SEEING science

how to use visuals in life science journalism

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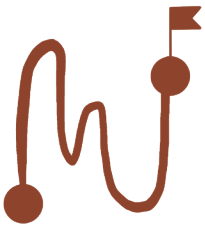
Mette Stentoft

Aarhus, June 2023



CONTENT

CHAPTER 1

WHY VISUALISE SCIENCE?

Why does untreated hearing loss increase the risk of getting alzheimers?

How far are scientists in creating a cell therapy that can treat heart failure?

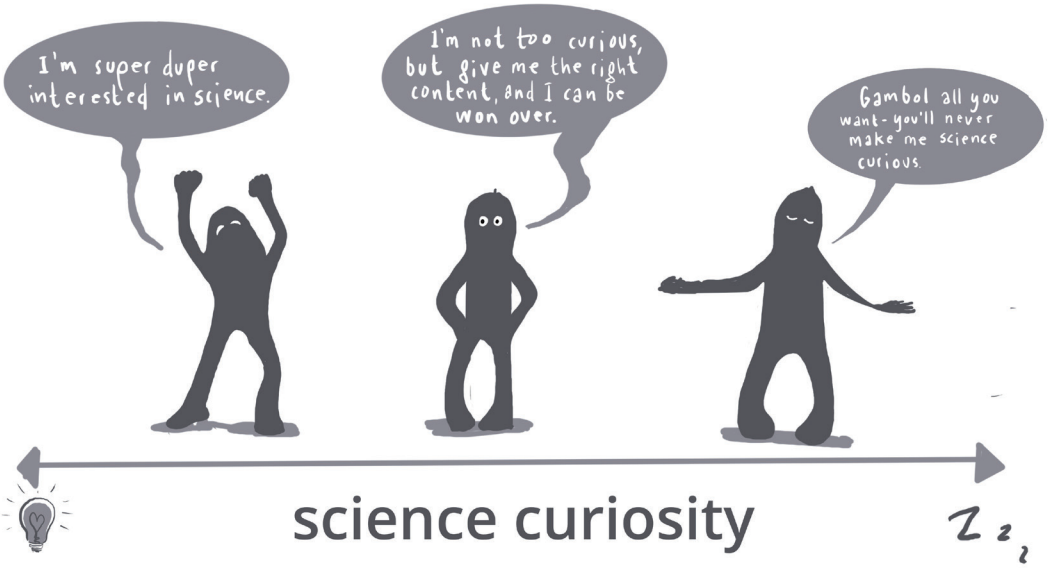
How come the pangasius grows so much faster than comparable fish species – and how might we benefit from its fast growth in solving global demands for food?

What is the connection between gut and brain?

Who is more likely to suffer from long covid – and why?

Answers to questions like these are, of course, very different. But they share are common trait in that they're rather complex and (for most of us) beyond our scale of immediate understanding. Though we recognize key terms – such as alzheimers, pangasius and covid – we might still be far away from understanding what's going on. Just like anyone who graduate high school will probably recognize an image of a double helix, when they see it, though most don't have a basic understanding of genetics (1).

Another common trait for the example questions – and for most life science questions – is the importance, their essentiality. And not just for the direct and obvious reasons: improving lives, solving global crisis, curing diseases, and understanding the nature of what life it, but also because (and we're staying on the somewhat lofty, pompous track here...) engaging with any type of scientific question is crucial in a democratic society.
Many have linked this 'indirect', democratic effect of science communication to so-called science literacy, arguing that engaging in scientific questions e.g. by consuming science journalism promotes the capacity to draw evidence-based conclusions and help make sound decisions. This, in turn, makes us better citizens in a society based on scientific knowledge. However, growing evidence suggest that we might be better of using the term science curiosity instead of science literacy; that the sheer act of trying to learn more about questions like the five examples above is linked to societal benefits: Simply put, the science curious – those, who enjoy consuming science-related information – are less likely to hold politically polarized views (2). As one of the progenitors of the science curiosity scale, Yale Law School psychology professor Dan Kahan, puts it: "with greater curiosity, people are more willing to take new information into account when forming their opinions about the world." (3)
In the light of misinformation, disinformation and growing polarization its importance this willingness is of growing importance (4). As a part of information wilderness, abound fake scientists don faux-scientific arguments to promote their 'truths' – misinformation masked as science - which makes the benefits of consuming content on real scientific findings and scientific thinking even more important; of harnessing such curiosity to improve scientifically sound decision making. And, importantly, the best predictor of how much science content a person engages with, is the level of science curiosity (5).



As science journalists and communicators we would benefit ourselves and society by being more interested in the people 'in the middle of' the science curiousity scale. Can our journalism help increase their curiosity in science – and what are their favourite topics and formats?

All in all, promoting the understanding the double helix, the human cell, or the growth of the pangasius is one thing; but just as important for science journalists is an effort to spark science curiosity through exciting, engaging must-read stories. Though creating great content is, of course, what most science journalists strive to do every day, three issues come to mind here: Firstly, that a lot of well-produced science journalism is 'preaching to the choir' – picture the magazine American Scientist or podcasts like 'Science versus' or (Danish) Kraniebrud, Science Stories or Unge forskere. (See page 16-17 for more on this). Secondly, which means we – as journalists – have at our disposal if we set out to promote science curiosity; what are the stories and story formats that will excite and engage the not already born-again science lovers? And thirdly, how might we come about promoting, well, anything in a vast and crowded media reality plagued by general news avoidance. (6)

Venturing out to answer these questions, to promote science curiosity, is by all means a constructive endeavor.

And it's an endeavor that calls for experimenting with forms for how science is communicated – for interdisciplinary approaches and possibly new ways of understanding science communication (7).

With all the above in mind,
the central question must be:

HOW CAN WE MAKE LIFE SCIENCE MORE ACCESSIBLE AND ATTRACTIVE TO THE GENERAL AUDIENCE?

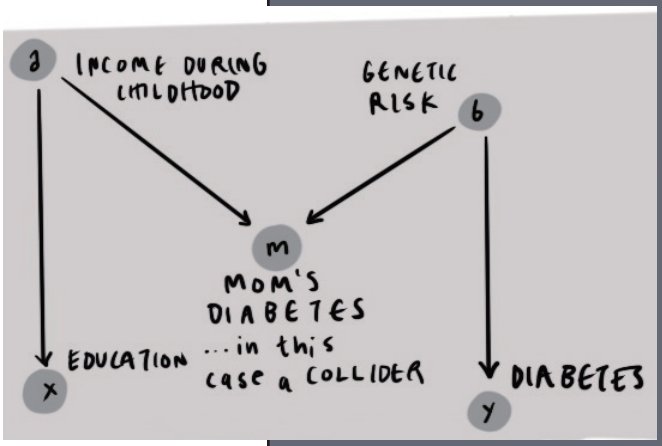
... not as a catch-all solution or without recognizing the abundance of great content aimed at the already science curious, but as one way to reach the constructive goal of promoting science curiousity.

An example: THE DIABETES EPIDEMIC

Trying to understand diabetes only through life science lens is like trying to understand the concept of an elephant by looking only at its leg... Instead, we must combine biological, psychological, and social understandings in a much more holistic manner.

This is the key takeaway from *Masterclass in epidemiology: Diabetes* – a public health class at Aarhus University that I followed during the fall of 2022.

This necessity of a holistic approach – the interwovenness of body, mind, and society – poses an excellent example of why an interest in life sciences should not be limited to e.g. the science section of publications. And it's an equally great example of how quality communication of life science – like the genetic and cell biology mechanisms of diabetes – should not be aimed (solely) at 'science literate' audience.



Diabetes, as so many issues, can't be reduced to either a 'personal' life science or a societal affair. Though communicating these components may pose a challenge, there is no way around it if we want to paint a fair and accurate picture of the world.

Professor Daniel Witte

"MOST BIOLOGICAL PROCESSES ARE GRADUAL. MOST CLINICAL DECISIONS ARE BINARY."

Luckily, the complexity is offering us its own plethora of interesting stories. For instance, because the diabetes diagnosis is a societal *and* biological construct, some people could, in theory, get a diabetes diagnosis simply by going from Europe to the US (as different parts of the world have different 'impaired fasting glycemia' thresholds).

JOURNALISM IN AN EMOTIONS PERSPECTIVE

Or: How might we attract our audience (without scaring or enraging it)?

Before looking at how to make life science journalism attractive to a general audience, we need to take a closer look at the term attractiveness itself. Simply put, what is it that elicit an emotional response strong enough that our audience stop scrolling (or maybe even actively seek out) our particular media content and then spend time consuming it? As journalists, we might talk about news criteria – what is it that makes for a good story – but I'd argue (with several nudging experts, psychologists, and neuroscientists on my side) that a useful way of approaching this issue is by talking about EMOTIONS (8).

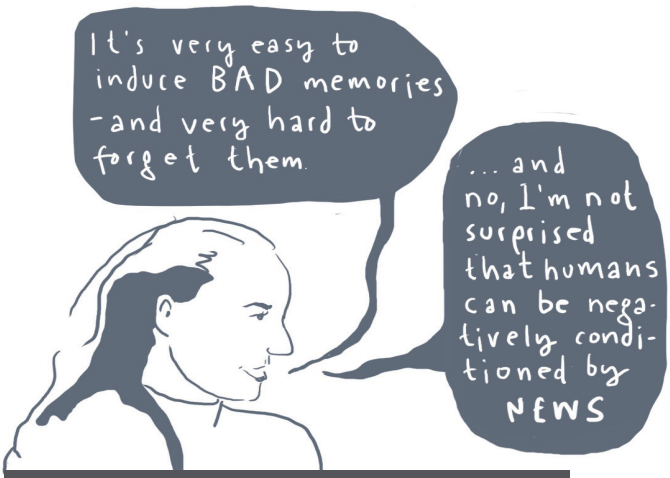
Though our audience's emotional response is rarely considered in the newsroom, our journalistic products do trigger emotions, whether we're aware of it or not, and that we constantly benefit from this 'emotional affordance' when we compete for the audience's attention with click bait, (over)dramatizing, promising sensations or tragedies. This is a core explanation for news avoidance, and a raison d'etre for constructive journalism (9). The key challenge is that it's far easier to trigger negative emotions than equally strong positive ones; it's no hard job to make the audience click on something that scares or outrages them only to leave them feeling powerless and overwhelmed – four typical negative emotional experiences from media consumption (10). Importantly, what Professor Michael Bang Petersen has coined 'vague reassuring communication' actually evokes fear as well, though its attempt to do the opposite – exactly because the worries aren't addressed or taken seriously (11).

In other words, it's a harder task to elicit positive emotions than negative ones. And it can be argued that science journalists have the added challenge of a connotation held by many people: that science is too difficult to engage with (12). It's not a stretch to imagine a user with a low degree of science curiousity feeling intimidated and scrolling on to something more welcoming. As science writers Mooney and Kirshenbaum argued in their book Unscientific America more than a decade ago: 'The world of science (...) can appear baffling, intimidating and downright unfriendly to non-scientists.' When listing the negative emotional responses, we can thus add intimidation in the case of science news and science journalism.

> **"EMOTION HAS A SUBSTANTIAL INFLUENCE ON THE COGNITIVE PROCESSES – ON PERCEPTION, ATTENTION, LEARNING, MEMORY, REASONING, AND PROBLEM SOLVING.**

This being so, the next step in combatting news avoidance and reaching our audiences with important stories – be it about life science or something else – must be to consider the positive obverses of these negative emotional responses. And we must consider how to 'match their strength' to the inherently powerful negative emotions; how to make the positive – or constructive - emotional user experiences as strong as possible.

But is it really all about emotions, one might ask; what about understanding and learning? The answer is that you can't have one thing without the other: Psychologists, neuroscientists, and professionals (like me) who are concerned with didactics and learning agree: **Emotion has a substantial influence on the cognitive processes – on perception, attention, learning, memory, reasoning, and problem solving.** (13) They form the basis of aesthetic experience, enjoyment, and entertain-



Assistant Professor Naomi Mermet-Joret

Memory and learning is one of the core research areas at the Danish Institute of Translational Neuroscience (Dandrite). And it's clear that FEAR is an emotion that leaves a very strong and very lasting impression.

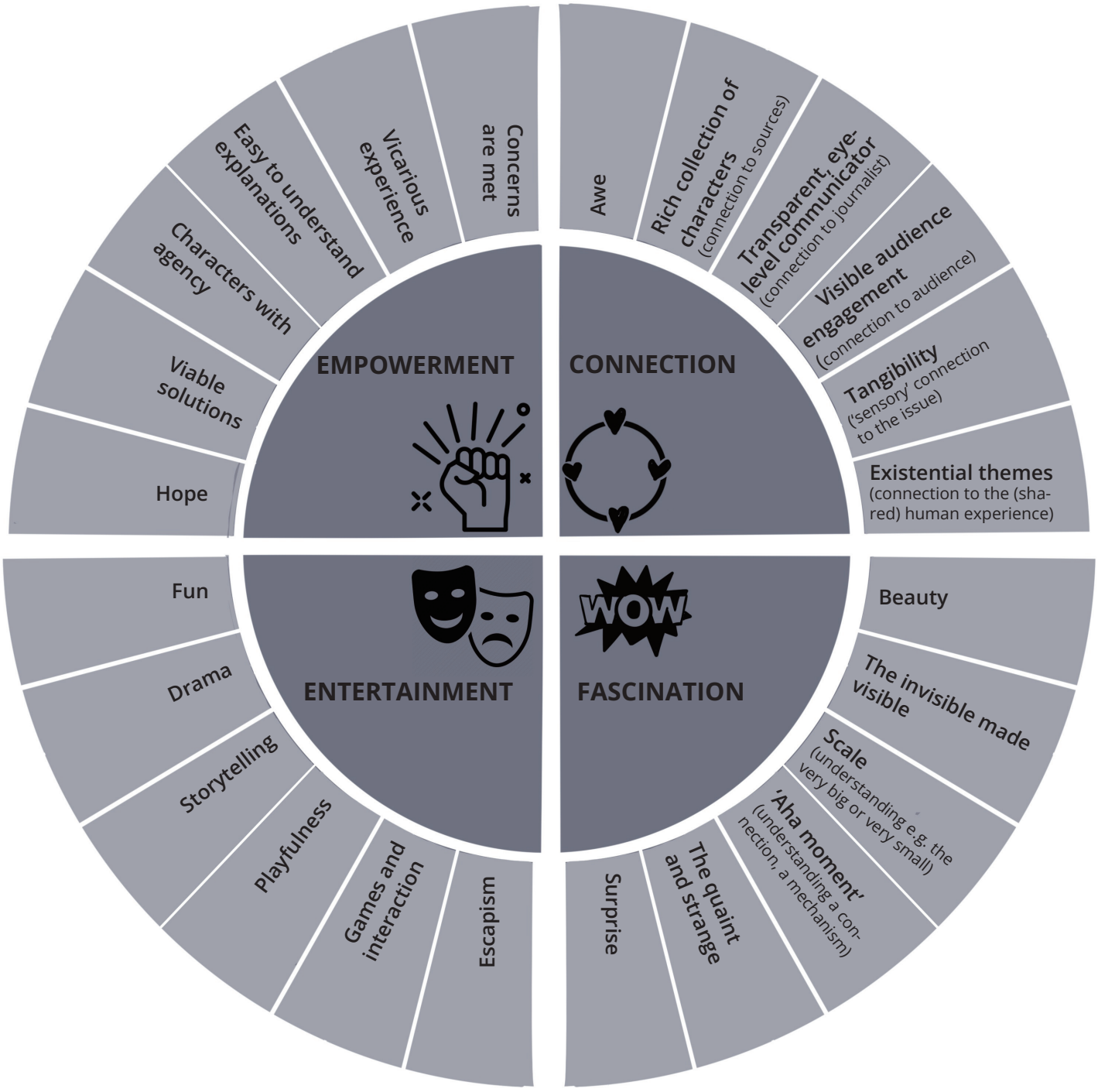
British Psychology Professor Paul Gilbert has constructed a simple – and widely used – model of the different systems that manage our emotions. The so-called 'alert system', to which emotions such as anxiety and outrage belong, isn't bad per se; we need all three systems to be in balanced and happy. But if the alert system dominates, which we've argued that media contributes to, it can lead to high levels of distress. (17)

ment; they guide meaning-making and make media experiences 'stick' in our memory; and they contribute to 'the formation of collective identities, values, and modes of action.' (14) This is not to say that we should discard discussions about cognition (which I'll get back to) or consider emotion a catch-all concept; but emotion is an inevitable focus when addressing the challenge of sparking more science curiousity and the even bigger one of combatting news avoidance. A recent finding from American KQED does indeed demonstrate that evoking feelings like beauty and awe can draw the not-so-science-curious in (15). And many previous scholars have argued that reaching beyond the cognitive learning and affecting emotions will have a positive impact on the willingness to engage in the science that is communicated (16). The counterargument to an emotional approach is that journalism should have factual and not an emotional starting point; that we as journalists should be concerned with objectivity and truth, not feelings. Though thoroughly reputed by media scholars, who've showed – as I've tried above – how journalists always 'design' an emotional response whether aware of it or not, I've often encountered this concern among colleagues. Hopefully, this project can qualify future discussions and demonstrate that consciously considering emotions in our content production can lead to better journalism.

When fear, anger, and powerlessness/apathy are three common, negative emotional responses from media users, what are then the constructive ditto? Different schools within (especially) psychology are champing at the bit to offer their own version of the so-called fundamental or existential emotions (18). With inspiration from psychology in general and the so-called positive psychology in particular, we can describe feeling joyful, feeling powerful, and feeling peaceful as fundamental of positive emotions. These are hardly an operational roadmap when producing journalism, and so, in a journalism and media perspective, we might benefit from asking two questions:
First, how do we, as journalists want people to feel when consuming our content? Ultimately, we want them to feel as capable, responsible citizens that are part of a bigger community (19). We could pick a variety of terms to best describe this in emotio-

nal terms; I've chosen EMPOWERMENT and CONNECTEDNESS.

The second question, we must ask ourselves, is: what positive emotional responses do we know that it's possible to evoke? Not just from journalism, but from any kind of media content. Again, media research, psychology, and our own experience (as producers and consumers) give us at least two obvious but nevertheless useful answers, namely FASCINATION and ENTERTAINMENT (20). The first of these, fascination, makes intuitive sense to most of us; it connotes the unusual (which in turn is the basis of if not all then most journalism), and several positive synonyms: excitement, interest, energy, and enthusiasm. When it comes entertainment, however, it might seem like a substandard emotio-



This first iteration of a 'constructive emotions wheel' is inspired by the feelings wheel (in its initial version created by Dr. Gloria Willcox in 1982 and now used a variety of versions in therapeutical contexts) and even more so by Anne Mette Hartelius' recent attempts to operationalize it in a graphics design / commercial communication setting. (26)
In the centre of the circle, we've got four basic, positive emotions that we can strive to evoke instead of the 'default' negative emotional news responses. In the circle's second tier are the means and instruments, we as journalists can use to increase our chances of evoking the desired emotional response. (The 'grounds' for the six means in each of the emotions categories all come from the literature mentioned in this report.)

nal response. After all, haven't we just established that our journalism should help people become responsible citizens (and not just pleasure-hungry consumers). Nevertheless, we shouldn't disregard the entertainment as a constructive emotional response. Feeling entertained can be a means to an end – 'I spend time reading this story, because it's entertaining, and at the same time I learn something important' (21). Moreover, entertaining experiences can, to quote Australian media professor Wyatt Moss-Wellington, elicit 'vicarious pleasures' and 'emotional experiences that are valuable beyond (their imminent theme)'. (22) In other words, taking entertainment seriously can help us benefit from the activities that people already perform at their leisure. (23)

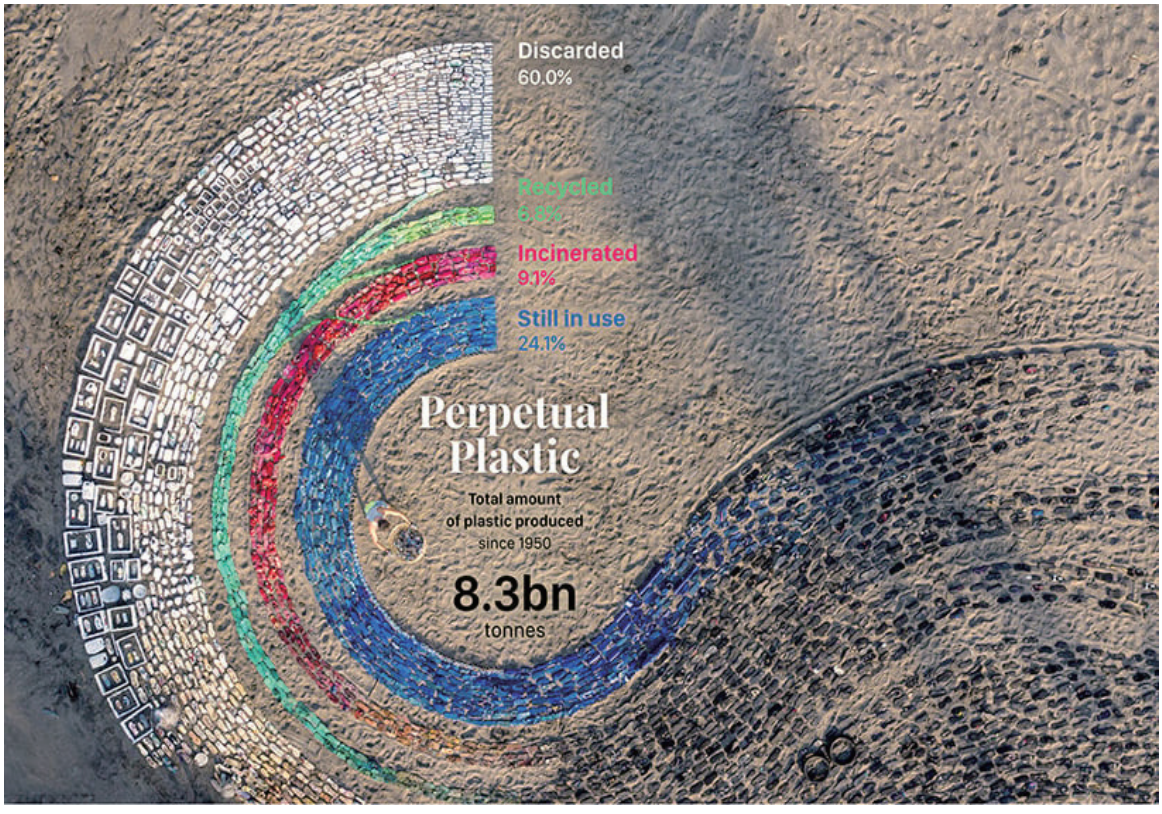
This leaves us with four basic emotional responses that we as journalists could use as inspiration when trying to replace or supplement the typical negative ones. These are certainly not an exhaustive list, but they're helpful in creating a road map for journalism that doesn't elicit fear and news fatigue. Inspired by psychology's so-called 'feelings wheel' (24) – and my own previous work with experience economy - I've mapped a simple overview of the four primary, constructive emotional responses and, in the second tier, nuances and examples that are implementable in a media setting. Not in a mechanistic way ('do x in your journalism, and your audience will automatically feel y'), but as emotional potentials.

VISUALS AND EMOTION

Most of us know it intuitively: that the image, the painting, the photo, or even that fun meme that we see on social media can make us feel things instantly. This hunch, that visuals can efficiently elicit emotion, is established in many studies – from very different fields such as psychoanalysis, cognitive science, phenomenology, cultural studies, or affect studies. (27)

If we look at the negative emotion intimidation that is a 'science-specific' obstacle for audience engagement, it's uncontroversial to praise visuals' potential to evoke a more constructive emotional response. As Jen Christiansen, graphics editor at Scientific American, puts it: *"Images are powerful in part because of their ability to immediately engage people – (...) and to provide a welcoming entry point for folks who may be predisposed to think of science as being dense and impenetrable."* (28)

Where science content – especially text – connotes difficulty, (the right) image doesn't. Moreover, aesthetically pleasing visuals can in themselves evoke a pleasurable emotional response; looking at e.g. a beautiful painting or illustration, has proven to increase blood flow to the brain and release dopamine. In other words, images can potentially give us a pleasurable 'reward' – and by letting art and science meet, it has been showed that we can indeed easier affect our audiences emotions. (29) All in all, by working consciously with



It's art - and it's an infographic. Though not realisable in your everyday newsroom context, the - by Skye Morét, Liina Klauss, and Moritz Stefaner - visualisation of what has happened with the plastic produced since 1950 is a great example of how to work with scale, beauty, and making the invisible (numbers) visible. (Source: perpetual-plastic.net)

visuals and aesthetics, we improve our chances of tapping into FASCINATION as a potential response.

American artist and scientist Skye Morét (see an example of her work on the previous page) works with both FASCINATION and CONNECTION in her effort to engage her audience in science; she argues that we – as communicators – have forgotten something important when defining 'effective communication': wonder and excitement. This is not, of course, on the face of it a controversial insight, and some topics easily evoke fascination. My own experience in communicating space has taught me how much easier this is than basically all other scientific areas (just imagine exploding stars, black holes, an infinite universe) – and that when the brilliant life science researchers, I've met during my fellowship year, point at 'talking to people just like we talk about space', this is easier said than done. These scientists do understandably feel this fascination themselves; they know that life science in principle poses plenty of opportunities in terms of beauty, infinity, and existential questions, but the fact remains that this is harder to communicate to non-scientists than the inherent awe and wonder of space.

In Skye Morét's case, she approaches this challenge by working with scale and tangibility. In her own words, she shows "the ecosystem in a way that we can immediately and intuitively grasp" - she speaks to her audience's emotions rather than their cognition in the way she presents (otherwise not-so-fascinating) issues. Moreover, it can be argued that she (like other communicators mixing art and science) works with the element of surprise, as the audience probably isn't used to seeing e.g. large quantities of plastic waste puzzled together in an aesthetically pleasing manner.
Other artists and illustrators have successfully approached CONNECTION through hand drawing. For instance, Italian information designer Giorgia Lupi has rather famously pleaded to take step away from 'peak infographics' and make more human, meaningful visualizations – often drawn by hand. (31) The same can be said for data journalist Mona Chalabi's artistic and humoristic visuals; though anecdotal, the large number of followers on her Instagram account might indicate does indeed work well.

Eva Hilhorst, editor of Drawing The Times, whose course I followed during my fellowship year, puts it like this: Graphic journalism works because it provides us with **INFORMATION** (one picture is worth more than a 1000 words), because it elicits **EMOTION** (just compare an email to a handwritten and **ENJOYMENT** (we like looking at a work of art).

Eva Hilhorst (self-portrait)

In other words, looking at something that's aesthetically pleasing, like a beautiful painting or illustration, has proven to increase blood flow to the brain and release dopamine.
In other words, images can potentially give us a pleasurable 'reward', as it's reported in literature on the topic. (30)

Even further from the typical infographic approach to science visuals is American Wendy McNaughton. Her hand drawn, visual journalism appears regularly in New York Times, and along with other practitioners she argues – including during the talk I was fortunate to have with her during my fellowship – that drawings made by hand can contribute

"Focus on the miracle of Creation. On the Earth seen from space; the strange beauty of the nudibranch, of nature."

Jørgen Steen Nielsen, Dagbladet Information, on how journalists should strive to create a feeling of awe and wonder to spark the audience's love for our world and, ultimately, its preservation.

to or even constitute to a feeling of CONNECTION between the (visual) journalist and the audience. As I've mentioned before, science can connote something hard, difficult, and unwelcoming. McNaughton's argument (much along the lines of Mona Chalabi's) is that a drawing made by hand does not; it's easy to take in, and it's very clearly made by another human. In this way, I would add, the subjectivity of the journalist becomes not just obvious but also part of the attraction; the communication is transparent and at eye-level with its audience.
Moreover, I'd argue that the storytelling components of McNaughton's work, like the work of other graphic journalists, clearly taps into ENTERTAINMENT. One group (a different category than graphics journalism altogether or a variety of it – depending on who you talk to...), namely comics practitioners who produce journalism, generally embrace this notion – that their product isn't (only) an important and meaningful story but also has all the entertaining elements that characterizes the comics medium: fun, drama, storytelling, playfulness, and escapism. This applies to neuroscientist and science cartoonist, Matteo Farinella as well, who is certain that comics can become a powerful tool for science communication because it is "the perfect format to obtain the balance of entertainment and clarity." (32) At a science visualization conference in 2018, he put it like this:

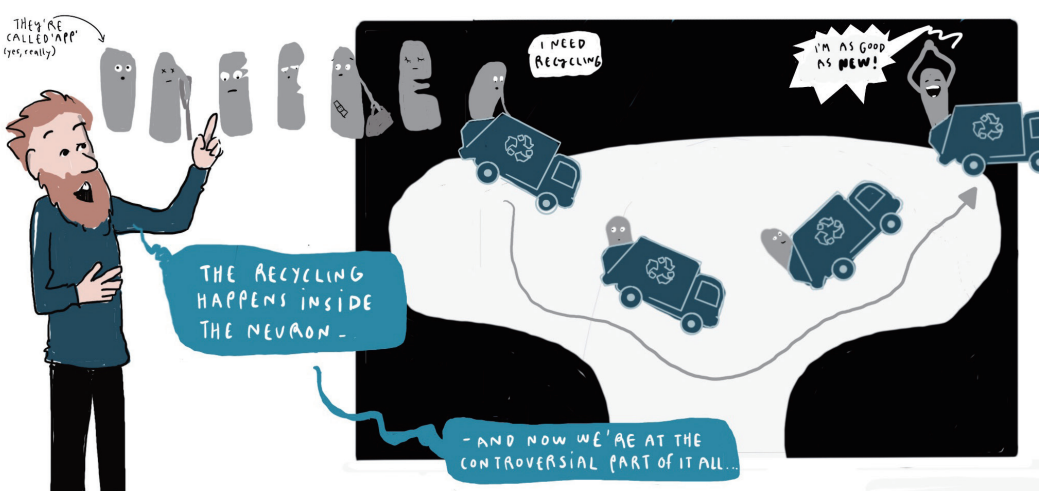
Wendy MacNaughton

"Comics and animations are becoming increasingly popular as a tool for science education and communication. Combining the well-established benefits of visualization with creative metaphors and character-driven storytelling, comics have the potential to make scientific topics more accessible and engaging for a wider audience." (33)

It's worth noting the term 'metaphor', as the visual metaphors found in comics and comic-like formats seem very well suited to illustrate complex phenomena. This is true especially when it comes to science since analogies and conceptual metaphors are indeed a key component of scientific thinking. (34) The more intangible entities, ideas and phenomena, we want to communicate, and the further we venture into the world that is invisible to the naked eye, the more important the visual metaphors might prove to be. (35) In other words, it can be argued that science communication can learn from comics when trying to make the invisible visible and evoke FASCINATION in the audience.

METAPHORS: In the plentiful literature on science and metaphor, it is generally agreed that metaphors are extremely important to people's understanding and thus need to be 'crafted' very deliberately.

This example explores how the membrane protein APP need to enter the endosome to keep functioning properly - via the metaphor RECYCLING.



Though not comprehensive, empirical research comparing the effectiveness and engagement of infographics, comics and text does seem to support the case for comics and graphic storytelling. For instance, the results from two British studies suggest that *"participants largely prefer data comics in terms of enjoyment, focus, and overall engagement and that comics improve understanding and recall of information in the stories"* (37) Similar results were found in a large Portuguese project that involved the production of content on stem cells in illustrated newspaper chronicles, radio interviews, a comic book, and animated video, and then monitored how this content impacted the Portuguese population. One important conclusion is that while all formats can be valuable in disseminating scientific messages, this is especially true for the comic. Moreover, the scholars conclude that "stimulating outreach materials that are able to teach new concepts and promote critical thinking increase engagement in science (... and), these materials can influence political, social and personal attitudes toward science." (38)

All in all, a case can be made for many different formats depending on time, resources, and topic, but in an emotional perspective, it's worthwhile to explore the visual approach (even) further.

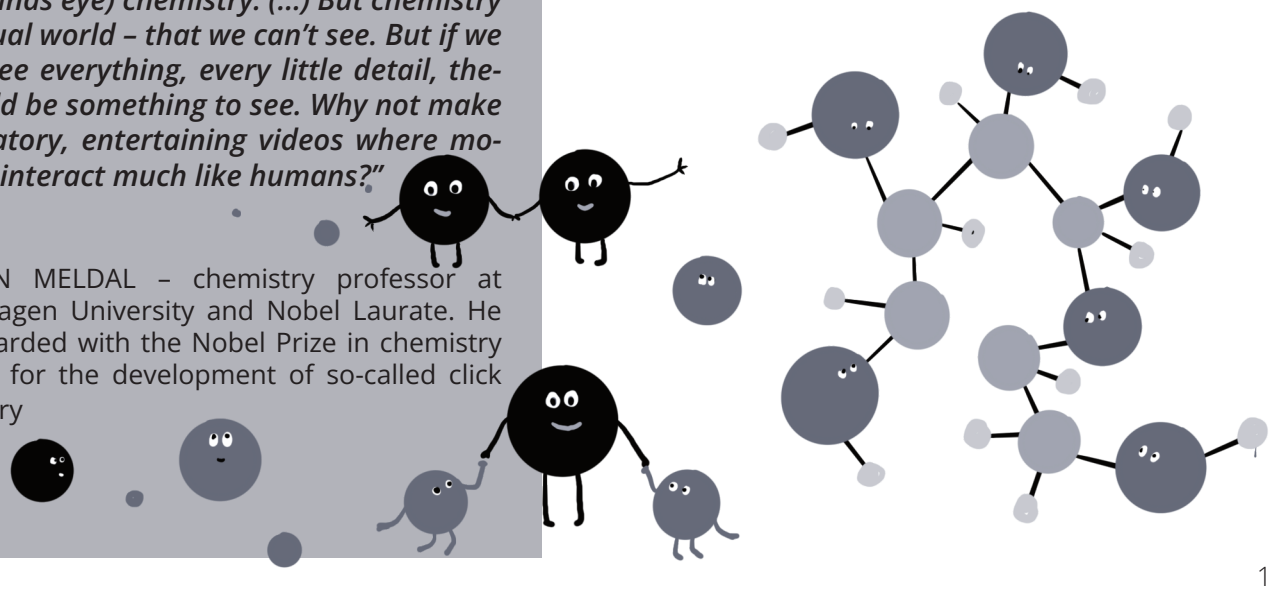
A VISIT TO THE PLANET OF COMICS

During my fellowship, I had the oppertunity to sit in on classes at the Animation Workshop in Viborg (it's among the best in the world in its field). More precisely, I followed several lectures in graphic storytelling with the initial intent to better understand and practice this art. This was a takeaway for sure, but importantly I gained a fundamental and comprehensive insight into what feels like a completely different world: (Comics) art is a calling; it absorbs and encompasses your entire existence, and all students seem aware that they'll most likely never earn too much money. (This alludes to a basic challenge of using comics in a journalistic context: They generally take a lot of time to make!)
A more explicite premise of graphic storytelling is **the creator's responsibility to consider and design the readers' emotions and experience** - an awareness (that I've argued is missing from most newsrooms...) that the choices you make as a creator can deeply affect your reader's perception.

Joana Mosi
Comics artist & guest lecturer

"It's initially very difficult for people to 'see' (in their minds eye) chemistry. (...) But chemistry is a visual world – that we can't see. But if we could see everything, every little detail, there would be something to see. Why not make explanatory, entertaining videos where molecules interact much like humans?" (36)

MORTEN MELDAL – chemistry professor at Copenhagen University and Nobel Laurate. He was awarded with the Nobel Prize in chemistry in 2022 for the development of so-called click chemistry

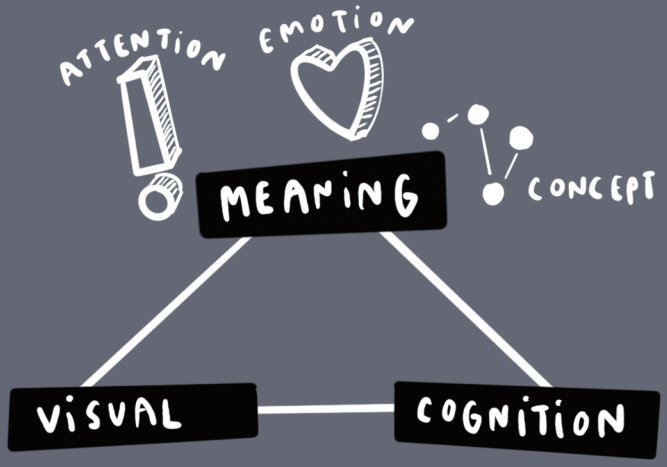


HOW OUR BRAINS RESPOND TO VISUALS

- a perspective from cognitive aesthetics

During the Spring of 2022, I followed the class Cognitive Aesthetics, a part of the master's degree cognitive semiotics at Aarhus University. Its focus is on aesthetic perception – how our visual brain reacts to images and artworks – and how these perception principles are used (consciously or unconsciously) by artists. An important takeaway is that shapes have an encoded meaning in themselves, independently from their symbolic or conceptual meaning, independently from what the shapes represent. Our visual brain, as associate professor Peer Bundgaard calls it, react to shapes and images for these 'purely visual reasons' and not just because we react to what is being portrayed in the image. Mostly, we're not aware of our visual perception, it's just something that happens in our brain. Unless we stumble upon something (visually) quaint or strange – that's when we turn of the mental autopilot and start paying attention. And this is a characteristic of the visual brain that can be utilized by artists – and, of course, in visual science journalism.

The cognitive aesthetics perspective is also applicable to journalism in general. It offers a framework for understanding clickbait, 'breaking' alerts, and the journalistic temptation to promise sensations and scandals by pointing out that as the writer/journalist, it makes perfect sense to use all kinds of stylistic and linguistic features to draw attention to the content, as this, when it works, leads to a 'deep processing' in the reader or viewer. But, as it is also emphasized, when overused – which we can definitely argue is happening in news – it has adverse effects.



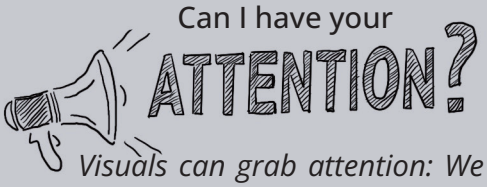
VISUALS AND LEARNING

Closely connected to the emotional perspective is learning; the process of comprehending and later recalling something. In the emotions wheel, this connection is evident in explanations and aha moments (EMPOWERMENT and FASCINATION respectively). Studies have linked the experience of awe to this too; awe is, in its core, when we absorb something perceptually or conceptually so very vast that we must adjust our previous understanding of the world. (39) Neuroscientists Ed Vessel and Irving Biederman offer us one account of why understanding something can evoke a positive emotional response: They've discovered that the brain's opioid-driven please receptors respond to "fresh understandings of complexity". The higher level of understanding, the bigger the pleasure – in other words, there's a very real chemical explanation why finding new meaning in what we thought we knew. (40)

Now how is all this connected to visuals? The number of theoretical and empirical studies pointing to the advantages of using visuals to assist learning and memory are – to use a typical journalistic way of putting it – enormous (41). The mere act of understanding something is often connected to visualizing; if you can't visualize something, often you can't fully understand it (42). Some phenomena can be easily understood – easily visualized in our minds without the use of actual, tangible visuals – while others require that the text is presented alongside visual communication. This is definitely true for complicated (life) science issues, as I've also discussed in the paragraph on metaphors and analogies (see page 13). American psychologist Allan Paivio attributes this to what he calls dual coding, meaning that the brain processes verbal and

non-verbal information in fundamentally different way; they're stored in our long-term memory as words and images/objects respectively. This essentially means that by presenting our information as both text and visuals, we double our chances that the audience can recall the information from their long-term memory.

We've seen experimental proof of this is 'recall affordance' in the already mentioned British and Portuguese studies, and more can be found in what is called graphic medicine, a field that supports and explores the interaction between healthcare and comics (43). For instance, a 2006 review of health communication research concluded that illustrated material does indeed increase both attention to and recall of information (44).



Visuals can grab attention: We know this to be true not just intuitively or from social media algorithms that by far favour images and video over text, but also from large empirical studies. These include eyetracking experiments where psychologists, media researchers, nudging professionals, and experts from many other fields of study have tested what parts of e.g. news sites that catch people's attention. The verdict? People look at visuals.

And if humans, especially humans in action, are pictured, this trumps the text with an even bigger margin. (47)

It's also worth mentioning that Reuters Institute's news report (2023) points to (the typically very visual) explanatory journalism as one viable solution to news avoidance and news fatigue, not least when it comes to the coveted younger audience. And earlier studies have found that 'explainers work' in the sense that they help people recall the content, and, importantly, that people are more likely to follow updates when an explainer has helped them understand the background. (45)

The increasing number of findings that illustration and comics can indeed help learning and recall is part of the explanation why these formats are becoming more common in especially science education. (46) And it's one good reason why we should experiment (more) with 'untraditional' visual formats – meaning not 'just' beautiful photos or infographics, however great these can be in some contexts – when doing science journalism.

CLARIFY DON'T SIMPLIFY

One of the many outstanding people, I've met during my fellowship, is Nick Sousanis, associate professor at San Francisco State University, where he teaches non-fiction cartoons. He is more well-known as the first person (or at least the first English-language person…) to write a PhD dissertation entirely as a comic book. His message is clear:

"Our job as cartoonists is to make things ACCESSIBLE – not SIMPLIFIED."

Sousanis' message on clarification is backed by other insightful people working with visualizing science and data, like Nigel Holmes, Alberto Cairo, and Jen Christiansen. All point to the common misconception that visuals should water down information and advocating for seeing the 'graphics person' as a translator or guide, as someone who makes complex and specialized information accessible to a non-specialist audience. (48)

A FUNDAMENTAL PARADOX: Disregarding visuals in a visual culture

We live in a visual culture, we're bombarded by images, videos, graphs. It's never been easier, journalist or not, to take and share a snapshot, to do a meme; the skill-barrier for working with (some) visuals seem to have been infinitely lowered.

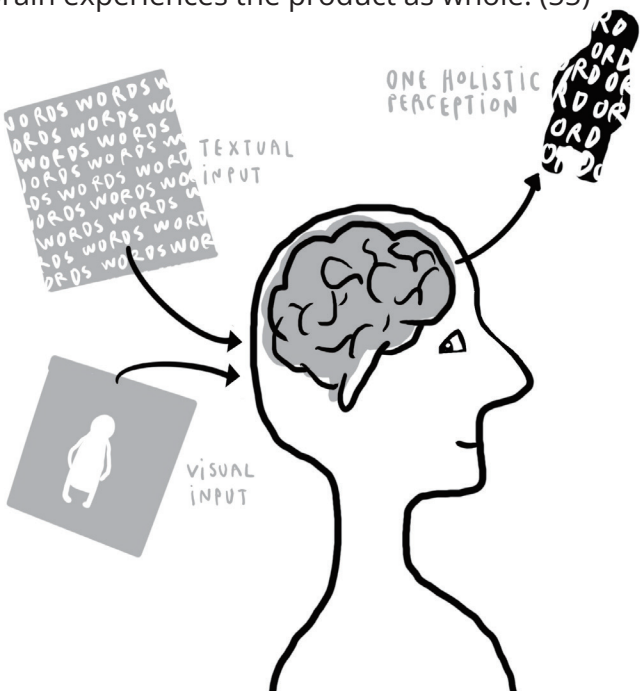
All this is true. (49) Yet, the fundamental premise of the report you're currently reading is that the power of visualization is, in general, underrated.

Because the following is also true: Press photographers are fired, journalists have very limited time to find the right photo. (50) Some newsrooms don't have in-house illustrators or graphic departments – and some of those who do, work in separate silos with separate processes. For instance: I visited a large newsroom that, with all the right intentions, had moved the graphics department from the office down the hallway to an island in the middle of the newsroom. But they hadn't changed the workflow or addressed how journalists and graphic designers could work together. And so, the visuals remained an add-on, something the designers had to figure out mostly on their own

after 'the real journalist' had done their job. This meant that the visual potential of 'thinking image from the beginning' (as Nick Sousanis put it) remained untouched, and that the visuals produced by the graphic designers – of course – kept having the same shortcomings as before.

This appears to be the case not just in the place I've visited, but in general (51), and anyone who has worked with text primarily can probably understand why: We tend to think that images are secondary to the words; they might grab our audience's attention, yes, but this is only important in order to lead the audience into the actually important text. In other words, we tend to think that the image is nothing more than a supplement. (52) Critics of science visualizations go on step further; they do not only regard the visualizations as a benign supplement, but rather as something that disturbs the text's important, factual information. (53) This can be explained with what I've earlier described as an advantage, namely visuals' potential to evoke entertainment and other emotions – because, according to the critics, emotions are seen as the counterpart to rationality and objectivity. (54)

Neil Cohn, Associate Professor in Communication and Cognition at Tilburg University, explains why this 'partition' of text and image is wrong – that our cognition system is multimodal not unimodal. Our brain doesn't perceive a core and a periphery when we engage in a communication product, the brain experiences the product as whole. (55)



Unlike what we might think (at least as journalists), our brains don't discriminate between textual and visual input. This emphasizes the importance of visuals; it's not just an add-on

All in all, when we set out to realize the many emotional and cognitive affordances of visuals, we must take the current (mis)perceptions about visuals and visuals' relationship with text seriously. In the beginning of this chapter, I denounced the term science literacy in favour of science curiousity in our audience. And I'll end it by hoping for better visual literacy in journalists – or at least visual curiousity... (56)

CHAPTER 2

TAKING STOCK

TAKING STOCK

- a (very) quick overview of science journalism - mostly in Denmark

From a merely quantitative perspective, science journalism is doing pretty well; the COVID-19 pandemic and climate change are contributing causes for this. The same can be said about the increasingly complex digital ecosystem of channels and platforms and websites, where science-related journalism is communicated – and consumed in 'patchwork' with non-journalistic science content. (57) And though the Danish Broadcasting Company DR as well as other prominent media outlets have shot down a number of dedicated science shows (and most recently – in April of 2023 – *Vid & Sans*, one of Denmark's two online science media outlets, was closed), new shows have been introduced (like DR's podcasts *Hjernekassen* and *Ubegribeligt* ('the brain box' and 'unfathomable' respectively), and – as we've seen most clearly during the pandemic – science-related content definitely has a place outside dedicated science sections or science shows. It has, however, been shown that science-content is generally approached with a less critical approach than any other field (58), which in Denmark as well as internationally has led to scientific institutions having a huge impact on the way science news are framed in the media: Media researchers in different countries have demonstrated how the way universities word and angle press releases etc. to a large extent determines the journalistic angle – which is a problem when, as it's often the case, universities' communications departments exaggerate and dramatize findings to fit into media's (negative) news logic. (59)

The news logic (often referred to as 'news criteria') and the push-effect of the science institutions help explain the prominent discourses in science journalism, namely that the scientific finding in question is NEW and (either!) MIRACOULOUS or SCARY. The latter is enforced by analogies and metaphors, which, as I argued in chapter 1, can be a good choice in terms of understanding, but are more often used to "personify viruses, cells, organs or illnesses and projecting them as scientists' enemies, often increase the drama of the narrative," as Polish media discourse researcher Katarzyna Molek-Kozakowska has demonstrated in (anglophone) science journalism. (60)

Gunver Lystbæk Vestergaard, science journalism PhD, is also critical towards these tendencies, and calls for journalists to "get out where glasses are lost, the incubator wrongly adjusted, researchers in doubt, journals rejecting articles, and where no one knows what's up and down with nature. This type of 'science in the making' stories can easily be positive; but focus shifts (...) to the citizens' need to know the true essence of science." (61)

My own very tentative mapping of prevalent discourses in science journalism - based primarily on Katarzyna Molek-Kozakowska's research on anglophone journalism and my own probes into Danish science journalism (via the article database Infomedia, via reading dedicated science media such as (the 'serious') videnskab.dk and (more 'tabloid-like') Illustreret VIdenskab, and via listening to full seasons of dedicated science podcasts from DR and R4dio .

THE CURIOUS AND THE MISSING

To the best of my knowledge, there are no Scandinavian insights into what types of scientific content is most popular, most engaging and/or has the greatest potential to evoke positive emotions and science curiosity. However, we could take American KQED's extensive and newly published research into consideration. In collaboration with media scholars, KQED made several findings:

- Millennials are the most science curious age group of all.
- Favorite topics change with age, so that younger audiences show the greatest interest in climate, and adults are most interested in wildlife and psychology – and, as they age, more and more in health and medicine.
- The most 'frequently missing' audience (ie. the demographic that consume science content to the least extent) seem to be minority women.
- Stories that explain something audiences are curious about in nature and the environment are much more popular than any other type of story, including news about scientific discoveries and climate change. (62)

Of course, American and Scandinavian audiences can't be equated without further research, just like American and Scandinavian science journalism can't. Nevertheless, KQED's research can, if nothing else, remind us to look for the missing audiences, and of the eternal but easily forgotten truth that we need to talk about audiences (plural) and not audience (singular). Also note that the last point is similar to Nick Newman's and Reuters' general conclusion: people are curious – and that we as journalists should hone this curiosity with explainer journalism (see page xxx). And it's in line with what we know from Danish media as well, namely that the explainer format is very popular indeed.

WHAT ABOUT VISUALS?

Apart from the fact that audiences in general like the inherently visual explainer format, what do we know about the use of visuals in Danish science journalism? Having followed (and produced) Danish science media for many years, and having talk to many of its practitioners, two things are clear:

Firstly, it's clear that state-of-the-art Danish (and Scandinavian) science journalism visuals are of lower quality than its anglophone counterparts (e.g. the Guardian, New Scientist, Quanta Magazine). This is hardly surprising; being a small 'language area' means smaller audiences and, in many cases at least, smaller budgets. Also, we have a long history of not being first movers when it comes to new types of journalistic content or tendencies... (63) This might help explain why visuals aren't high on the agenda in e.g. the otherwise remarkable videnskab.dk (see more in chapter 3).

Secondly, it's clear that especially that infographic has gained growing recognition among Danish journalists in the recent years – to the point where it's now taught at the Danish School of Media and Journalism.

All in all, in my well-researched and well-informed (but still biased) opinion, there's a huge untapped potential, when it comes to visualising science...

THE NARRATIVE ABOUT THE LONE GENIUS ISN'T NEW

Though most life science is carried out in teams and groups, the lone-genius trope seems to be hard to get rid of. And this is, as the figure on the previous page shows, both true when it comes to 'dangerous science' and 'miraculous science' (just think about, respectively, Chinese He Jiankui who used CRISPR to 'gene-edit' human embryos and the Danish Nobel winner Morten Meldal). While there might of course be some truth to the genius-like achievements of Jianku and Meldal, focusing excessively on the individual neglects other equally important truths about science. This was a key takeaway from the class *'history of ideas in natural science and technology'* that I followed at Aarhus University in the Fall of 2022. For instance, the genius trope makes it easier for us to forget the fact that science is a practice, and that it is always embedded in a certain time and culture. of 2022.

CHAPTER 3

FORMATS & PROCESSES

A fundamental object of my fellowship work has been to deliver a set of applicable, workable guidelines for the many journalists, who are not familiar with tapping the potentials of visuals. In this chapter, I explore a variety of formats that might serve as the basis of such guidelines.

I've entered into this exploration dialectically, so to speak; from three different perspectives that have been in a constant 'conversation' with one another. These perspectives are:

- What **literature** can tell us about formats that 'work' in the sense that they (have the potential to) evoke constructive emotional responses. Much of this is laid out in chapter 1.
- What we can learn from **other people's experiences**; I've had conversations with editors and journalists in Denmark and abroad.
- What we can learn from **practically engaging** with the subject matter – and get hands-on experience with what it takes for scientists, journalists, and illustrators to work together. This is not least inspired by designers and design thinkers ability to quickly gain practical knowledge through prototyping and testing.

As I've alluded to in chapter 1, choosing which formats to explore could be approached in several sensible ways. When teaching visual literacy at the Danish School of Media and Journalism, for instance, I ask the students to look for and create 'visual evidence' in the form of data visualizations, archival material, models, film/photo/drawings (e.g. portraits, reportage, or genre), and maps. And Eva Hilhorst has the following classification of graphics journalism formats: Comics, reportage, drawn article, portrait, infographic, and graphic memoir, and cartoons.

Classifications like this serve as an inspiration and a backdrop, but I've approached my work with visual formats from a slightly different starting point, that is by asking what formats make best use of the visual affordances to evoke an emotional response – and how might we work with these formats in an editorial setting? Both infographics and photograph have a key role to play here but are beyond the scope of this project – and described thoroughly in many articles and books.

The currently most common format is the **EDITORIAL ILLUSTRATION**, which works as an eye catcher ('read this article, please!') and/or help communicate an important aspect of the written story. The quality of this type of visual in Danish science journalism (and, one could argue, beyond...) is wildly erratic, and the interesting question, then, is how we can improve this quality without messing with the general logic behind the popularity of the format, namely that it's fast and cost-effective.

A far less common format is **COMICS JOURNALISM**, ie. a visual stand-alone format that is the journalism rather than an accompaniment to the journalism. Comics journalism utilizes the storytelling affordances known from, yes, comics, and has proven very successful in creating an emotional and cognitive experience with many different audiences (see chapter 1 for more on this). One obvious disadvantage is the specific skillset required not just to produce an actual comic but also work and collaborate with comics artists to get the best result. An important question, then, is when it makes to most sense to spend the time and effort it takes, and how we might do so.

The third format I'm exploring here is the **VISUAL ABSTRACT** – a term I've borrowed from scientific journals, where it's gaining currency as a one-page visual summary of an article's key messages. In a journalistic context this might not be the findings of a scientific article, but rather key points of a long article or article series, an answer to timely question, or a summary of a talk or a discussion at a readers' event. Relating to resources, this format is somewhere in between the editorial illustration and comics journalism, and that is less 'invasive' to the current editorial workflow – and depending on what's needed, it might either work by accompanying a text or as an independent piece.

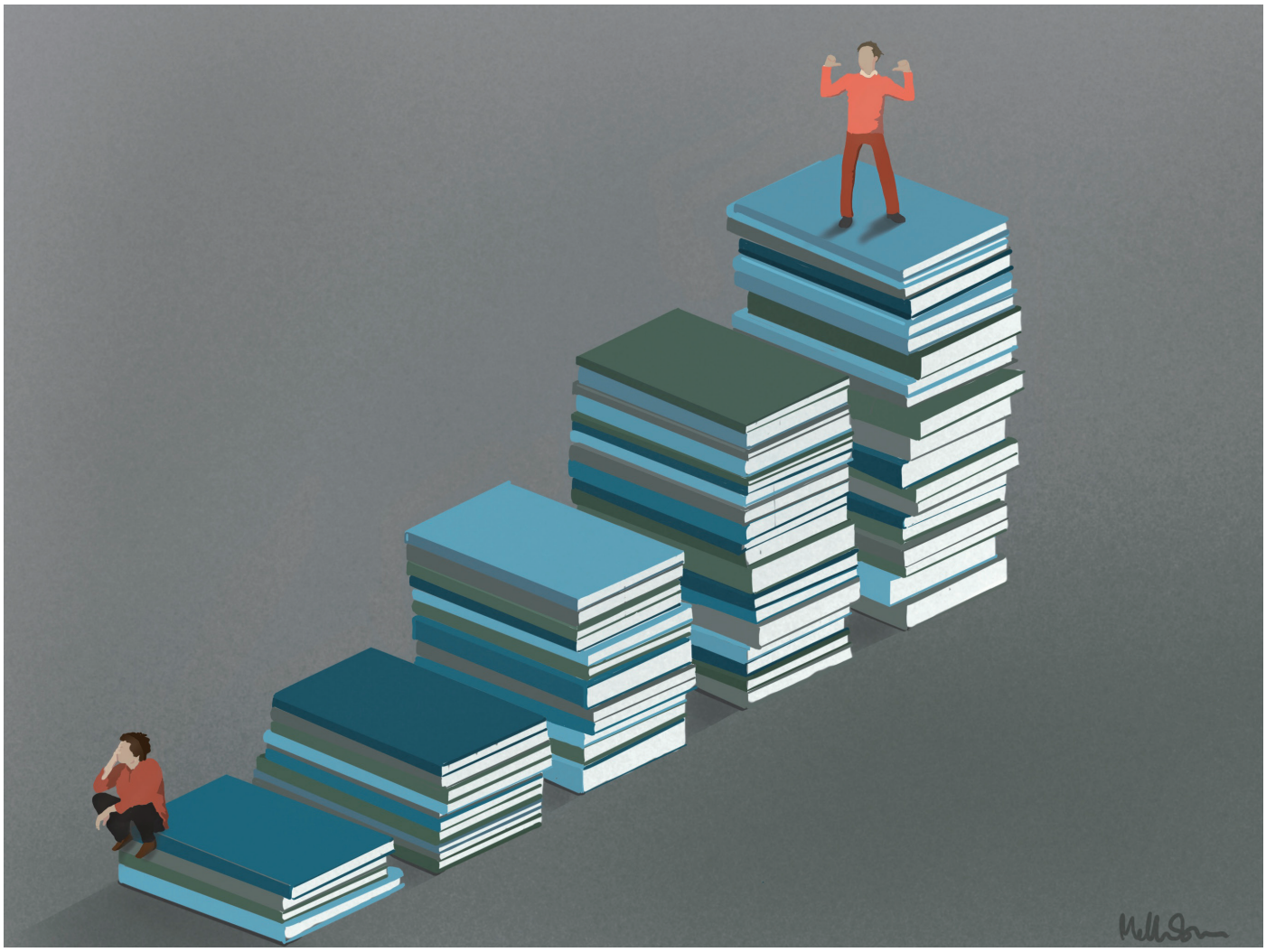
Throughout much of my fellowship I was convinced that I should focus on a number of formats and only address editorial workflows and processes when discussing these and to a smaller extent. However, through creating the format prototypes and through my conversations with journalists and editors, it became obvious that I needed tackle the process question – how illustrators and journalists can better cooporate – more explicitly. And so, I've explored how a **QUICK SYNOPSIS** might help us here.

EDITORIAL ILLUSTRATION

Any time you're not using a photo to catch people's attention or tell your story, you'll probably use the editorial illustration – meaning any type of drawing, sketch, or collage made to accompany a written piece of journalism. It's no wonder that this is by the most popular (non-photo) visual format: It's fairly cost-effective, and it can be added after the submission of the written piece. Not that the latter is optimal, but it works.

During my fellowship I've worked with the Danish science media *videnskab.dk* to experiment with editorial illustrations of life science. The media's budget for visuals is very tight, and so their written pieces are usually accompanied by free stock photos; often glitzy, generic ones from international image libraries. And so, it seemed like an obvious partner for my goal to practically engage with the subject matter – to make editorial illustrations of their ***life science articles.***

Interestingly, however, among the requests from the newsroom were next to none concerning life science issues. Instead, most requests concerned stories relating research processes and research politics in any kind of science. In hindsight, this makes sense: A tolerable (but not great!) photo or illustration is easy to find for most life science questions: An image of a cell or a double helix for the stories on various biological processes. An image of a handful of pills if the story is on medicine. An image of whatever animal might be protagonist. And so forth – and usually generic. Research processes, on the other hand, are harder to illustrate. For instance, how do you illu-



How might we illustrate the intangible, invisible concept impact factor? One option is using the staircase or rostrum as a metaphor, with the upper level more attractive than the lower. Published at videnskab.dk

Another illustration commissioned by the Danish science media videnskab.dk. Again, the article in question was about research processes rather than, as I'd asked for, life science issues, thus demonstrating what type of stories the journalists find especially difficult to illustrate. This is definitely understable; as I've argued earlier, the more intangible or invisible the subject is, the harder it can be to come up with visualisation ideas. And research processes are indeed hard to grasp. (65)

strate a story on impact factor and the controversies around it? Impact factor is used to evaluate the relative importance of a scientific journal, as a seal of approval, and when the story is about no specific one journal, it's clearly hard to illustrate in an interesting way. The journalist considered using a stock photo of one or a couple of journals. That's the obvious idea. However, if we stop and consider what an illustration is *meant* to do, it's doubtful that this idea suffices: An illustration should either catch the reader's attention or communicate an important aspect of the story. Preferably both. Using a stock photo of anonymous journals does convey the central aspect of the story: *this has to do with journals*. A fact that is understood immediately from the subheading, and to which the stock image adds no extra meaning, emotion, explanation…

So, what can we do instead? And what can we do, when time is a (very) limited resource? One approach is, as I've described in chapter 1, considering what metaphor could explain the concept or process. In this case, then, we'd have to find a metaphor for impact factor; for something having to do with a hierarchy, with the number journals/citations, and with the fact that can have a huge impact on the individual researcher. I try to portray this by using the staircase as a metaphor – with the unhappy researcher/person sitting on the lowest step, the shortest stack of journals. And I try to portray the staircase in a way that might be interpreted as a sort of rostrum as well. The colour scheme a feel of the illustration hopefully conveys the atmosphere of the article more than e.g., a lighter or more humorous style would have. Many more metaphors could have worked just as well if not better. But all things (not least the tight deadline) considered, the finished illustration is definitely better than the stock photo in that it conveys an emotion; a small narrative.

The illustration above is another example from videnskab.dk – and another example of how their illustration requests concerned process and politics rather than life science per se. IIn this case, the subject is PhD students' stress, and how older scientists impose themselves on their scientific articles. The default choice here, as the journalist put it, was a stock photo of some people in white coats. Though my quickly made illustration isn't fantastic, it's at least better than this trope and the stereotypes about research and researchers ('it's all natural science, and it's all done in a lab') that it reinforces.

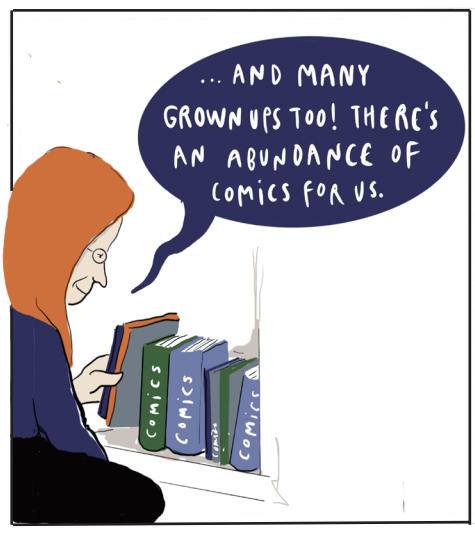
COMICS JOURNALISM

When experimenting with visual journalism, comics are a natural choice. During my fellowship I made a couple of attempts to do so: First and foremost, I worked with Associate Professor Olav Andersen to test if and how his very important and very complex research could be told as a comics narrative. My starting point was the fact that research very often takes years, decades even, without any fancy results to show – and that this process is very important to communicate outside science circles. The challenge is, of course, that decades without any results that can be used to save human lives – and, which is often the case, with most hours spent in front of a computer screen and in meeting rooms – are hardly headline-inspiring. In other words, what I wanted to test was if comics journalism could help create a more engaging process narrative. Olav Andersen's story seemed well-suited for this purpose: Roughly speaking he had worked 20 (!) years without any major result, before finally (oh joy!) he and his team reached if not a happy end then at least an important milestone; one that will play a role in the development of Alzheimer medicine. And, moreover, he had spent most of this time not in a lab but in long zoom meetings and a stuffy office. In other words, his story seemingly posed the perfect mix of (real world) research challenges and (communication friendly) results and pay-offs.

All longform journalism takes time – comics journalism even more so. I knew this before making the first sketch in Olav's story, but I had attributed it to fact that drawings simply take time to create. Which, of course, they do. However, while working with the comic I had an important realisation: That the benefits of comics is closely linked to the reason they're so time-consuming to create. I realised that I needed much more detail, much more information, than I would in my written science journalism, because every panel in the comic needed to be correct – including the details that weren't in focus or mentioned in e.g. speech bubbles. And all these details, communicating to the user in a multitude of ways, makes for a richer, denser, and more impactful user experience. Banal or theoretically obvious as this insight might seem, it is nevertheless important. And for several reasons:

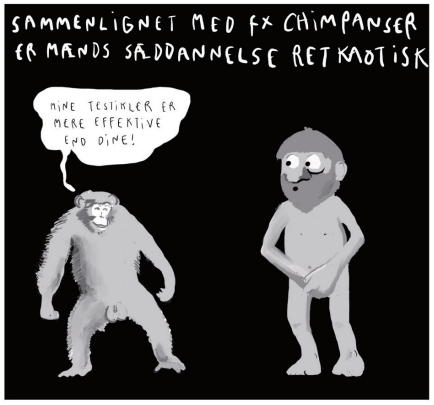
- To match expectations with involved scientists, they need to know that their participation will possibly require more interviews and more detailed questions than the average interview.
- To make a realistic financial plan for the involved media, it's important to know that longform comics are more time-consuming than textual longform…
- To put together the right team, it's important to know that the science comics requires (even) more insight than the textual science piece. In other words, if the comics artist isn't science literate, it's a good idea to add a science journalist to the team.
- To understand that AI can't do the job on its own. Though AI can create illustrated panels, there's no way to remove the time-consuming human understanding of the subject from the work process.

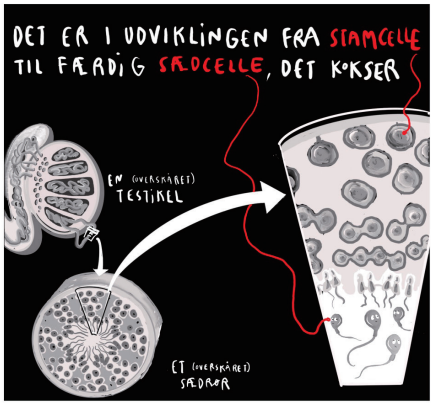
Does all this mean than the only way to do comics journalism is in this very demanding longform format? Definitely not. In cooperation with the science media videnskab.dk, I've tested a more quick-and-dirty, cartoon-style comic. This comic had a dual purpose: It was meant as an add-on to a text-based article on the website, and – with its uniformly square panel – for a series on Insta-

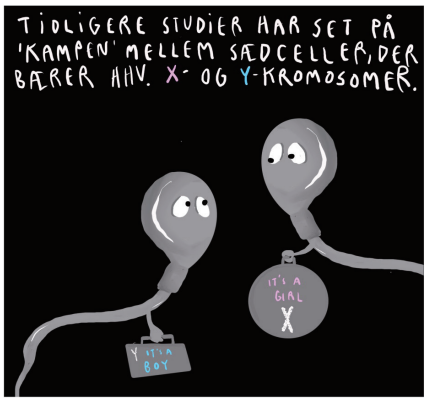


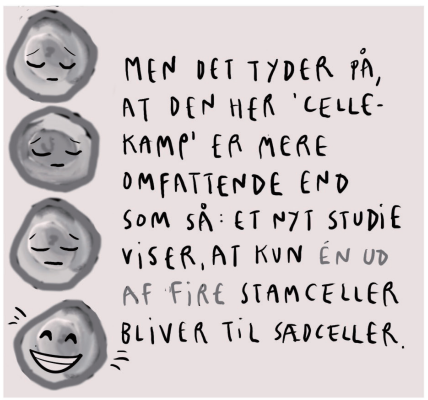
gram. Again, the understanding of the issue took much more time than the actual drawing. And this posed a serious challenge, as the editor had only commissioned me *after* a freelancer had handed in a finished article and with only a weekend to produce the piece before it had to be published. In other words: I could neither consult the quoted scientists nor the journalist. And though I'm fairly science savvy, I only understood the essence of the research after consulting with fertility doctors in my own network.

Though the editor and the rest of the newsroom liked the finished result, the freelancer was far from happy. She felt that the comics over-simplified the very complex research that she herself had had trouble understanding, and (this is my guess...) probably and rightly felt somewhat ambushed that her article was published alongside a jolly cartoon-ish comics. Though the conclusions presented in the comics are absolutely correct - I've consulted the expertise - all this only goes to underline the fact that involving the illustrator/graphics person/comics artist early is a very, very good idea....

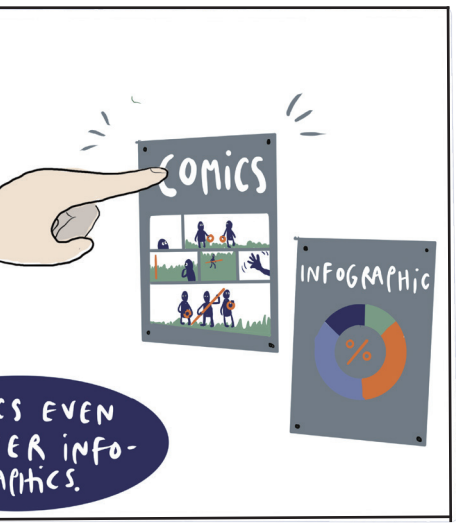


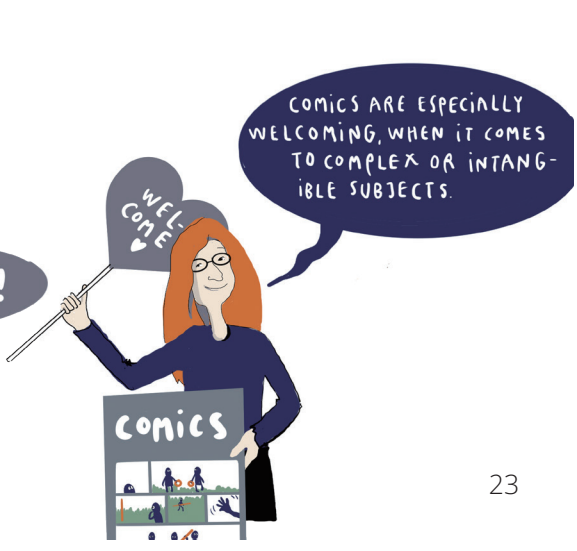






Top right: *A short comic produced as an add-on to a written piece on videnskab.dk. The subject is how sperm is produced in various species - including humans. After it was first published, the editor removed it from the site and only kept the first panel, because the freelance journalist who wrote the piece felt that it over-simplified the subject.*
Bottom: *The meta comic... created to shortly convey the pros of, yes, using comics in journalism. Published in the tiny book on visualisations (se the section on 'process').*
Next page: *The first two pages of 'Olav and the Alzheimer Brain'.*



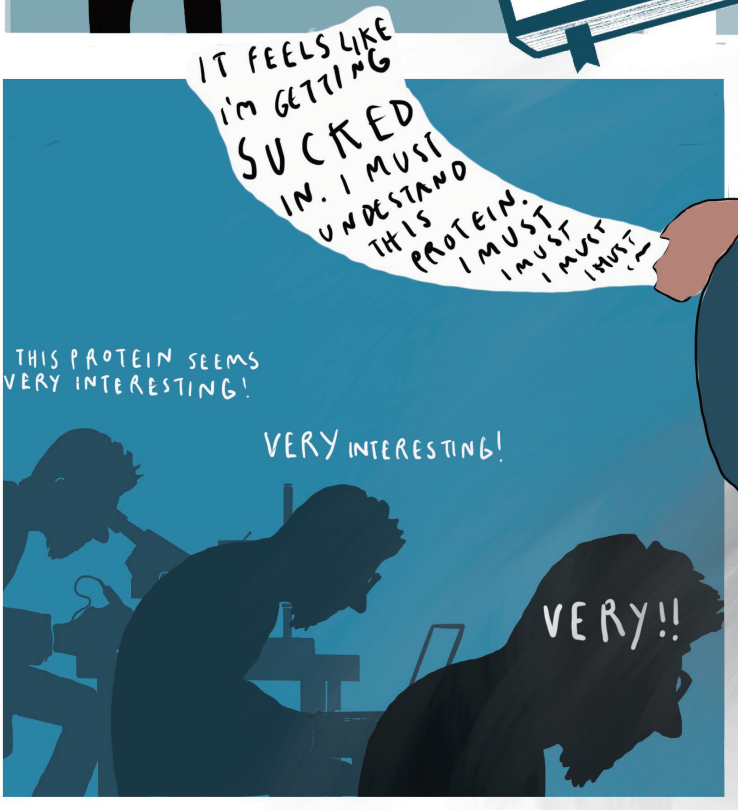


OLAV & THE ALZHEIMER BRAIN

OR: THE TRUE STORY ABOUT HOW BIOLOGIST OLAV ANDERSEN EXPLORED A PROTEIN THAT MIGHT MAKE AGING LESS SCARY FOR A LOT OF US.

ONCE UPON A TIME, A YOUNG BIOLOGIST HANDED IN HIS DISSERTATION...

... WHICH LEFT HIM WONDERING WHAT HE SHOULD FOCUS ON NEXT. HE THEN REMEMBERED HEARING ABOUT A PROTEIN – A COOL, NEWLY DISCOVERED ONE –THAT SEEMED PRETTY SIMILAR TO WHAT HE HAD LOOKED AT IN HIS PHD.



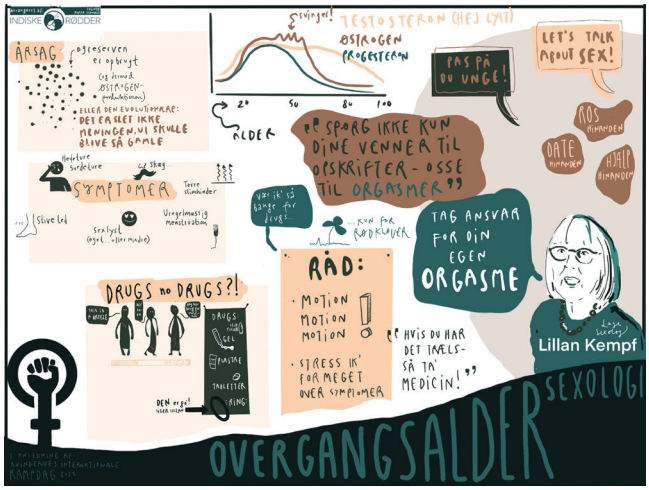

AT THE TIME, IT WAS WELL-KNOWN THAT THE ALZHEIMER BRAIN IS FULL OF PLAQUE. BUT WHAT CAUSES THIS PLAQUE? AND WHY?
NEURON
THE PLAQUE BUILDS UP BETWEEN THE NEURONS IN MY BRAIN
...AND SO, THE NEURONS END UP DYING, AND MY BRAIN STARTS FORGETTING
COULD IT BE THAT THE 'NEW' COOL PROTEIN PLAYS SOME PART IN THIS?
LET'S FIND OUT BY (GENETICALLY) MESSING UP THE PROTEIN IN A PIG!
THEY GAVE ME THE PLAQUE!
SO OLAV, WHAT IS THE CONNECTION?
WELL, FIRST WE MUST TAKE A CLOSER LOOK AT THE NEURONS IN YOUR BRAIN...
THESE TINY GUYS IN THE MEMBRANES HELP THE NEURONS FUNCTION...
BUT IF THEY AREN'T RECYCLED PROPERLY, THEY EVENTUALLY TURN INTO... PLAQUE.
THEY'RE CALLED 'APP' (yes, really)
I NEED RECYCLING
I'M AS GOOD AS NEW!
THE RECYCLING HAPPENS INSIDE THE NEURON -
- AND NOW WE'RE AT THE CONTROVERSIAL PART OF IT ALL...

VISUAL ABSTRACT

Originally, the term visual abstract comes from scientific journals, where it is gaining currency – not least because it has proven to be a popular format on social media (1). In a journal context, the visual abstract is just as rigorous as its textual counterpart: It must, briefly and matter-of-factly, summarize the key findings of a study described in a scientific article.

To the best if my knowledge, the term hasn't yet been used in a journalistic context. Which is, of course, not to say that the actual format hasn't had some traction; the jury is simply still out when it comes to coining just the right term for it. And so, this section has had several working titles including **graphic recordings, visual notes, visual summaries, and explainer drawings**. Regardless of what we call it, this format has various potential uses and advantages. According to studies on the effect of graphic recording (albeit not in a media context but in meetings and various processes), these advantages include an appeal to reach and involve target groups that are usually hard to reach. This is explained with the accessibility and appeal of the graphic representation and with a positive shift in the power balance between researchers/experts and lay people (when their questions and insights are represented visually) (2).

How might we benefit from these attractive affordances in a media context? The most obvious answer is that the visual abstract can be a part of readers' events and debates. Just like the recordings mentioned in the studies, they can serve as a **communication tool** that helps participants remember key messages. And, I'd argue, as a **branding tool** for the media house or organiser. During my fellowship year, I've experimented extensively with this, both in the realm of life science and in many other areas. Most recently, I've made visual abstracts of all Danish party leaders at Folkemødet, Denmark's largest democratic festival. Other experiments include an Aarhus University PhD defense on fertility (see the opposite page), and



Top left: *Visual abstract from 'Folkemødet' 2023, commissioned as a branding device for social media.*
Bottom left: *Handout produced for a small NGO for a Women's International Day. Printed out immediatly after the talk on hormones and menopause and gifted to participants.*
Right: *Snapshot from a break during party leaders' constructive debate shortly before the 2022 national elections. Note the visual abstract on the big screen.*
Opposite page: *Visual abstract of a 2022 PhD defense. Made as an attempt to communicate the dissertation's very complex conclusions. It was printed on large sheets of paper and put op around the venue afterwards.*

INFERTILITY AND NITRATE IN DRINKING WATER

NITRATE IN DRINKING WATER AND FECUNDITY HEALTHCARE USE PRIOR TO INFERTILITY

NINNA HINCHELY EBDRUP MD

PhD defense · 2022

FERTILITY IS DECLINING... WHAT ROLE MIGHT THE ENVIRONMENT PLAY?

We're exposed to NITRATE all of our lives - including the 'reproductive window

WATER SOIL FOOD ...

USUALLY WE'VE LOOKED AT INDIVIDUAL FACTORS

Other research · Mainly high doses on rodents...

HEALTH BEFORE INFERTILITY

Not in treatment

CONTROL GROUP

(Later) in treatment

711 WOMEN STUDIED

EQUALLY HEALTHY

MORE PRIOR VISITS TO GENERAL PRACTITIONER (and more drugs, more tests etc in the YEAR before)

study no. III

study no. I

RISK OF PREGNANCY LOSS - AND NITRATE IN WATER

HARMFUL MECHANISMS:
→ blood not too good at transporting oxygen
→ harmful substances (NOCs)
→ 'unhappy' hormones...

DATA: 100.000ish PREGNANT WOMEN - LINKED TO NATIONAL DRINKING WATER DATA

RESULT: OVERALL - NO EFFECT

asthma drugs etc

EFFECT OF 'NITROSATABLE DRUGS - COULD IT AFFECT WHAT NITRATE MIGHT DO? → NO!

WATER WORK

WATER WORK

DIFFERENT REGIONS - DIFFERENT EXPOSURE

HOWEVER:
- THIS MIGHT BE EXPLAINED SOMEWHAT BY SELECTION BIAS
- AND: THERE IS A (SMALL) CONNECTION BETWEEN LOW RISK & LOW EXPOSURE...

"WE NEED MORE DATA!"

ESPECIALLY ABOUT EARLY LOSSES

OTHERWISE WE END UP WITH A GREAT DEAL OF SURVIVAL BIAS

Population surveys measure:
- the time it takes to get pregnant
- (not-too-early) abortions

PREGNANCY LOSSES

ICEBERG

invisible losses

study no. II

TIME TO PREGNANCY - AND NITRATE IN WATER

DATA: 70.000ish PREGNANCIES

RESULT: OVERALL - NO EFFECT

HOWEVER: SELECTION BIAS MIGHT EXPLAIN THIS

FECUNDITY CONCERNS ALL OF US

CAUSES

♀ fertility

♂ infertility

mixed infertility

unexplained infertility

AGE

LIFESTYLE

WISH LIST
- ☐ MORE RESEARCH
- ☐ EVEN MORE RESEARCH
- ☐ ...

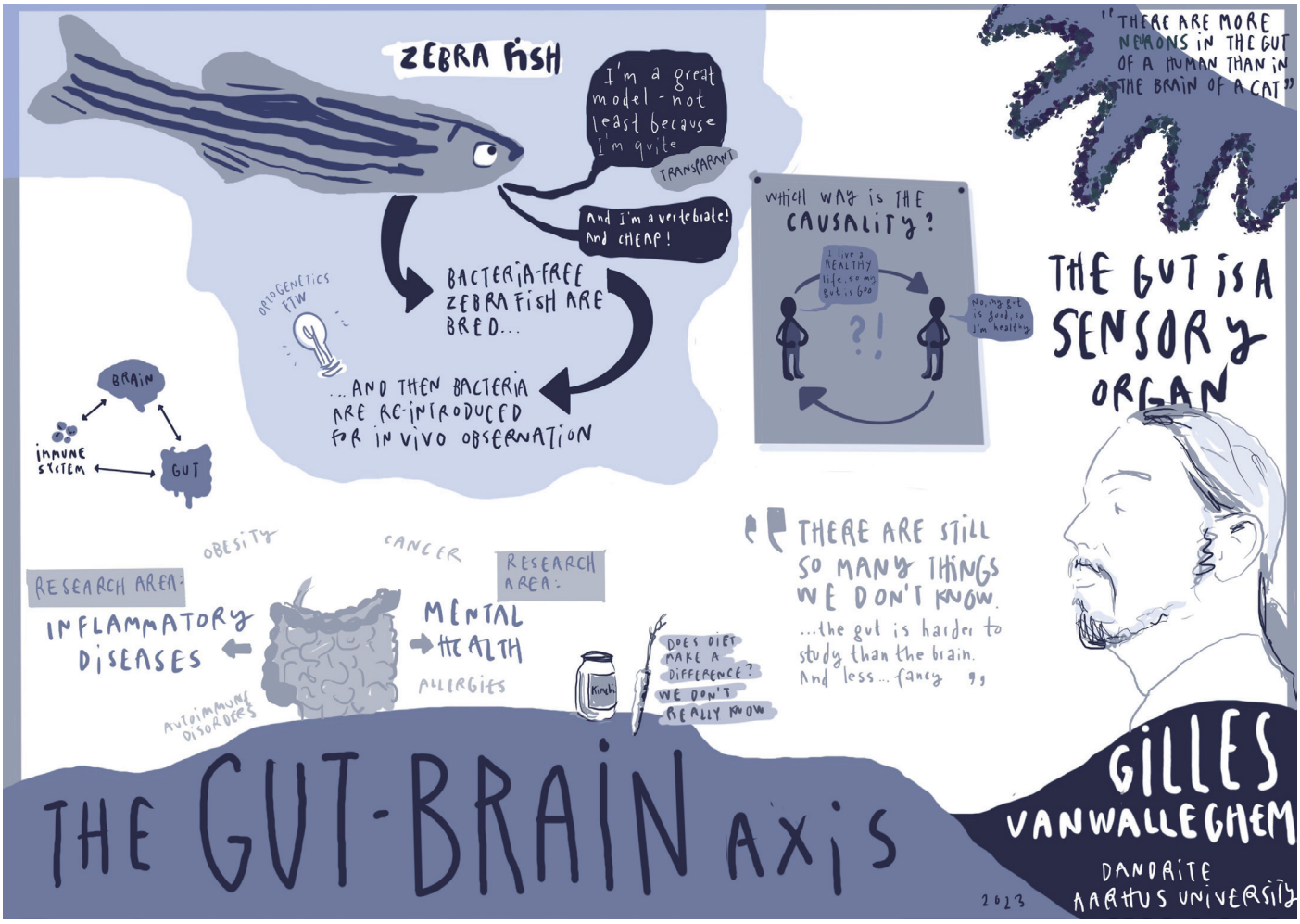
IS THIS BAD IF I WANT BABIES?!

Constructive Institute's own public debate leading up to the national election. At the latter, the abstract was shown on a large screen at the end of the event.Iin other cases, when a printer is accessible, the abstract can turn into handout to hang on the fridge (complete with key messages and the media's logo in a prominent position…) – hopefully making the participant feel that they've received a small but tangible gift. This was the case, when a small NGO hosted an all-women's event on menopause and hormones and handed out low-quality colour prints to all participants by the end of event. Despite the poor print quality, the feedback from participants was great. In several other cases, printer access hasn't been an option, and the visual abstract has merely been shown at a screen at the end of the event and then distributed to participants on social media and/or email. A consistent response concerns the speed with which the abstract is made; it seems that the presence of a human (not just AI…), drawing the events and points as the unfold, causes quite the wauw effect.

This human touch is, in my experience, a selling point. Earlier, I've described the positive feelings of e.g. connection the hand drawn image can evoke. This is true for the visual abstract as well. One could argue that the less tangible the event setting is, the more valuable the product made by a human hand might be. My own impression from making visual abstracts of online events is that the abstract lends an air of tangibility and presence.

Other than mostly casual feedback from participants, event hosts, and the people portrayed, and my own (clearly biased) observations and experiences, I have no evidence to back my conclusion that the visual abstract is a low hanging fruit in terms of adding value to media activities. And I have no way – yet, at least – of quantifying this value. Nevertheless, **I won't hesitate to recommend media outlets and event hosts to corporate with visual professionals and produce abstracts.**

With regards to summarising long articles and article series, the wauw effect of the live drawing is clearly missing, but the explanatory and aesthetic affordances of the abstract remain. I have some experiments in the pipeline (e.g. with Fredensborg Amtsavis), but haven't done enough to make any conclusions on the effect on readers and on the value for the media.



A visual abstract from a talk by Gilles Vanwalleghem, Team Leader and Assistant Professor at Aarhus University.

PROCESS: QUICK SYNOPSIS

How can the graphic designers and journalists better cooperate? I've mentioned how, in many places, journalists and graphic designers have moved into the same newsroom. Yet the old patterns of division still dominate: journalists discuss their stories with other journalists, then they get busy writing and editing and… only then do they realise what they needed the graphic designer's help with. I know this from the many journalists and editors, I've talked to during my fellowship year, and from my own explorations, especially with editorial illustration. As Jen Christiansen, senior graphics editor at Scientific American, puts it:

"It's not uncommon for editors to turn to visuals only after the words are solidly underway. The thought process could be described as, the reporting is complete, a story arc is in place, and it's time to move on to the finishing touches. (…) And, as graphics editors continue to distance themselves from the classic "service desk" model — especially as data reporting and data visualization become more intertwined — it's important to remember that visuals can be the driving force behind top-notch science journalism." (64)

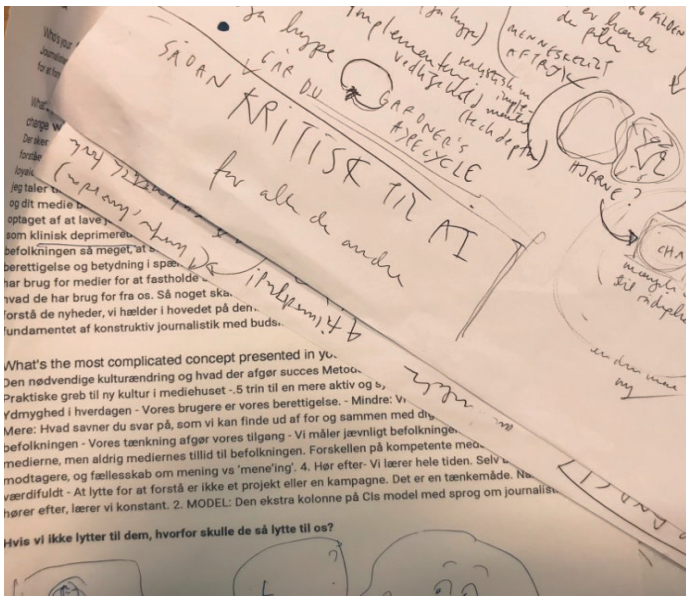
When the visuals are just an afterthought, the consequence is that the end product, the published article, often 'misses out on' the captivating, arresting, emotion-provoking illustration that the designers or illustrators could have crafted, had they been involved earlier. And good intentions and physical proximity in the newsroom is not enough to change ingrained workflows and habits. Neither are our good intentions, our knowledge about the importance of visuals, or our momentary motivation ("we really need to do something about this!"). At the same time, it's hardly ever realistic to make large cultural changes or suddenly add resources to new and exciting collaborative projects across graphics and editing departments. It almost sounds like a catch-22. So what should we do?

We should **start small but systematically**. And so, I explored how a QUICK SYNOPSIS might be of value to the cooperation between journalists and designers, and ultimately to the quality of the illustrations. This approach is similar to what has been called the maestro method, and to what e.g. American KQED has experimented with – with great success.

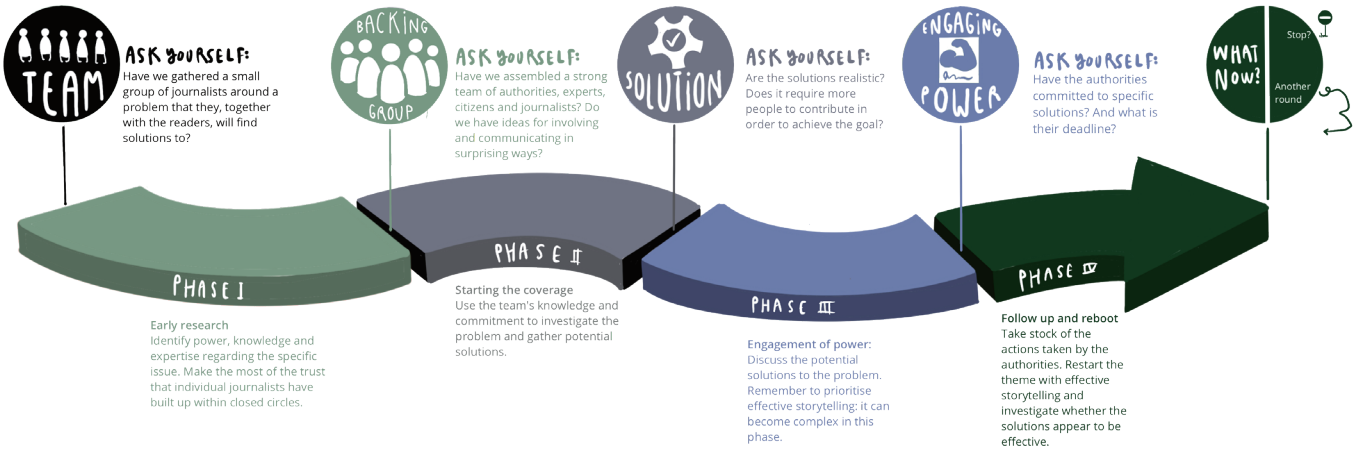
When I and a group of fellows decided to turn elements of our fellowship projects into short books, I volunteered as the illustrator – provided I could use the occasion to test the synopsis approach. Therefore, at the very beginning of the work process, I ask the group of authors to fill out a short form with the following questions:

1. Who's your (main) target audience?
2. What's (so far…) the most important thing your reader should learn from the book?
3. What's the most complicated concept?
4. What's your book's most important message?

This was not a comfortable process for all contributors: How can you answer these questions before having written at least a few pages? But I insisted. And more than one expressed how answering the questions and later talking them over

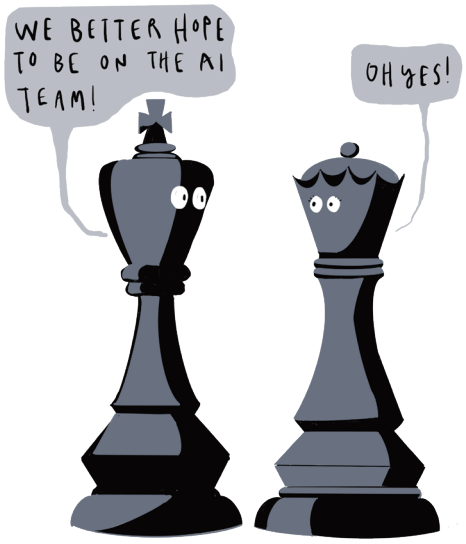


All contributing journalists were asked to submit a brief synopsis very early in the production process. This was used as a starting point for the illustrations.



An illustration example from the book 'Inspiring great conversations' (by fellow Steffen Sloth). This is probably the prime example of an illustration that was only made possible due to the fact that I was involved from the very beginning. Only during the conversations with Steffen - based on the synopsis - was it clear that Steffen was offering a great roadmap for involving people and power in the journalistic process. A roadmap, easier understood through a visual representation than (only) text).

in a meeting with me, help clarify their guiding question and see the whole project more clearly. As I'm writing this, the five books have just arrived from the printer's. In other words, the jury is still out on the quality of the illustrations. And the authors haven't yet had time to thoroughly reflect on how and to what extent, the synopsis made a difference in their writing process. In my own biased opinion, however, the initial feedback – that filling out the synopsis form helped clarify important questions – makes spending five precious minutes 'extra' on answering a handful of basic questions worthwhile. And no, a handful of simple questions is no miracle cure: Producing a huge number of illustrations in a very short time was a great simulation of any other busy workday in the graphics department, and in more than one case I didn't manage to systematically check in with journalists. This meant that their projects sometimes took a turn without me noticing – and, hence, that the positive effect of having an illustrator involved from the beginning diminished. Nevertheless, my experience was that the synopsis definitely made enough of a difference to make it worthwhile also seen from an illustrator perspective: my opportunity to generate ideas and get feedback on my quick sketches was much better than usual, and I haven't actually spent more time than usual on each illustration. However, my bias here is clearly through the roof, and once the dust has settled on the freshly printed books, my plan is to make a methodically analyse the outcome and the journalists' experiences.



***Left:** Another example of an illustration from the book project. In this case from a book on AI in healthcare. An illustration ment to 'soften' the book's otherwise serious visuals (charts, models etc.). My perception is that it wouldn't exist, hadn't I had the opportunity to be part of the writing process.*
***Right:** The finished books.*

GUIDELINES

THE WRITER'S GUIDE TO U

IT HELPS US UNDERSTAND COMPLEX CONCEPTS BY IMAGINING THEM THROUGH WHAT WE ALREADY KNOW.

1. Pick your battles

What is the lowest hanging fruit? If you often use glitzy, generic stock photos from international image libraries, the answer is simple: Find alternatives to the worst of these - the ones that your audience hardly notices, or that they only detect as a passing annoyance. The posed, the artificial looking, the ones that lack a connection with the article.

Also: Look at your audience to determine, which topics they love – regardless of what images you use. And then focus your time and energy elsewhere. A rule of thumb, no matter your audience, is that cute animal pictures work for most demographics...

2. Involve designers early on

By consulting with visual experts in the beginning of your work process, the result will be much better – without either of you having to spend more time than usual. Write down these four questions and put them somewhere annoyingly visible:

1. What important questions does the reader have?
2. Could any of these questions be answered visually?
3. What concept is the hardest to understand and communicate?
4. What can I do myself, and what do I need help with?

Be systematic: answer the same questions for every story. In the (frequent!) cases where it is relevant, share your answers with the graphic designers. Find a way that makes sense in your work context. Should you invite a graphic designer to your daily editorial meeting? Should you share your answers in a daily email, or in a weekly five-minute coffee meeting with someone from the graphic department?
It all depends on how your deadlines, stories, and workplace look. As long as you share the answers systematically, you're good to go.

3. Think in metaphors

Let associations and imagery run free; which analogies and metaphors can describe the essence of the story? The more intangible our stories are, the more important it is to use metaphors - whether this calls for a search for an image in a database, a conversation with a graphic designer/ photographer/artist or writing a precise prompt for an AI image generation program. At the same time, there is a great deal of research pointing to the fact that metaphors can play an extremely important role in people's understanding of a difficult topic, especially when we are dealing with complex or invisible phenomena from the natural sciences.

4. Use your source

Remember to ask for private photos, graphs, and ideas. And ask what images and metaphors the source uses to explain a difficult phenomenon. It seems obvious, but it is a low-hanging fruit that many of us forget to pick during a busy work day. Consider adding a few new inquiries to the (more or less conscious) list of standard questions:

USING VISUALS

ESPECIALLY FOR SCIENCE JOURNALISTS

- Do you have a photo that I can use?
- Do you have a figure that I can make a version of?
- What metaphor would you use to describe this?

An added bonus of these last questions is that even if they don't end up providing a visual, they help you better understand the subject – and thus write a better article.

If you meet your source face-to-face, ask them to draw what you're talking about. Even if you just use a bad ballpoint pen and a napkin so nobody needs to stress about their lack of drawing skills.

5. Embrace the constructive potential of visuals

Visuals can, quickly, immediately and without us necessarily being aware of it, touch us and fascinate us. When used right, they can trigger strong, positive, emotional responses.
For the constructive-minded journalist, this is great help. Because, though our audiences' emotional response is rarely considered in the newsroom, journalism does indeed trigger emotions. And we use this, when we compete for attention with click bait, sensations, tragedies, and so on... which contributes to the growing news avoidance. In other words: try turning down the volume of the strong negative emotion triggers, and compensate with visuals that elicit strong positive emotions of empowerment, connection, entertainment, and fascination.

6. Cast a critical eye... on yourself

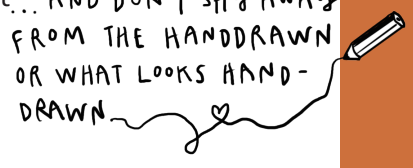
Look at your recent stories. Ask yourself:

- What is the best visual, you've used. Why is it good? Which is the worst photo or visual you've used?
- Does any of your photos/visuals inadvertently pass on your own prejudice? (Like when we illustrate stories about diabetes with headless pictures of severely overweight people. Or stories about climate change with a nice trip to the beach.)
- Where could the source have helped you?
- What's the lowest hanging fruit in terms of making it BETTER going forward? Eg. fewer stock photos, more infographics, talking to the designer or illustrator earlier...

7. Play around!

Experiment with new formats.
Maybe someone in the graphic department has a new idea. Maybe someone in the editorial team can draw. Maybe you know someone who can teach you how to make infographics easily, or put you in contact with an upcoming illustrator...

When you have the time, energy, and (or) ideas, PLAY with the formats. With illustrations, infographics, and data visualisations. Or with the more unconventional formats: comics, visual abstract, science art...



CHAPTER 4

NEXT STEPS

The top story of the most recent issue of the Danish Journalists' Unions magazine Journalisten (66) the magazine made by the Danish Journalists' Union) has roughly the same conclusion as this report: **We live in a visual world, and that visual skills are increasingly important – but that traditional news media is cutting back on this post in their budget.**

This ambiguity is an essential condition of working in the intersection between journalism and visuals, and the new kid on the block has by no means changed this. My own approach during my fellowship (before and after the launch of ChatGBT and Midjourney and so on) has been a pragmatic one, mostly focused on realistic changes that can be tested or implemented in newsroom. Just as the guidelines on the previous pages demonstrate. But this is clearly just a first step into an important discussion, for me and in general.

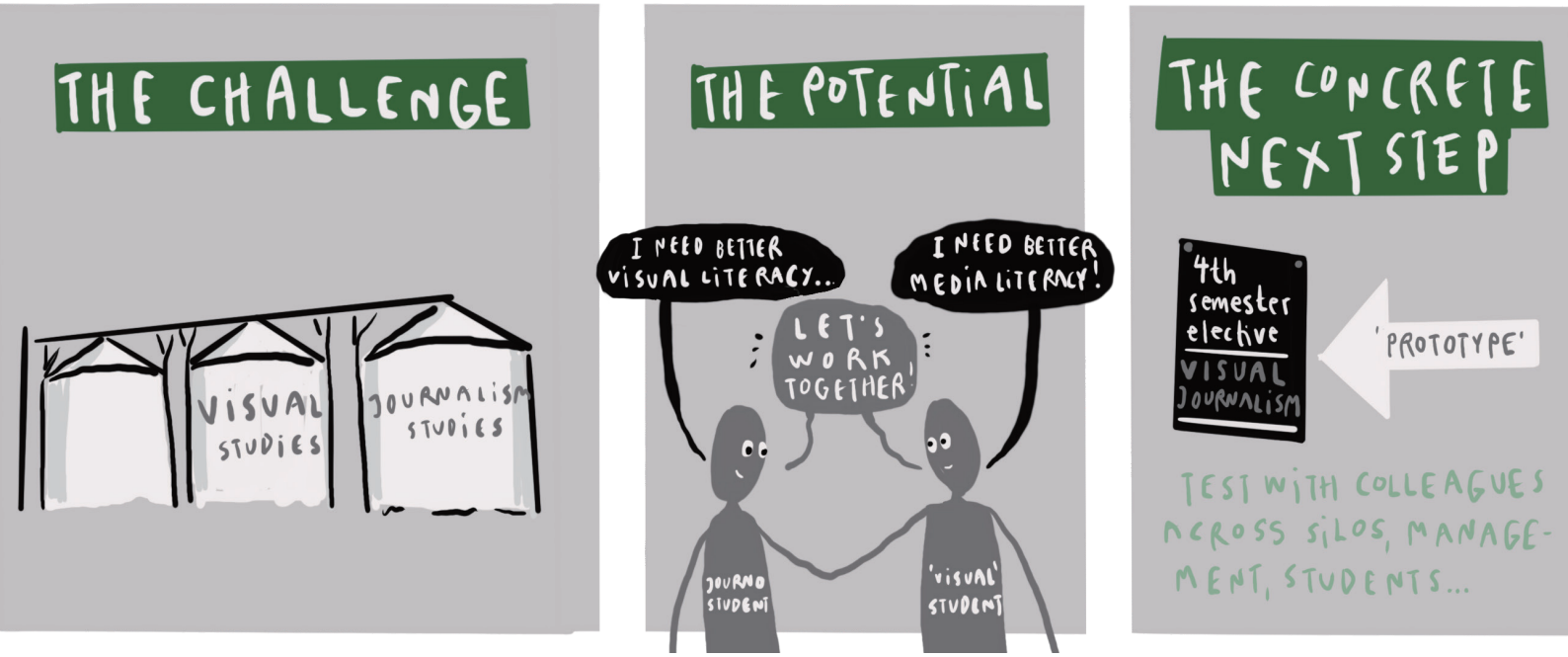
EDUCATION perspectives

As an associate professor at the Danish School of Media and Journalism, it's natural to consider how we can improve our degrees – in light of the challenges and conclusions I've just mentioned. If we look at the current structure of the different programmes with this in mind, something odd immediately catches the eye: One the one hand, the photojournalism track and the 'classic' journalism track are beautifully intertwined. For instance, photojournalists participate with the 'classic' journalists all the way through first semester, and it isn't rare that students from these two programmes do their bachelor thesis in cooperation. On the other hand, there is hardly any cooperation between any type of journalism student and the students belonging to one of the many other tracks at the school – including visual communication and graphic design. This isn't the result of some great (and misunderstood) plan but has its roots in the 2008 fusion of the School of Journalism in Aarhus and the School of Graphic Design in Copenhagen. More cooperation would benefit both type of tracks – and, hopefully and ultimately, the quality of journalism in general and science journalism in particular.

One step towards this could launching a shared elective at the fourth semester, simply called VISUAL JOURNALISM, where journalism students and visual communication students could work and learn together. General wishes to work closer together across silos have been voiced throughout the organisation, just as there's an increasing acknowledgement of how important visual literacy is, also in 'classic' journalism. (67) But not much has happened. Working with lecturers and students to formulate and test a (prototype of a) curriculum of a new elective could work as a realistic, doable first step. In parallel with this, my own experiments with forcing journalism students to draw and to use visual metaphors, will definitely continue… (68)

RESEARCH perspectives

There are several questions to explore theoretically and practically (… and the moment, someone grants me the funding for a Ph.D., I'll be happy to do so). On a somewhat small scale, there's a lack of research in a Danish context: For instance, how



Lecturers at the Danish School of Media and Journalism have for a long time expressed a wish to establish stronger cooperations across programmes and tracks. And it is necessary, if we want to teach future writers and future designers to create the best results.

do Danish audiences react to science journalism as comics? Might we reproduce the findings from the European studies that compare comics, text, and, sometimes, infographics? A stepping stone to a larger study could be a small scale, qualitative user test, where people are asked to think out loud while reading science comics, and later tested for understanding and recall.

On a larger scale, there's a need for an actual meta-analysis of all studies concerned with the effects of visuals in science journalism. The effect of photos and infographics is fairly well-established, but systematically reviewing the studies on other types of visuals would be of great value to the field.

Another general question is that of perceived *subjectivity* in stand-alone visual science journalism. I've realised this through the remarks made by journalists, when I've presented my findings or interviewed them for this project: *isn't this way more subjective than a written article?* It's well-known that visual data comes with an air of confident authority behind it, just like the camera is often perceived as an objective device, an entity stripped of intentionality. (69) As my own anecdotal evidence shows, this is hardly the case with drawn journalism. But how exactly this subjectivity is attributed to drawings, and what this means for how true the journalism is considered to be, has not been researched.

When it comes to metaphors, it would be of value to the field of science journalism (from both a journalistic and a research perspective) to look further into how they're used, and to what extent this use is textual and visual respectively. There's are fair number of studies looking into this in e.g. textbooks, but to the best of my knowledge this isn't the case with science journalism.

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