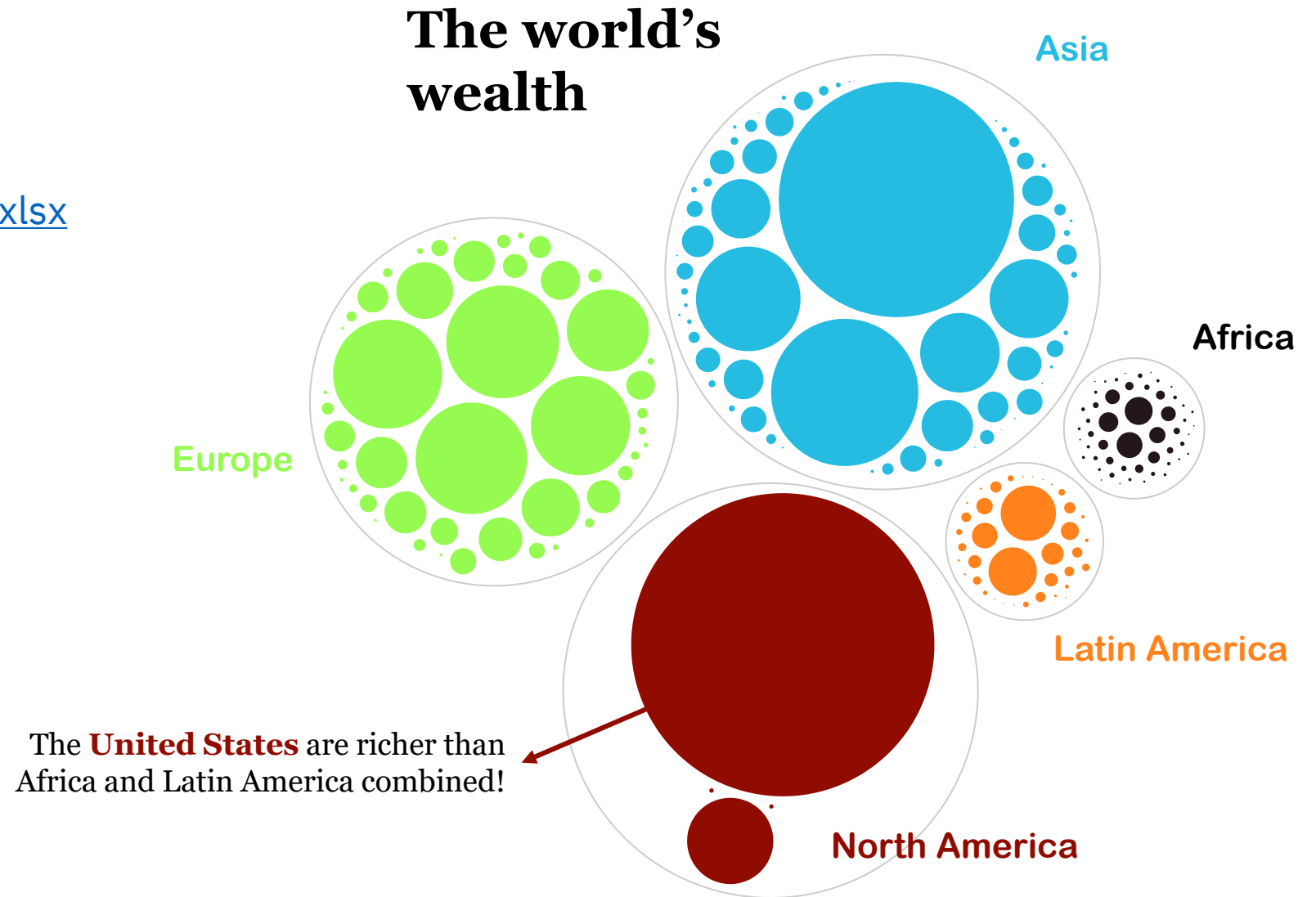
Individual exercise

Download the data file

[baryon.be/files/workshop/wealth.xlsx](http://baryon.be/files/workshop/wealth.xlsx)

Use **RAWGraphs** and **PowerPoint**  
to mimic the chart on the right

Or feel free to play around and  
explore a tool of your choice



# Creating visuals about your research

Elements of powerful visuals

Visual communication  
principles

Editing vector images

lunch break

Graphical abstracts/posters

Design principles

Bitmap images

Graphs

**Legal and ethical aspects**





# Legal and ethical aspects

# Licenses and rights



PREMIUM

1 jaar Libelle +  
reistas  
cadeau



## NET BINNEN

**16:02** Treinverkeer tussen Deventer en Almelo plat door aanrijding: extra drukte op...

**15:01** **PREMIUM** Dromen komen uit voor Deventer Nachtparlement: 'We kunnen nu...

**12:21** Tientallen tips na delen heftige dashcambeelden van over de kop geslagen...

**11:30** **PREMIUM** Deventer schaatsen in het vet, maar nog niet gedaan met de pret: 'Tijd voor...

**11:29** **PREMIUM** Verloren zoon Duteweert helpt ABS langs Colmschate

BEKIJK ALLE ARTIKELN

▲ De bewuste foto die ABS-handbal gebruikte: De Nederlandse handbalsters vieren hun overwinning op het WK handbal in Japan. De Stentor kan de foto wel publiceren omdat de uitgeverij een contract met het ANP heeft. © ANP

## Onrechtmatig gebruik van deze foto kost handbalvereniging Bathmen halve loterijopbrengst

Zonder na te denken zette ABS-handbal uit Bathmen in januari bovenstaande foto bij een berichtje over hun clubloterij. Dat kwam ze duur te staan. De opbrengst van de loterij: 518,40 euro. De boete voor het onrechtmatig gebruik van deze ANP-foto (na verhoging): 292,50 euro.

Fleur Reijngoudt 20-07-20, 09:00 Laatste update: 20-07-20, 17:21



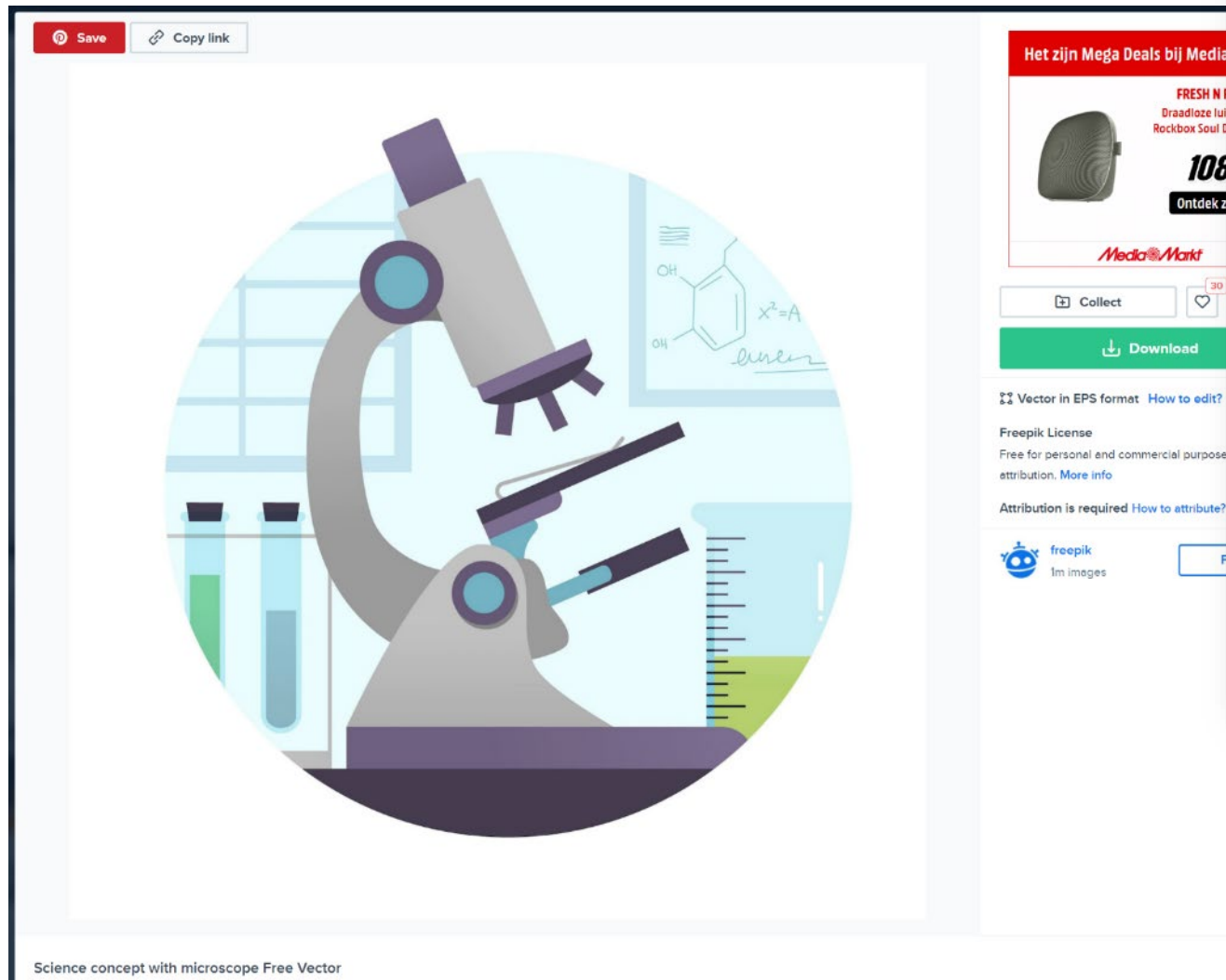
Doe mee aan de Handbal NL Verenigingsloterij en steun ABS-handbal!

Het bericht met deze titel verscheen op 3 januari op de website van de

MEEST GELEZEN



# Licenses



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30


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Attribution is required [How to attribute?](#)

 **freepik**  
1m images

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## Personal purpose

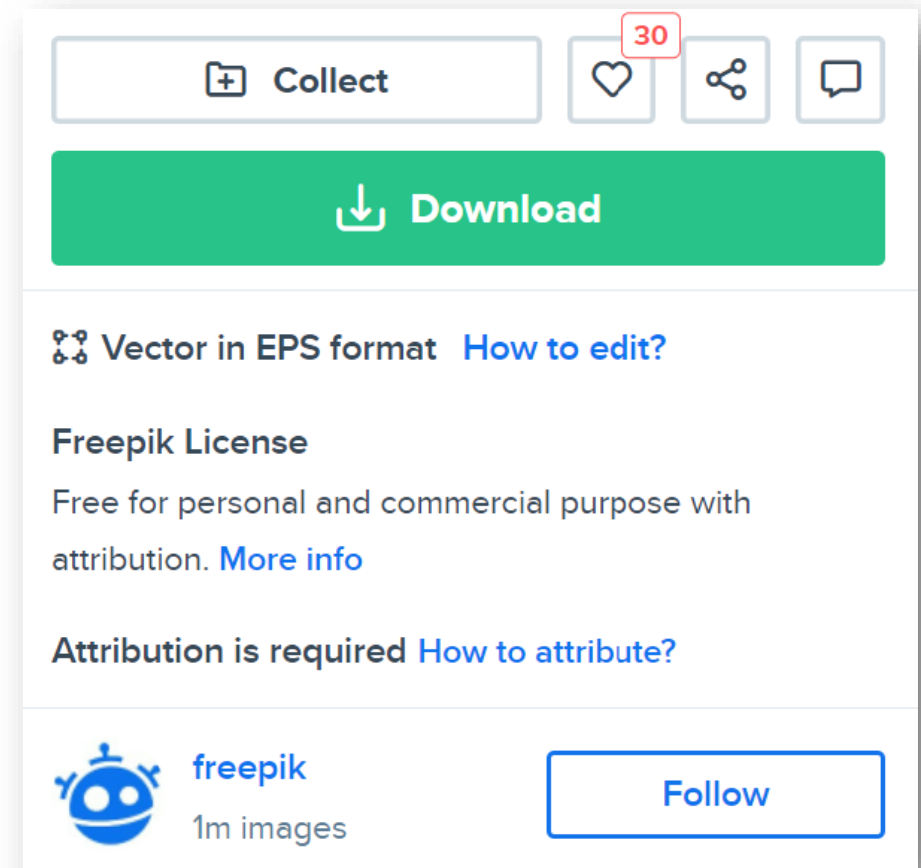
not used for financial gain

- use in presentations, online or offline publications

## Commercial purpose

used for financial gain

- selling visuals to a client
- using visuals in a book that you're selling
- using visuals in a logo
- ...





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Icon



Background



Square



Noodles



Adrien Coquet FR

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## Get This Icon



Noodles



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You can modify and  
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of the work.

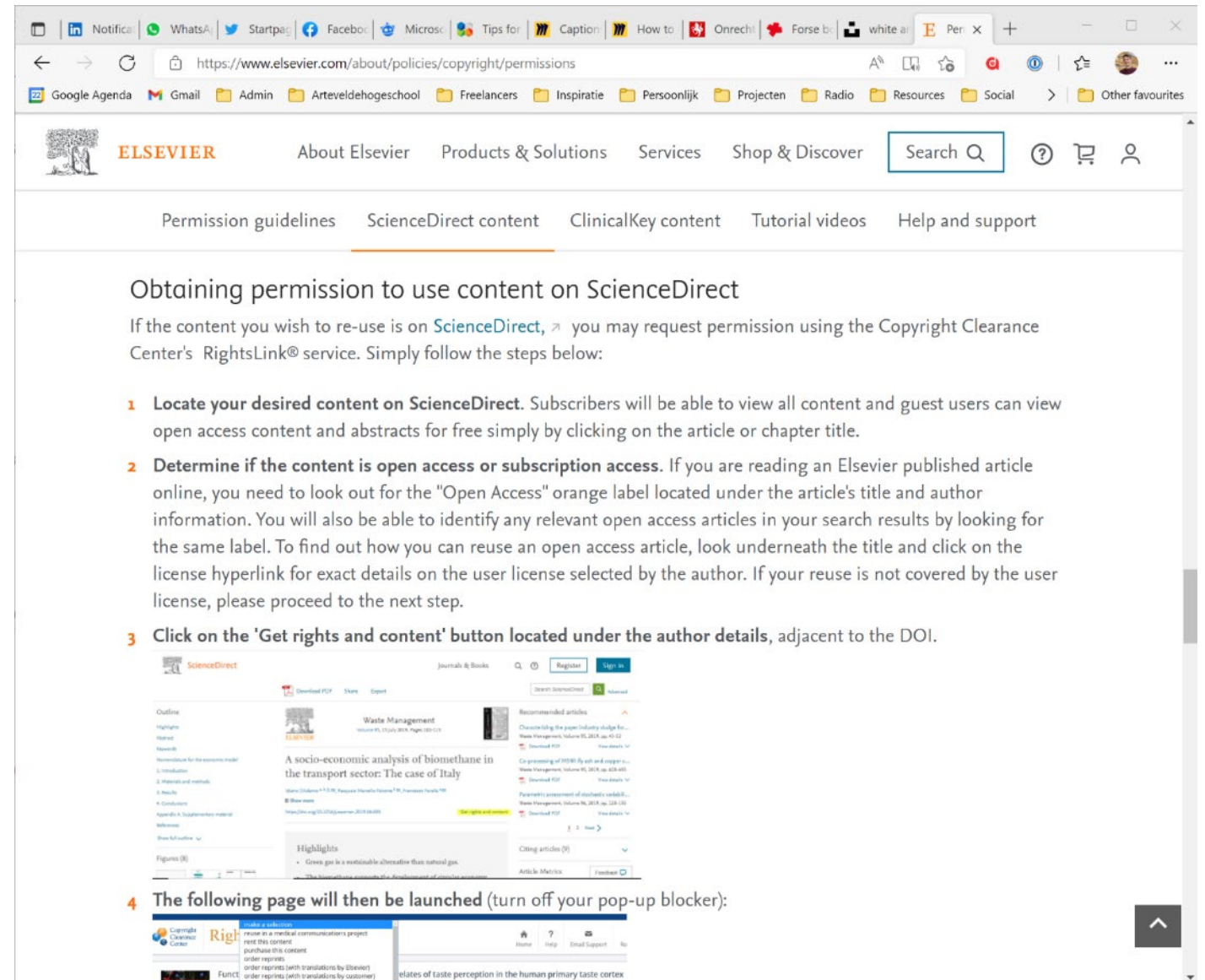
# What if I don't find information about the license?

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Describe why and how you will be using the visual.

## Careful!

For visuals in articles, the copyright holder is typically the *journal*, not the author!



The screenshot shows the Elsevier website's 'About Elsevier' page, specifically the 'Copyright/permissions' section. The page is titled 'Obtaining permission to use content on ScienceDirect'. It provides instructions on how to request permission using the Copyright Clearance Center's RightsLink® service. The steps are as follows:

- 1 Locate your desired content on ScienceDirect.** Subscribers will be able to view all content and guest users can view open access content and abstracts for free simply by clicking on the article or chapter title.
- 2 Determine if the content is open access or subscription access.** If you are reading an Elsevier published article online, you need to look out for the "Open Access" orange label located under the article's title and author information. You will also be able to identify any relevant open access articles in your search results by looking for the same label. To find out how you can reuse an open access article, look underneath the title and click on the license hyperlink for exact details on the user license selected by the author. If your reuse is not covered by the user license, please proceed to the next step.
- 3 Click on the 'Get rights and content' button located under the author details, adjacent to the DOI.**

Below the steps, there is a preview of a ScienceDirect article titled 'A socio-economic analysis of biomethane in the transport sector: The case of Italy'. The article is from the journal 'Waste Management' and is available for free. The preview shows the article's title, authors, and a 'Get rights and content' button. The article's DOI is 10.1016/j.wasman.2018.06.005.



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Was the picture taken by an official photographer (e.g. during an event)?

-> ask permission to the owner/copyright holder

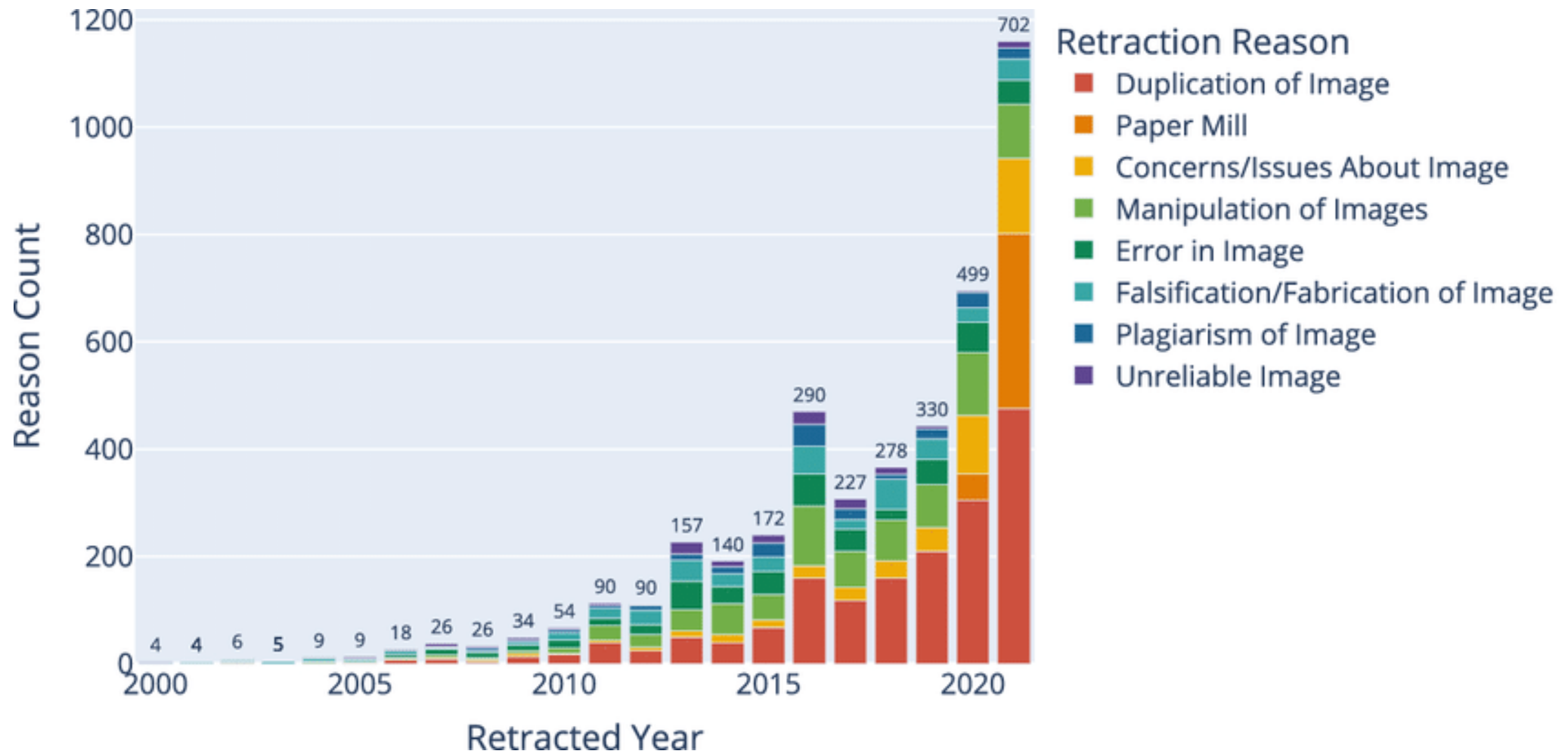
Did you take the picture yourself?

-> ask the people on the picture to sign a **model release form**

You don't know who took the picture or what the license is?

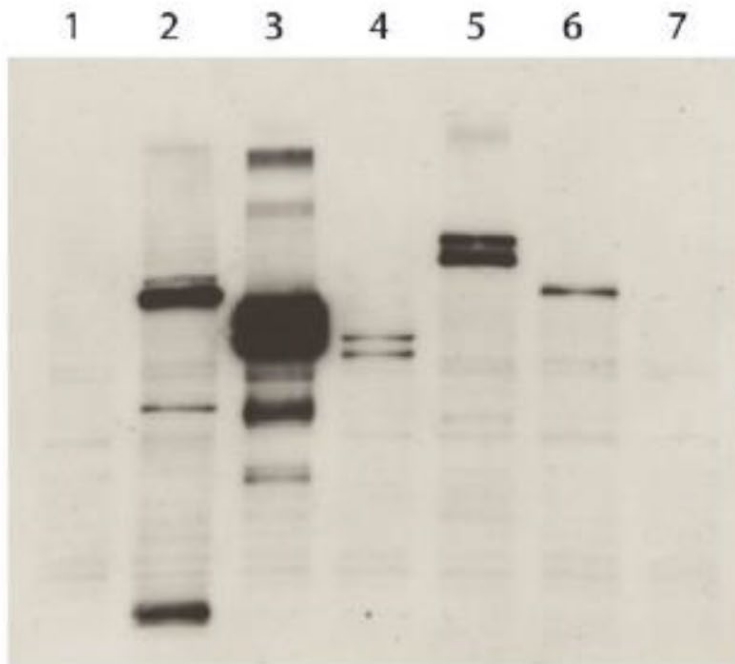
-> don't use the visual

Image **manipulation**

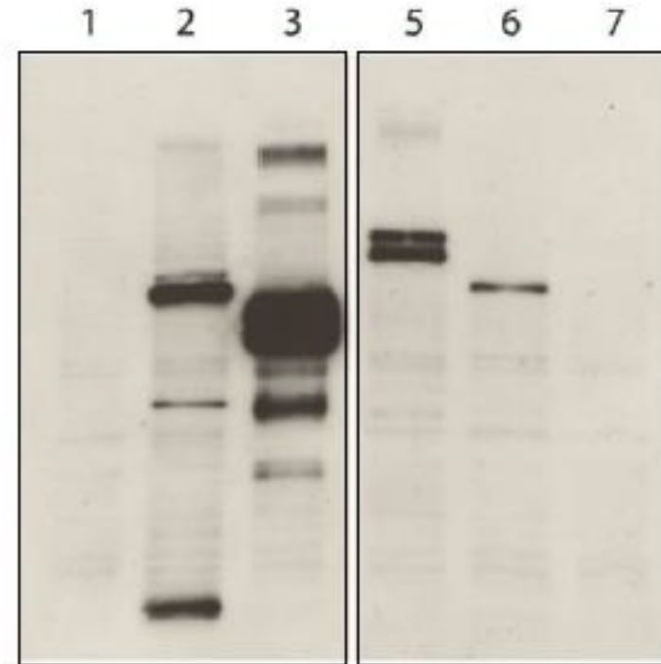


Benchmarking Scientific Image Forgery Detectors,  
Science and Engineering Ethics 28 (2022) 35

# “Ethical” manipulation



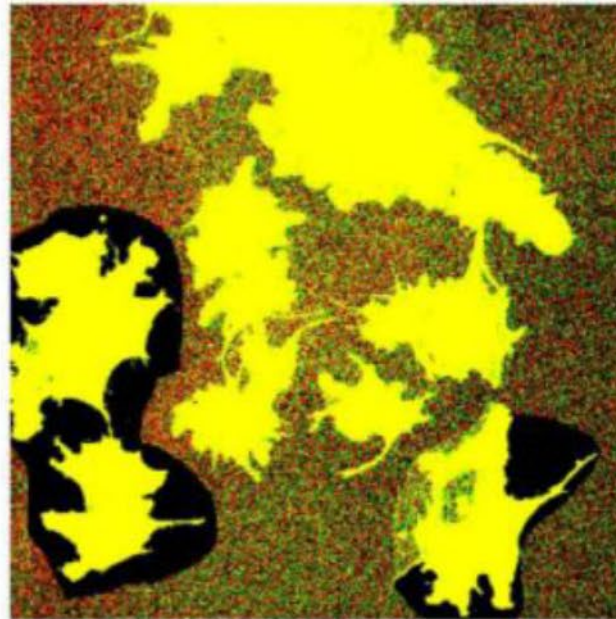
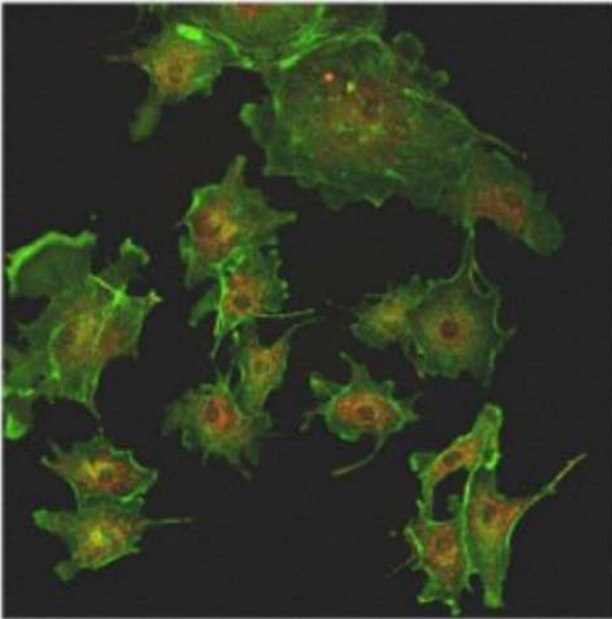
Original image



Manipulated image: a lane was removed because it was not relevant. A white dividing line clearly indicates that something was removed.

# Unethical manipulation

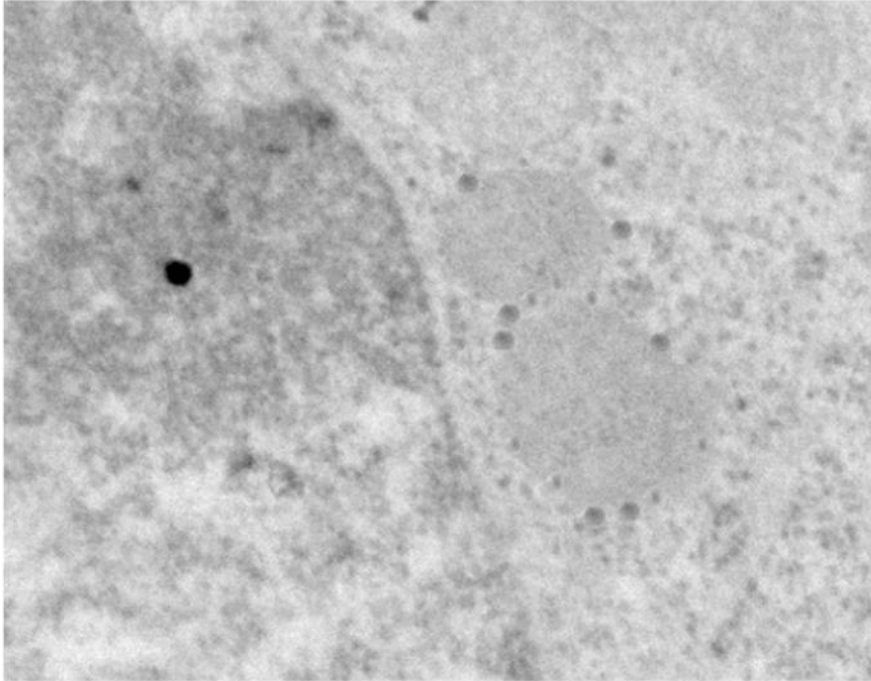
Original submitted



Manipulation revealed  
by contrast adjustment



Original image



Manipulated image

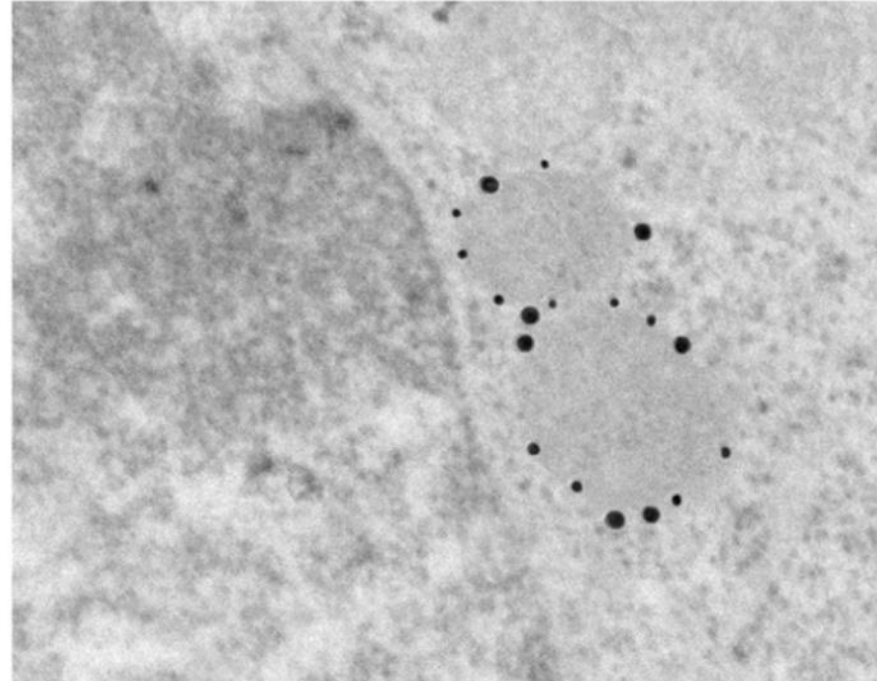


Figure 5. **Misrepresentation of immunogold data.** The gold particles, which were actually present in the original (left), have been enhanced in the manipulated image (right). Note also that the background dot in the original data has been removed in the manipulated image.

[What's in a picture? The temptation of image manipulation, The Journal of Cell Biology 166 \(2004\) 11-15](#)

← Elisabeth Bik   
66,2K Tweets



**Elisabeth Bik** 

@MicrobiomDigest Volgt jou

Science consultant, PhD. Microbiome, science integrity, [#ImageForensics](#).  
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📅 Lid sinds oktober 2013


44,2K Volgend 135,2K Volgers

 Gevolgd door Dr Yiğit Oezcelik, Sarah Ahannach en 65 anderen die jij volgt

Tweets Tweets en antwoorden Media Vind-ik-leuks

 Vastgemaakte Tweet



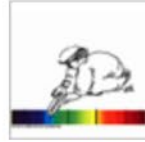
**Elisabeth Bik**  @MicrobiomDigest · 9 dec. ...  
New Microbiome Digest, December 9, by [@svetlana\\_up](#)



**Svetlana U. Perović** @svetlana\_up · 9 dec.  
NEW @MicrobiomDigest 📄 [microbiomedigest.com/2022/12/09/dec...](#)

- global sewage #AMR /@pat\_munk
- wastewater /@KatieCommits @irmarie\_25
- mOTUs3 /@hjruscheweyh @alessio\_mila
- postdoc days /@Berkovata @chris\_zig

## 12 Guidelines for best practices in image processing



**Treating Images as Data:** Digital scientific images should be treated as data



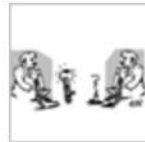
**Saving the Original:** Manipulations of digital images should always be done on a copy of the raw image data. The original must be retained.



**Making Simple Adjustments:** Simple adjustments to the entire image are usually acceptable.



**Cropping is usually OK:** Cropping an image is usually acceptable.



**Comparing Images:** Digital images that will be compared to one another should be acquired under identical conditions.



**Manipulating the Entire Image:** Manipulations that are specific to one area of an image and are not performed on other areas are questionable.



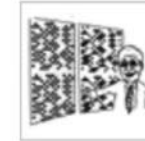
**Filters Degrade Data:** Use of software filters to improve image quality is usually not recommended for biological images.



**Cloning Degrades Data:** Cloning objects into an image or from other parts of the image is very questionable.



**Making Intensity Measurements:** Intensity measurements of digital images should be performed on raw data and the data should be calibrated to a known standard.



**Lossy Compression Degrades Data:** Avoid the use of lossy compression.



**Issues With Magnification:** Magnification and resolution issues are important.



**Issues With Pixels:** Be careful when changing the size (in pixels) of a digital image.

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## Image integrity and standards

### On this page

- [Electrophoretic gels and blots](#)
- [Microscopy](#)
- [Nature Portfolio journals' editorials](#)

Digital images submitted with a manuscript for review should be minimally processed. A certain degree of image processing is acceptable for publication (and for some experiments, fields and techniques is unavoidable), but the final image must correctly represent the original data and conform to community standards. Editors may use software to screen images for manipulation.

Editors may request the unprocessed data files to help in manuscript evaluation during the peer review process; if these data are unavailable upon request, we may need to halt the peer review process until the issues are satisfactorily resolved. We may also request unprocessed data when responding to post-publication issues that may arise with published papers. Lack of availability of unprocessed data can make resolution of post-publication issues challenging. We recommend retaining unprocessed data and metadata files after publication, ideally archiving data in perpetuity.

All life science papers published in Nature Portfolio journals require submission of unprocessed original images of gels and western blots to be submitted with the final accepted version. These unprocessed images are published in the Supplementary Information.

[Nature Portfolio:  
Image integrity and  
standards](#)

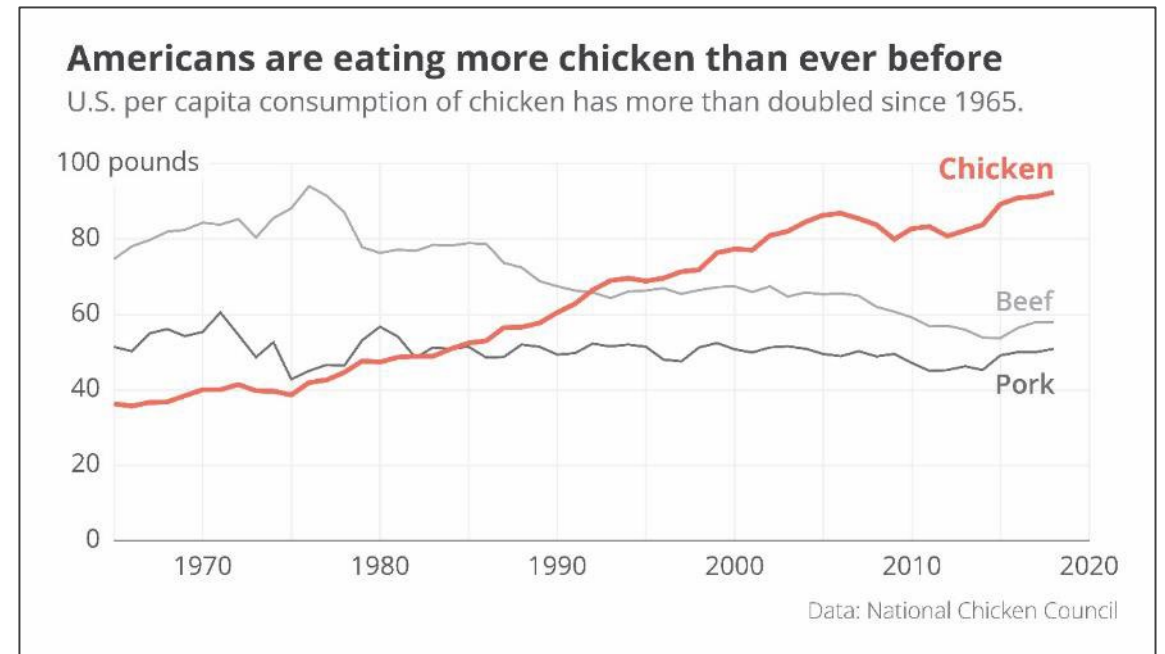
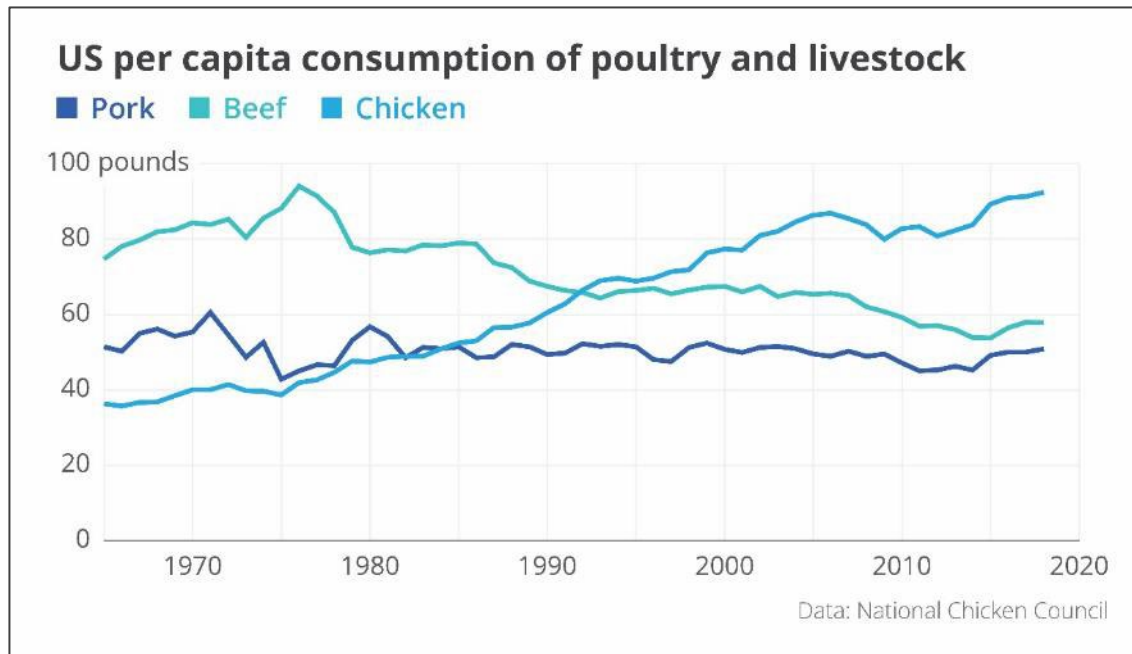
# **Objective** versus **subjective** data visuals



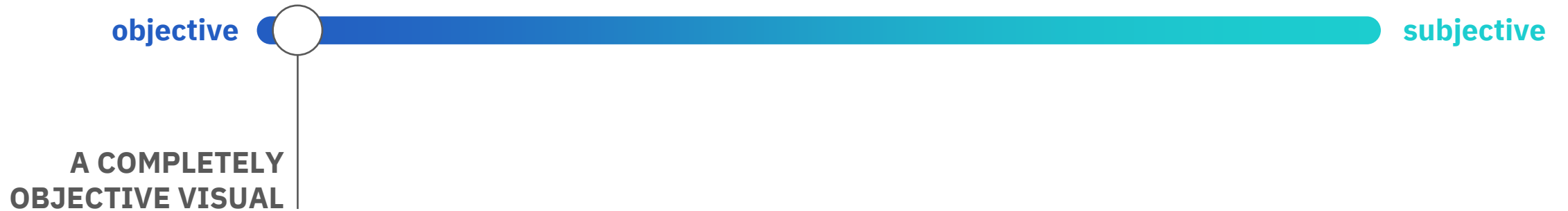
~~data~~



story



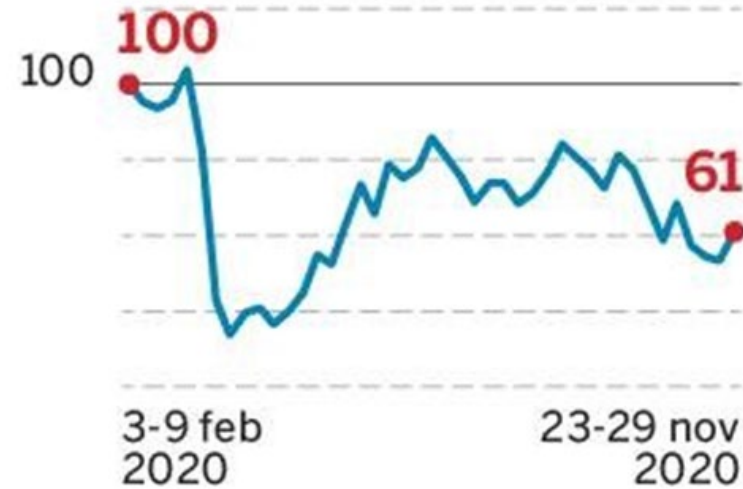
# Which chart do you want?





## Aantal geldafhalingen aan automaten

(index, 3 feb = 100)



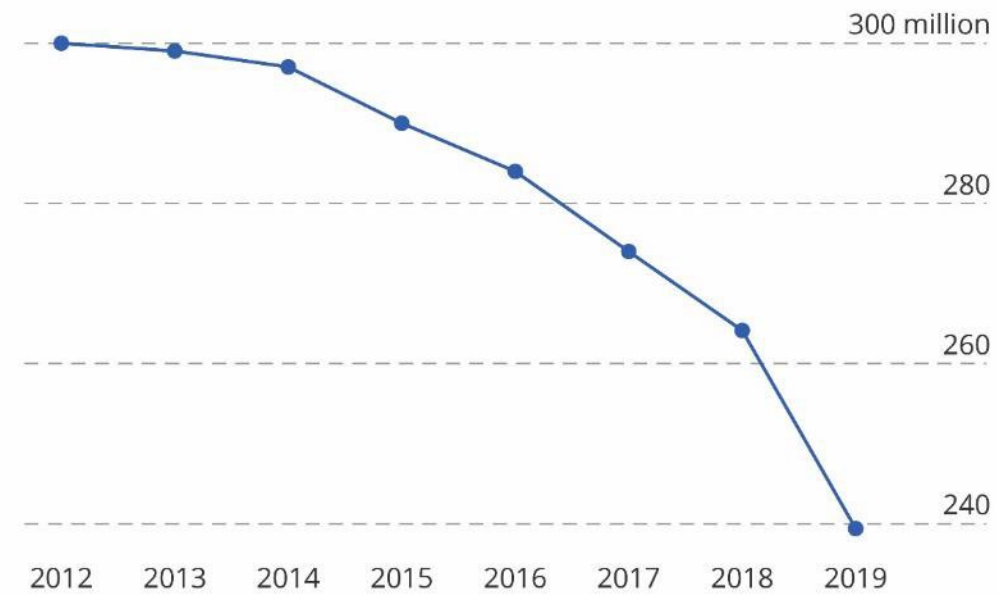
DS Infografiek | Bron: Febelfin

*\*(number of cash  
withdrawals from ATMs)*

Source: [De Standaard](#),  
22 December 2020

## Number of cash withdrawals at Belgian ATMs

Source: Febelfin



**Number of cash withdrawals at Belgian ATMs**

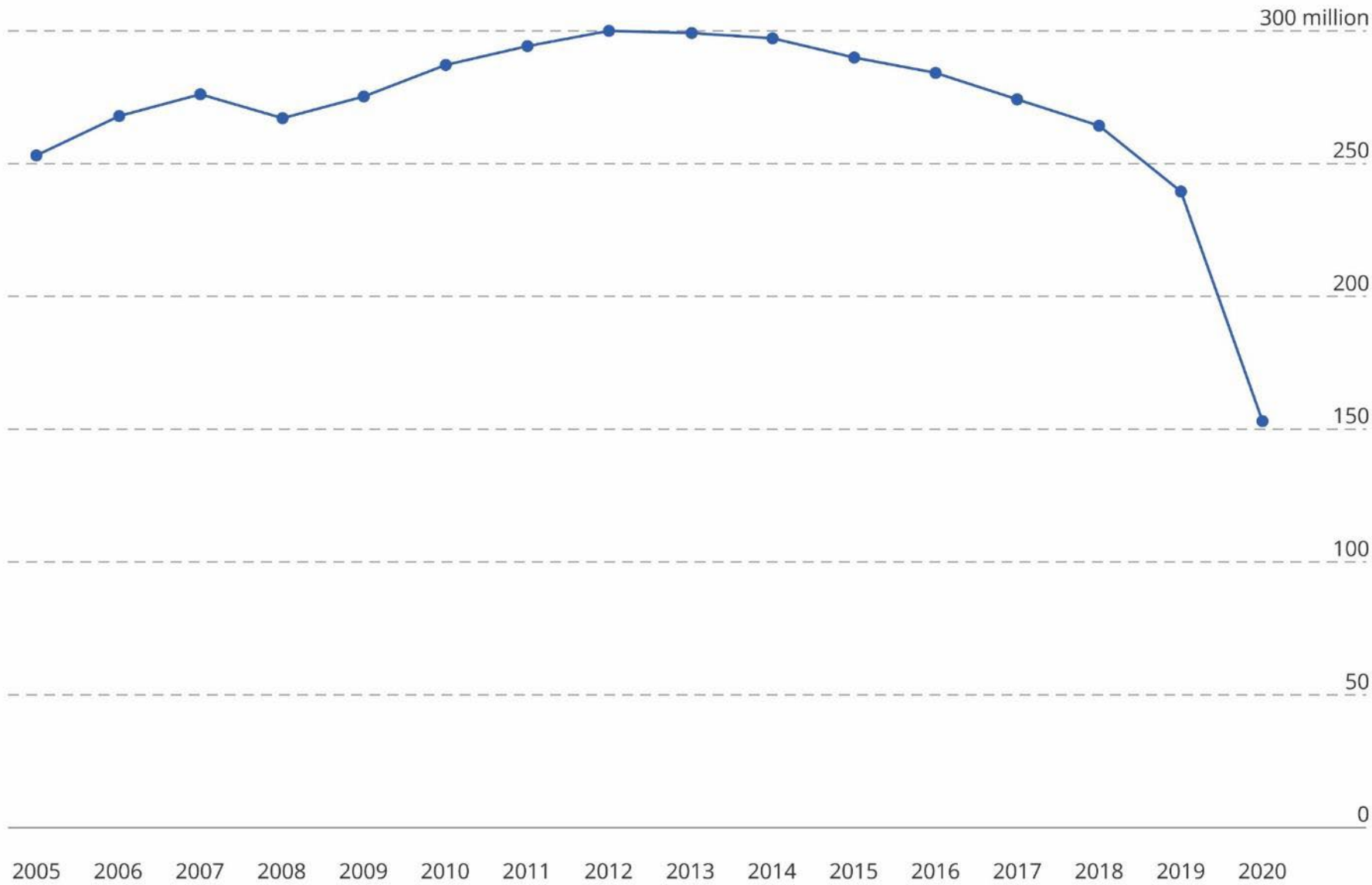
Source: Febelfin



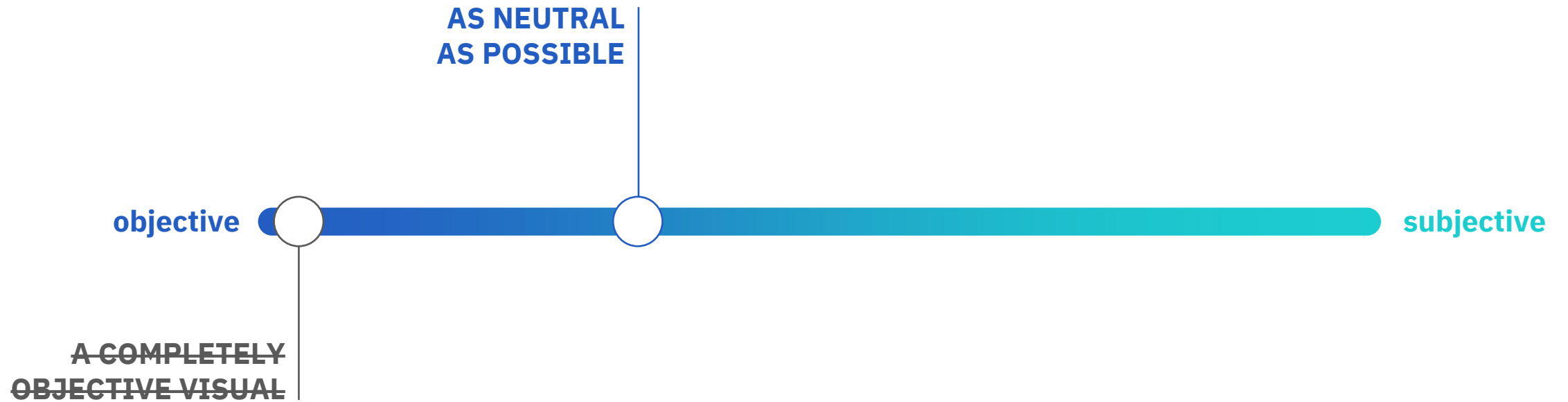


Number of cash withdrawals at Belgian ATMs

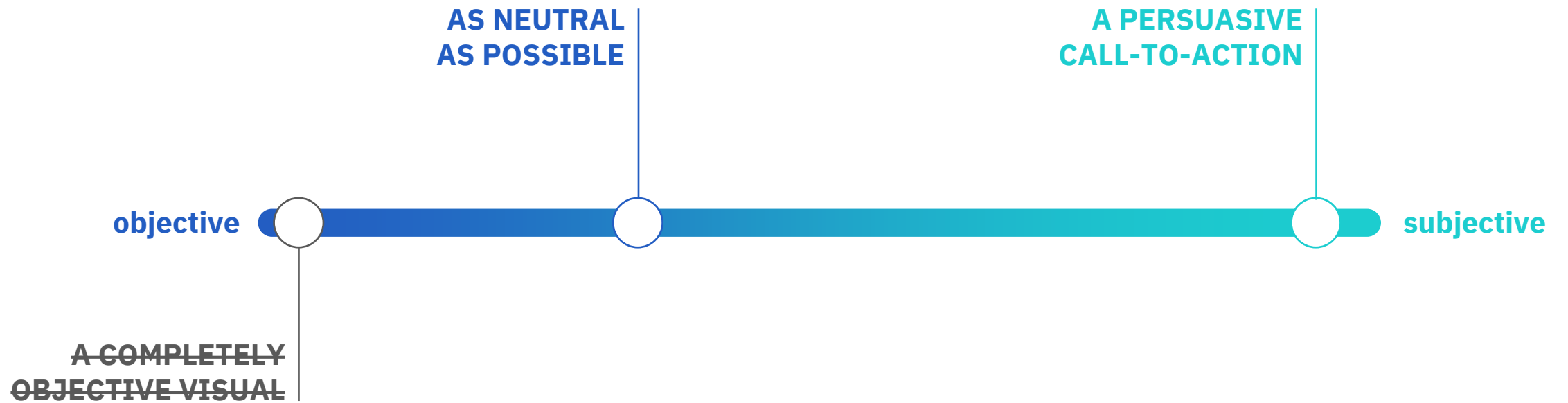
Source: Febelfin



# Which chart do you want?



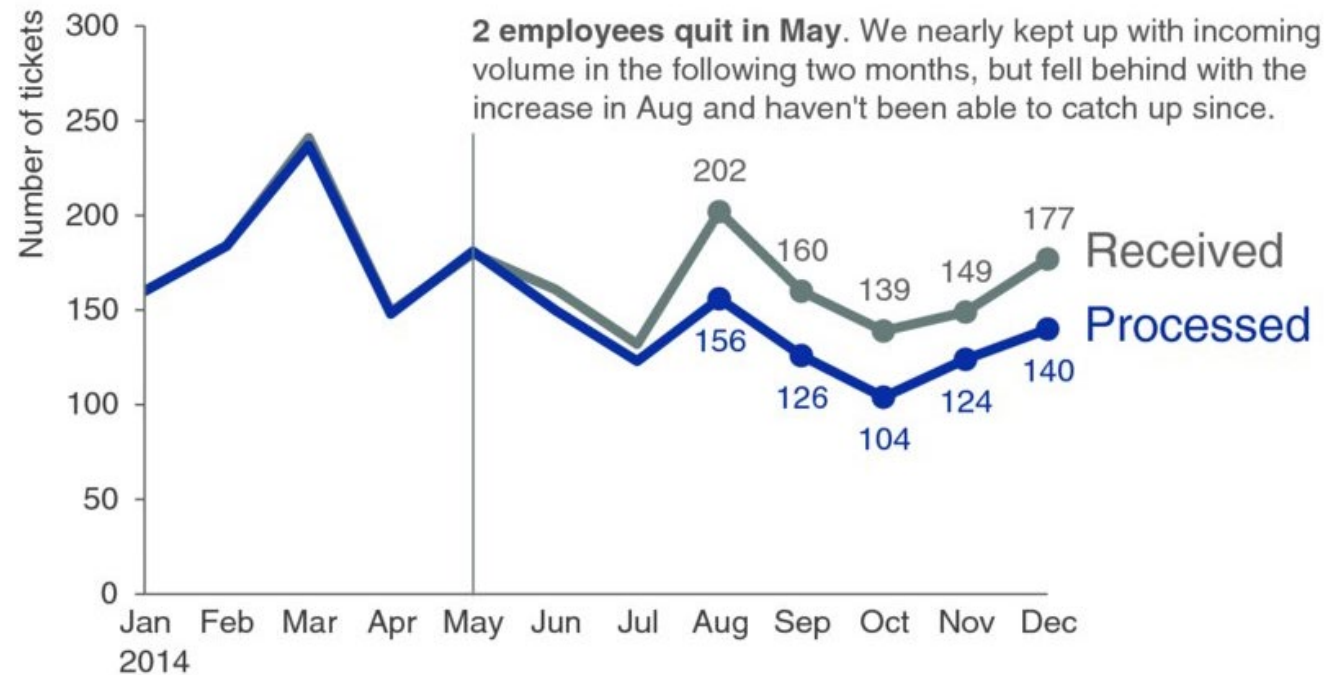
# Which chart do you want?



## Please approve the hire of 2 FTEs

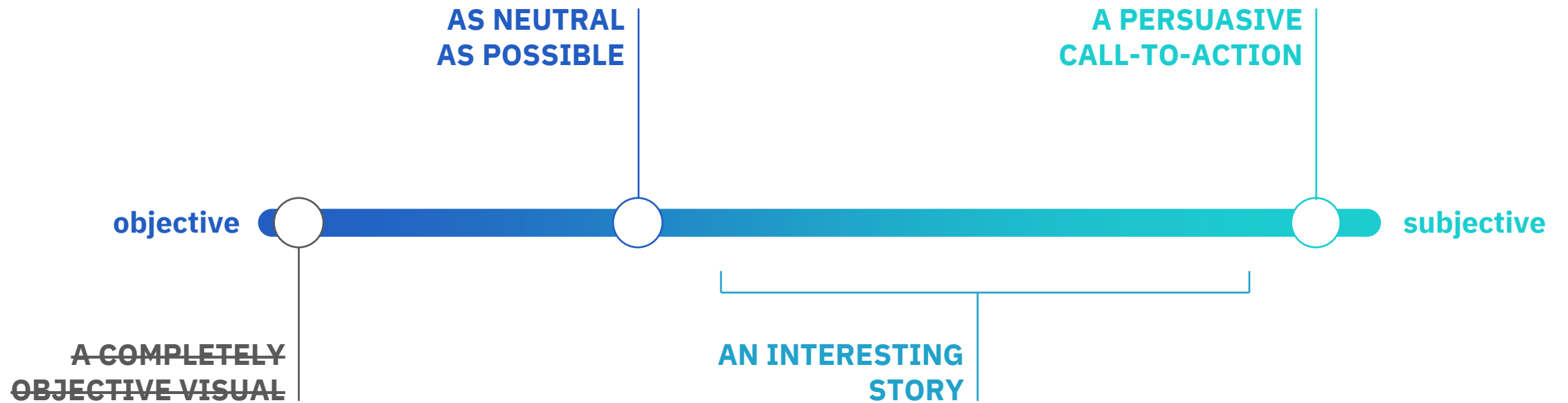
to backfill those who quit in the past year

### Ticket volume over time



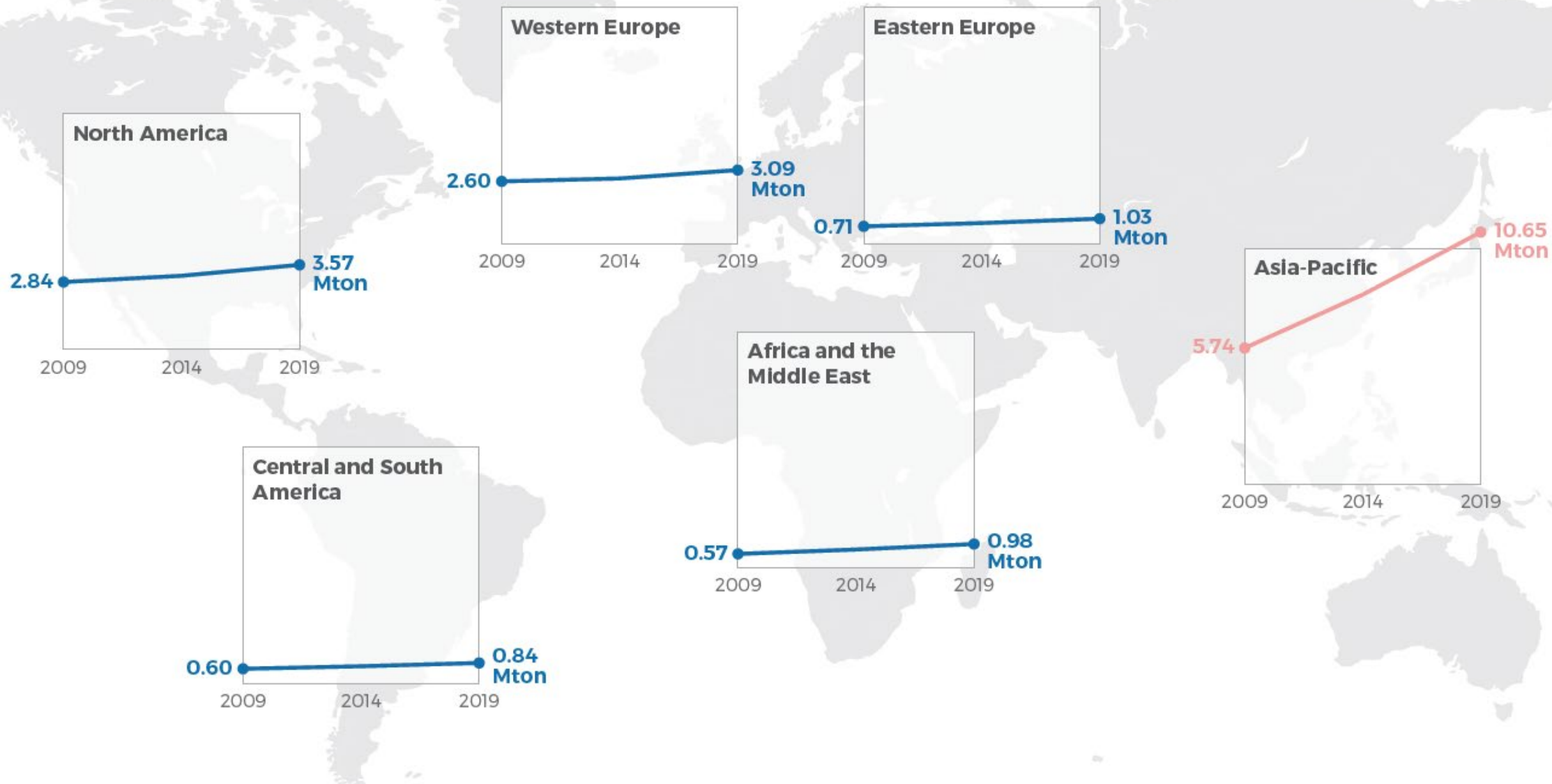
Data source: XYZ Dashboard, as of 12/31/2014 | A detailed analysis on tickets processed per person and time to resolve issues was undertaken to inform this request and can be provided if needed.

# Which chart do you want?





# Asia-Pacific will continue to be the biggest demand region





# Thank you!

All the slides and all the links:

[baryon.be/visuals-resources](https://baryon.be/visuals-resources)

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