

What killed the cat?

– *How Curiosity Drives Us.*

Dissertation. Word count: 8681
2017-06-23

Written by Marcel Mueller
Tutored by Dr Juliette Kristensen

MA Design Products, Royal College of Art



Figure 1: Frederick Stuart, 'Pandora – From the original water color painting. F.S. Church', 1883

"Despite a lack of natural ability, I did have the one element necessary to all early creativity: naiveté, that fabulous quality that keeps you from knowing just how unsuited you are for what you are about to do."

– Steve Martin, Born Standing Up

Table of Contents

List of Illustrations	7
i. Introduction	9
ii. Curiosity	10
01. What is Curiosity	10
a. Perceptual Curiosity	11
b. Epistemic Curiosity	11
c. Specific Curiosity	12
d. Diversive Curiosity	12
02. Consequences of Curiosity	13
03. Magnets	15
a. Experimental Study	18
b. Findings	20
04. Gravity	25
iii. Apathy	27
01. What is Apathy	27
02. Reasons for Apathy	27
a. Information Satiation, or: Just Answers	27
b. Explain it simple and tailored	29
c. Amotivation	30
iv. Shape Curiosity – For The Better (Conclusion Part 1)	31
01. Methods	31
a. Make it exploratory	31
b. Interaction for the sake of discovery	32
c. Play as a supporting mechanism	33
d. Leave headroom	34
e. Establish meaningful connections	35
02. Should we?	36
v. Conclusion Part 2	37
Bibliography	38

List of Illustrations

- Figure 1: *Frederick Stuart, 'Pandora – From the original water color painting. F.S. Church', 1883,*
https://commons.wikimedia.org/wiki/File:Opened_up_a_Pandora%27s_box.jpg
- Figure 2: *Marcel Mueller, "YouTube search results for 'magnets' and 'climate change'", 2017*
- Figure 3: *Marcel Mueller, "Google search results for 'magnets' and 'climate change'", 2017*
- Figure 4: *Marcel Mueller, "YouTube video view comparison between 'magnets' and 'climate change'", 2017*
- Figure 5: *Screenshot from video recording,*
- Figure 6: *Screenshot from video recording,*
- Figure 7: *Marcel Mueller, Magnet Experiment Results: Understanding vs. Curiosity, 2017*
- Figure 8: *ernell, Fendt Favorit 501C mit Pöttinger Kurzscheibenegge 3001, 2016,*
https://commons.wikimedia.org/wiki/File:Traktor-Fendt_501_C_-mit-Egge-5022829.jpg
- Figure 9: *Ireland's School of Falconry, Fly a hawk on the shores of Lough Corrib, date unknown*
- Figure 10: *Marcel Mueller, Headroom available, 2017*
- Figure 11: *Marcel Mueller, Headroom unavailable, 2017*

i. Introduction

We are a curious species. Our curiosity has always been pushing the limits of how we understand our world. From the tiniest particles to enormous multiverses, from the beginning of time to projecting the future. We came up with the idea of god, evolution, physics, mathematics, music, philosophy and many, many other theories to help us understand and explain the world and us.

We devote ourselves to exploration, discovery and knowledge to ultimately understand everything. All of that to make sense of the world we're living in. To become the greater version of ourselves. Curiosity and discipline strongly shape who we are. Those two attributes, amongst many other, influence our personal life, our career, our dreams and our goals. But what affects how curious we are? What about the other way around? What determines what we don't care about?

One theory is, we are not interested, because we are not curious. We are not curious, because we are overflowed with so much information in so many areas – all the time. We don't have time to be curious and explore, because information hits us at a constant rate, without a break, without a moment to breathe, no time to grasp what we see.

In terms of our understanding the world and our impact on it, it is paradox. We can access nearly any information at all times, yet this doesn't necessarily ignite our passion.

In design this can be used to do good – and bad. Once we learn how to control it – within ourselves – then we surely can influence other people's curiosity. It could be used as a tool, an incubator for behavior change. Questioning the ethical aspect of consciously influencing people's behavior must be part of this journey, since history has revealed many times: what can be used to do good can be used to do bad.

But what is it, we are talking about? Curiosity is the underlying motivation for knowledge. Knowledge is the underlying argument for appreciation and appreciation is one underlying reason for behavior. For this to be proven right or wrong, this dissertation will investigate deeper into what curiosity defines, how it is understood and perceived and most importantly by what it's influenced the most.

The main reason for me to dive deep into the vast world of our brain to the place where it creates decisions about what we do and what we don't, why one wants to explore the broad expense of the ocean whilst the other wants to learn about the complex correlations between sound and emotion, is to better understand where my own path leads me, and why I choose it.

ii. Curiosity

01. What is Curiosity

In common language, after the definition of the Latin term “*curiositas*”¹, curiosity is the “*a strong desire to learn something*”, humans urge to gain knowledge, discover and understand. A desire, which is triggered and constraint by various factors and influences. Former knowledge, experience, stories and context. People, expectations and relationships.

As a concept it was first introduced into psychological literature by William James in 1890.² He considered curiosity as one of all higher organisms primary instincts, arguing that the unknown can facilitate survival, as well as it can facilitate danger and harm. Therefore, James sets fear as an instinct right next to curiosity and claims that both of them are deeply connected to each other. He reasoned, based on Darwin’s evolutional theory, that curiosity as well as fear are adapting to context. Environmental and situational conditions drastically changing whether a person finds him or herself experiencing either curiosity, fear or both.

Later on, perspectives on curiosity differed from just being one of humans primary instincts. For example, Cofer & Appley still suggested curiosity to be seen as an instinct similar to hunger and thirst, whereas Dashiell sees it as an secondary, acquired skill.³

Appreciating curiosity as an acquired ability that one has to learn makes it easier to investigate. It opens a space where to create hypothesis about how it is build up in our brain.

That said, if both perspectives are true and it is a primary instinct and also an attribute, which is being shaped by events, experiences and knowledge throughout a human’s life, it could help us understand how to shape it consciously.

Curiosity is our conceptual answer to the question why humans – and animals – are “[...] *being devoted to put so much time and effort to the acquisition of knowledge.*”⁴ It is very often described as being very closely related to feelings of mystery, wonder and excitement. In *The Door in the Wall*, written by Herbert George Wells in 1911, the protagonist describes a suddenly appearing door in a wall in London that leads to a place full of wonder and joy as a mysterious event.⁵

Daniel E. Berlyne, one of the pioneers of studying curiosity in humans and animals, made two interesting points: What is the underlying motivation for being curios? In some cases, there is a clearly perceptible chance of gaining a valuable reward. Although very often, there is “*no manifested practical value or urgency*”⁴. Secondly, the question for reasons for the decision-making, which area or field one is curious about.

¹ <https://en.oxforddictionaries.com/definition/curiosity> (accessed 23 June 2017)

² Harold F. O’Neil & Michael Drillings, *Motivation: Theory and Research* (Abingdon: Routledge, 1994), p. 221

³ Harold F. O’Neil & Michael Drillings, *Motivation: Theory and Research* (Abingdon: Routledge, 1994), p. 223

⁴ Daniel E. Berlyne, ‘A Theory of Human Curiosity’, *British Journal of Psychology*, 45 (3) (1954), p. 180

⁵ H. G. Wells, *The Door In The Wall: And Other Stories*, (CreateSpace Independent Publishing Platform, 2015), p. 17

A third question would be, which will be dealt with in this work, if there is a way to actively influence being curious and what to be curious about. A question to develop methods to influence people's understanding in a positive way for urgent and problematic matters. Climate change, flora and fauna, racism, many to count.

For further research, different manifestations of curiosity need to be understood:

a. Perceptual Curiosity

"*Perceptual curiosity*"⁶, a drive to investigate a particular thing, evoking from a "*novel stimuli*"⁴, a sensory experience. It "*motivates visual and sensory-inspection*".⁷ and then leads to remove uncertainty or satisfy interest. It happens day in and out. It's the process of discovery, investigation, trial and error and at last drawing a conclusion.

b. Epistemic Curiosity

The second type is led by the motivation to gain knowledge about complex ideas. "*Epistemic curiosity*."⁸, whereas the biggest difference is the motivation to ask questions which result in answers and ultimately form memories.

In epistemic curiosity, we can find a set of different steps that try to simply explain how the process works.⁹ A complex idea, for example a question, elicits a chain of thoughts and opens up possible pathways. The least complicated one is: the answer to the question is already known; secondly, the person is absolutely not interested and therefore has no urge to get to the answer. This behaviour requires explanation and therefore will be dealt with in the later chapter "Apathy"; thirdly, a period of asking questions or testing hypothesis based on experience and former knowledge, in order to solve the question and clear out the uncertainty.

If no satisfying answer was found, the person possibly pursues with observation. Consulting experts, books, articles, videos or any other source of information.

Once an answer has been found and hence the knowledge has been acquired, curiosity about that particular question is reduced, strongly depending on the complexity and the level of satisfaction the answer delivers.

⁶ Daniel E. Berlyne, 'A Theory of Human Curiosity', *British Journal of Psychology*, 45 (3) (1954), p. 180

⁷ Robert P Collins, Jordan A Litman, Charles D Spielberger, 'The measurement of perceptual curiosity', *Personality and Individual Differences*, 36 (5) (2004), p. 1 <http://www.sciencedirect.com/science/article/pii/S0191886903002058> (accessed 7 June 2017)

⁸ Harold F. O'Neil & Michael Drillings, *Motivation: Theory and Research* (Abingdon: Routledge, 1994), p. 223

⁹ Daniel E. Berlyne, 'A Theory of Human Curiosity', *British Journal of Psychology*, 45 (3) (1954), p. 182 f.

c. Specific Curiosity

Further distinction has to be made between specific curiosity and diversive curiosity, which were introduced by H. I. Day (1969), based on Berlyne's specific and diversive exploration.¹⁰ Specific curiosity is defined as a narrow scoped curiosity that seeks the answer for a specific question. Thus a need for a given kind of information.

d. Diversive Curiosity

Diversive curiosity is defined as seeking for a novel stimulation in a broad range, “*[...] regardless of its source [...]*”.¹¹ Travelling the world and visiting foreign places for the sake of discovery therefore belongs to diversive curiosity, while seeking an answer for how something is made falls in the category of specific curiosity.

¹⁰ Harold F. O'Neil & Michael Drillings, *Motivation: Theory and Research* (Abingdon: Routledge, 1994), p. 240

¹¹ Harold F. O'Neil & Michael Drillings, *Motivation: Theory and Research* (Abingdon: Routledge, 1994), p. 228

02. Consequences of Curiosity

“No one can quite say what the creative process is because I have nothing to do with it almost because it’s created in space, it’s God’s work not mine”

— Michael Jackson, 1987

Creativity requires an open mind, interest and curiosity. It is much about understanding subjects, groups of people or entire systems. It is about combining knowledge. Intense research and synthesising play a crucial role. Let's say, for example, you have to design a new kind of pilot ladder for cargo vessels. Usually, it is not one magic person sketching the innovative ladder on a blank sheet of paper from nothing. Instead, an important stage of the design process is to do with research into existing technologies, surroundings, legal issues, norms and most importantly the people exposed to and interacting with the design in the future.

Most parts of this process can be forced. Rewards, like money or reputation, are such external influences that ensure you do your work. Internal motives, like the will to succeed, to show off, or to get to the next level also increase motivation to do good work. Yet, sometimes those driving forces are questionable in terms of quality. How good can a person perform, if there is insufficient passion, a wobbly structure? How well does our brain function, if in a position that is not driven by curiosity and will, but by other factors?

Matthias J. Gruber, Bernhard D. Gelman and Charan Ranganath published a study in 2014 in which the brain activity was monitored, after asking a question and showing additional unrelated information. *“Participants in the study were asked to rate how curious they were to find out the answer to a specific trivia question, [...]”*¹². A questionable piece in this study, since it inserts a subjective variable, which could add distortion to the results.

Participants rating their curiosity as high, *“[...] are better at learning that information”*¹², as well as the additionally shown, unrelated information. This was the case short-term and when the participants were asked to retrieve that information after 24 hours.

A practical application in education might be to connect information that is of interest to a person with less interesting, but important other material, to enhance the ability to memorize the important, but maybe less interesting information.

Contrary to that, it is relevant to understand, how much information our brain can handle simultaneously. According to Mihaly Csikszentmihalyi, a psychologist from Croatia, our brain can process as much as 110 bits of information per second at the same time. Attentive listening to someone explaining something uses about 60 bits of information per second.¹³ Hence our attention is limited to a maximum of two people talking at the same time, and even that might be

¹² Emma Saville, ‘How curiosity changes our brains’, *The Washington Post*, <https://www.washingtonpost.com/posteverything/wp/2014/10/03/how-curiosity-changes-our-brains/> (accessed 05 June 2017)

¹³ Mihaly Csikszentmihalyi, *Flow, the secret to happiness*, https://www.ted.com/talks/mihaly_csikszentmihalyi_on_flow#t-1112873 (accessed 13 June 2017)

hard for many of us. As a consequence, teaching diverging material at the same time would have to be used with care.

One person who implemented this idea, either by accident or knowingly, was Friedrich Froebel, when he invented the concept of kindergarten in 1837.¹⁴

*“Play is the highest expression of human development in childhood,
for it alone is the free expression of what is in a child’s soul”¹⁴*

– Friedrich Froebel

The kindergarten offers a combination of playing and learning. Whilst giving children the opportunity to express their selves through play and therefore allowing them to pursue what they’re curious about and what they enjoy, he made them more open minded for a variety of other things, they perhaps weren’t curious about in the first place. Playing, learning and working have been mixed up.

Speaking in medical terms, when curiosity is high, brain activity in the area called hippocampus, part of the limbic system and “critical in the formation of new memories”¹⁵ through consolidating information from short-term memory to long-term memory, increases. Also, activity in the reward system, a group of “neural structures”¹⁶ called Mesolimbic pathway, which is “especially important to mediating pleasure and rewarding experiences”¹⁷, is much higher compared to when being not or less curious.

Brain activity in the reward system plays an important role when looking for answers for why we are curious about something or not. Professor Peter Dayan told the BBC in an interview:

“Animals of all different sorts have to be able to predict things that are going to be good or going to bad and choose actions in light of those predictions.”¹⁸ If a decision leads to a better result than expected, the reward system kicks in, dopamine is released and makes our brain remember this event for future decisions. Hence, if something goes better than expected, we’re more likely to repeat similar decisions in the future.

Curiosity is an incubator for knowledge, decisions, ideas and beliefs. It increases the formation of memories, changes how and what we decide and develops our ideology. It makes us individuals, instead of all being the same.

¹⁴ <http://www.froebelweb.org/> (accessed 08 June 2017)

¹⁵ Dr. Kenneth E Carter, Dr. Colleen M Seifert, *Learn Psychology* (Burlington, MA: Jones & Bartlett Learning, 2012), p. 239

¹⁶ Kent C. Berridge & Morten L. Kringelbach, ‘Pleasure systems in the brain’. *Neuron*, 86 (3) (2015), p. 1 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4425246/> (accessed 08 June 2017)

¹⁷ <http://www.neuroscientificallychallenged.com/glossary/mesolimbic-pathway> (accessed 01 June 2017)

¹⁸ James Gallagher, ‘Prize for cracking brain’s ‘feel good’ system’, *BBC News Health*, <http://www.bbc.co.uk/news/health-39183178> (accessed 12 June 2017)

03. Magnets

Magnets are fascinating objects, occurring naturally in our world as magnetite, as well as being produced artificially by permanently aligning positive and negative charged particles in materials.¹⁹ Very much enchanting and weird because of their invisible force, they are hard to understand. An invisible force, an electro magnetic field, that pulls on other ferromagnetic materials and objects. They allow us to hold objects, to cause movement, make other objects levitate – without any external source of energy. Although an explanation for their functionality exists, it is hard to imagine and understand why it works.

To explain in more detail why investigating in magnets is interesting when talking about curiosity, a look at statistics based on data from YouTube and Google helps. Comparing search results for “magnets” to “climate change”, two relevant insights can be found.

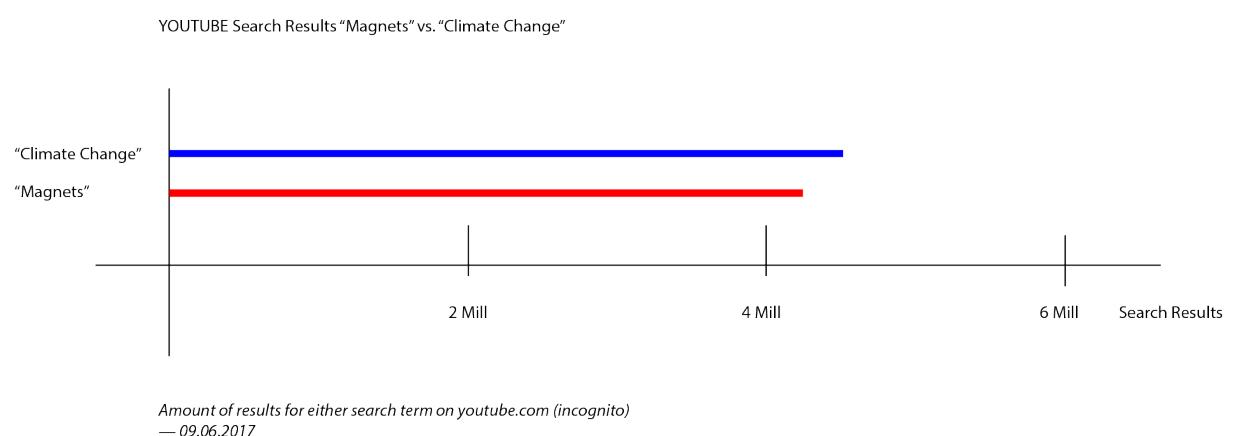


Figure 2: Marcel Mueller, “YouTube search results for ‘magnets’ and ‘climate change’”, 2017

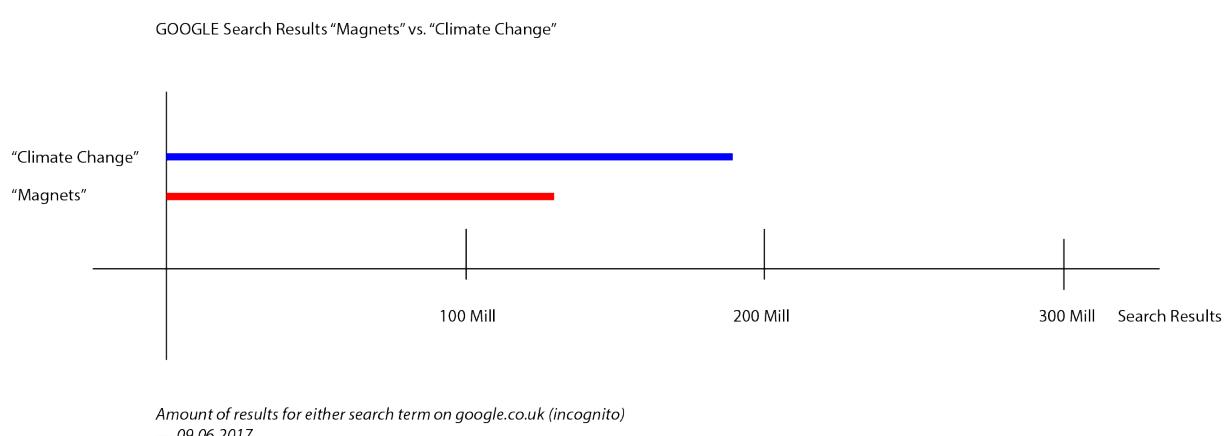


Figure 3: Marcel Mueller, “Google search results for ‘magnets’ and ‘climate change’”, 2017

¹⁹ Edward Neville Da Costa Andrade, ‘The Early History of the Permanent Magnet’, *Endeavour*, 17 (65) (1958), p. 1

The number of search results for “climate change”, shown in Figure 2 and Figure 3, are higher on both platforms. Nearly 80 million more results on google along with 290.000 more videos on YouTube. The relevant information we can draw from this comparison, is the amount of information provided on the internet about climate change is significantly higher, compared to magnets. Further investigation revealed that the information provided about climate change is also more diverse, compared to magnets.

Contrary to that, clicks compared to views on the videos, shown in Figure 4, reveal another interesting fact. Videos about magnets are viewed way more often, than videos about climate change are.

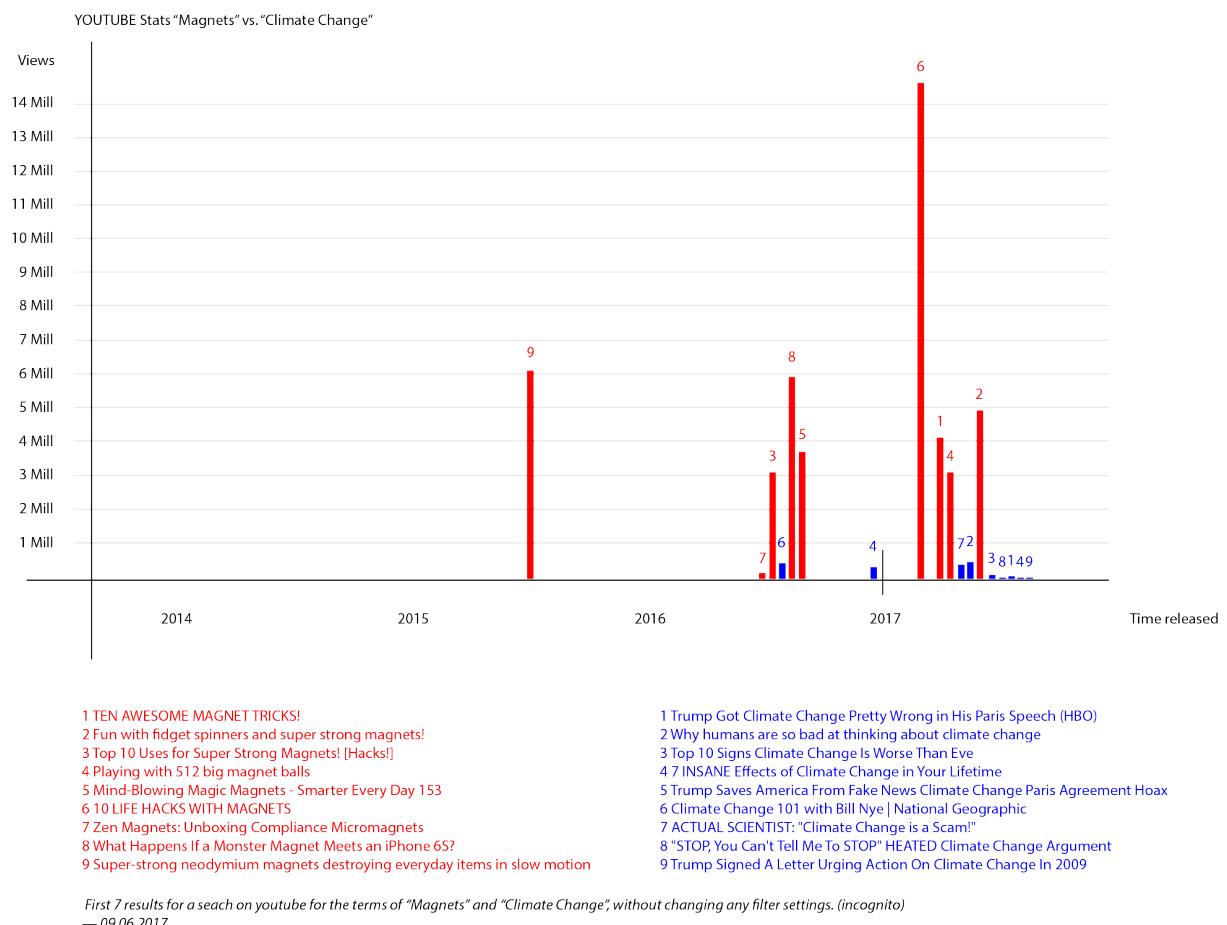


Figure 4: Marcel Mueller, “YouTube video view comparison between ‘magnets’ and ‘climate change’”, 2017

The difference in the number of views is remarkable. When we were talking about the definition of curiosity earlier, survival was used to explain and to argue for curiosity being a primary human instinct. This doesn't seem to reflect here, instead it is the opposite. People are more interested in magnets, a fascinating phenomenon, than in climate change, a subject that describes the danger our planet faces in the future. But maybe survival is not meant to be understood in such a literal way, but rather more abstract.

To find out why magnets are so interesting to people, I conducted an experiment to study the way people react and interact when presented with the phenomenon.

a. Experimental Study



Figure 5: Screenshot from video recording, available on request.

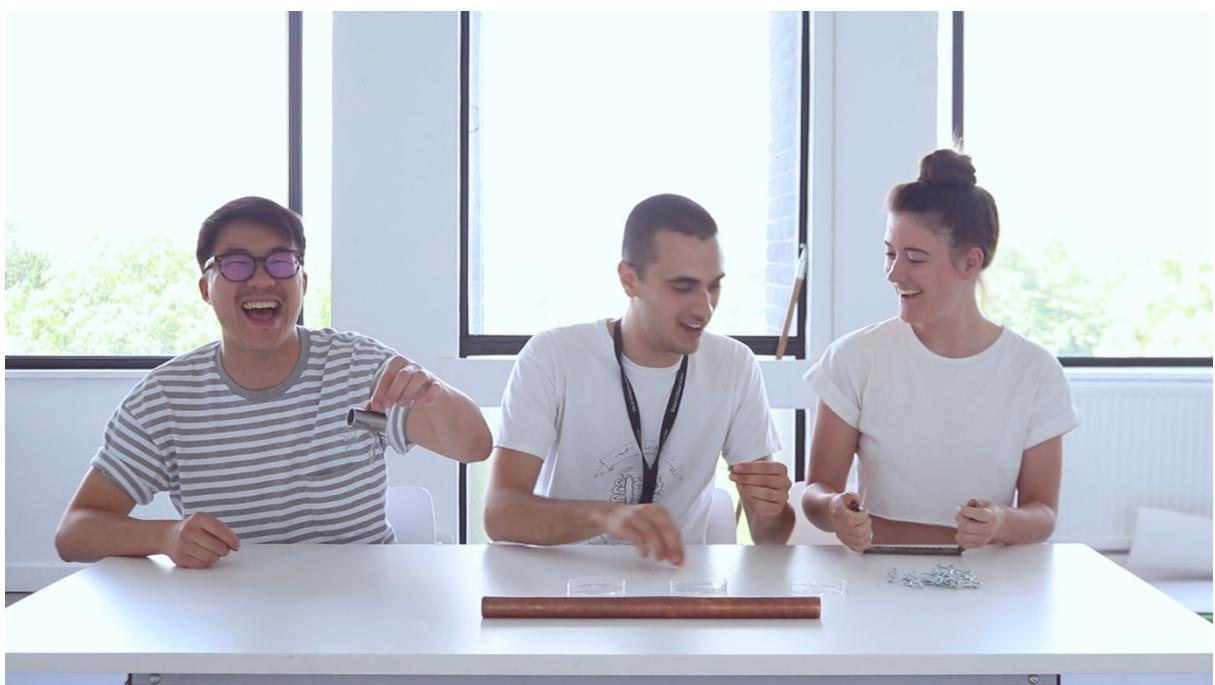


Figure 6: Screenshot from video recording, available on request.

Groups of three participants were observed whilst engaging with magnets, to explore the way they are perceived over a specific period of time. Neodymium magnets, iron nails, petri dishes, a copper tube, a steel tube and a steel chain were lying on a desk, without any coherence.

All three were asked to sit down at the table and to interact with the given items for three minutes. During the three minutes, a random, unrelated image of a landscape with a tractor ploughing from right to left was shown to the participants.

Immediately after the experiment, the participants were asked to fill out a survey:

1. *What emotions did you experience during the three minutes of playing with the magnets?*
2. *Why do magnets attract other ferromagnetic material?*
3. *Why do magnets attract and repel each other?*
4. *Where do magnets come from (how are they made)?*
5. *On a scale from one to five, how good do you think is your understanding of how magnetism works?*
 - a. *If you're well aware of how magnetism works in theory, do you think you really understand what is holding them together?*
6. *On a scale from one to five, how fascinated are you by magnets?*
7. *On a scale from one to five, how curious are you about magnetism?*
 - a. *If you are very curious about magnetism, would you consider yourself eager to explore this curiosity?*
 - b. *Would you be satisfied, if a more detailed answer for how magnets work would exist?*

If a participant was not able to answer questions two to four, according answers were given to him. The phenomenon of magnets was then briefly discussed in the group.^{20 21}

This was then followed up by another task, where all three participants had to read a text about about Rick Beckett (https://en.wikipedia.org/wiki/Rick_Beckett), which I assumed to be a rather boring piece of writing about a radio broadcaster. Whilst reading, another random, unrelated image, containing a landscape with a woman and a bird just flying away from her hand, was shown to the participants. After the participants finished reading, they were asked how the article was to confirm my assumption.

The conversations have been recorded on video, to carefully analyse and compare the given answers and can be found in the appendix.

²⁰ Appendix B, Experiment with Ting Li, Matteo Bandi & Freyja Sewell, 14 June 2017. Video available at request.

²¹ Appendix A, Experiment with Philipp Schenk-Mischke, Huang Shing & Eddie Hamilton, 14 June 2017, Video available at request.

b. Findings

Physical Interaction – The experiment revealed findings, some of which were already covered previously. One noticeable output was how curious each participant said he was about magnetism (Figure 7). This strengthens the comparison between search results and clicks and views on YouTube, mentioned earlier on.

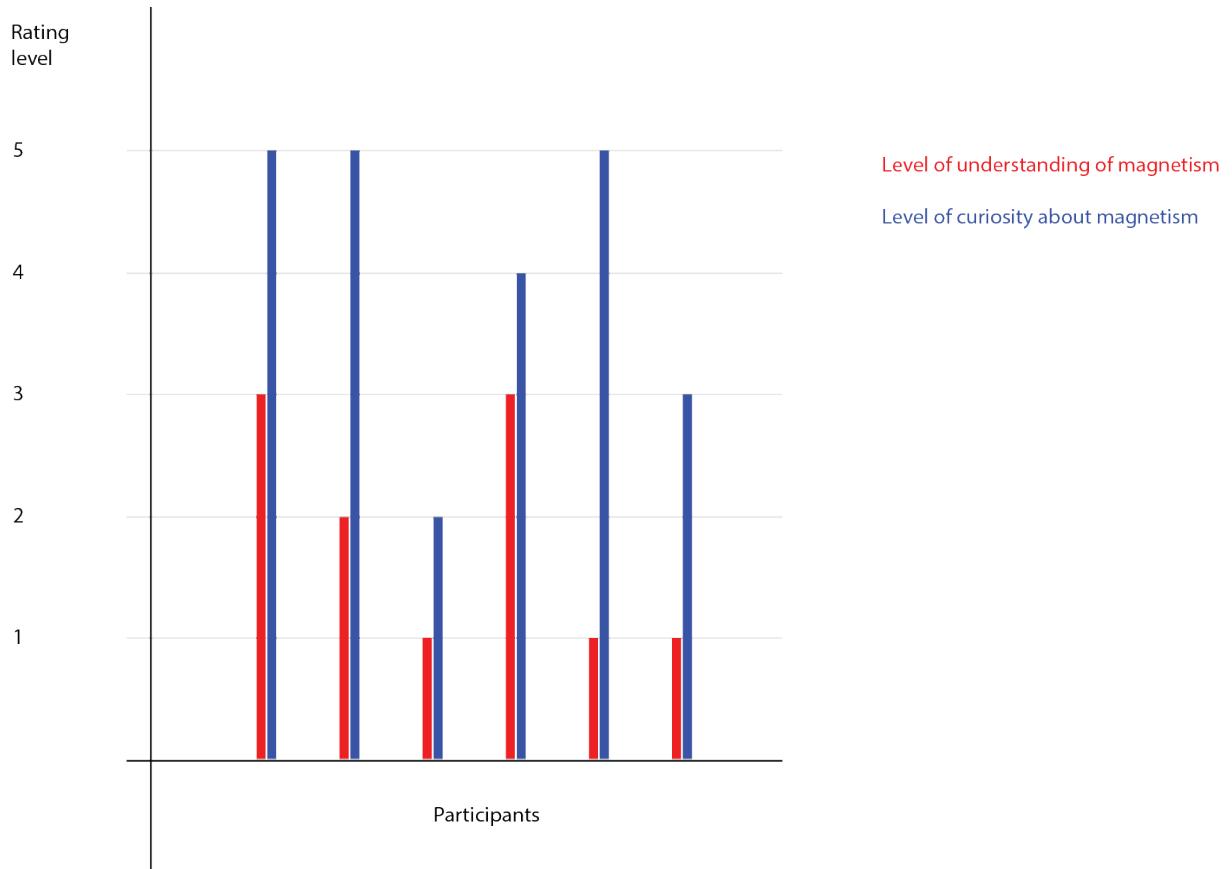


Figure 7: Marcel Mueller, Magnet Experiment Results: Understanding vs. Curiosity, 2017

The comparison between participants self-rated understanding of magnetism and their self-rated curiosity about it clearly shows, how engaging with the phenomenon makes the participants want to know more about it, understand it better. A low understanding means little engagement with the subject. A high level of self-rated curiosity leads to the belief that the physical interaction with it increased the level of curiosity.

Looking at the recorded footage, a distinct tendency of understanding through play is observable. Personal input which causes an effect, has an influence on the world outside the head.

In many cases, physical interaction alone won't deliver scientific knowledge or allow complete comprehension about a particular function, but it can steer someone into the right direction and

arouse curiosity. Statements like, “*I kind of want to know now*”²² and “*I need to know how it works*”²³ were common. Is interaction therefore one of many significant influences of curiosity? Is interaction and conscious engagement with something outside our head an important piece of the puzzle of what drives curiosity?

Enhanced activity in hippocampus – During both activities, exploring magnetism and reading a as boring perceived article, one unrelated image was shown to the participants briefly (See Figure 8 & Figure 9). 24 hours later, all six people were prompted to recall the content of those two pictures. This was to further support the idea of increased brain activity within the hippocampus, mentioned earlier, studied by Matthias J. Gruber, Bernhard D. Gelman and Charan Ranganath. The approach to examine the ability to remember information was slightly modified to eliminate the subjective rating of one’s own curiosity about the subject. Rather than using a trivia question which can be interesting to some and less interesting to others, a high level of curiosity during a playful exploration with magnets is highly likely and supported through subjective rating afterwards. Hence, the results become more clear.

²² Appendix B, Experiment with Ting Li, Matteo Bandi & Freyja Sewell, 14 June 2017. Video available at request.

²³ Appendix A, Experiment with Philipp Schenk-Mischke, Huang Shing & Eddie Hamilton, 14 June 2017, Video available at request



Figure 8: ernell, Fendt Favorit 501C mit Pöttinger Kurzscheibenegge 3001, 2016



Figure 9: Ireland's School of Falconry, Fly a hawk on the shores of Lough Corrib, date unknown

Image one represents Figure 8 and image two represents Figure 9. These are the given answers, 24 hours after the experiment:

Philipp Schenk-Mischke

- Image one: A tractor, working on a ploughing a cornfield, green background, the tractor causes dust, was the tractor orange?
- Image two: An eagle flying from hands in front of a mountain scenery, it was sunset

Huang Shing

- Image one: Colourful, looks like rice field, a traction machine in the centre of the image, I think the traction machine's colour was red, whole picture was constructed by yellow and green, just looks like a picture of summer in the rice field
- Image two: I'm not really sure if I remember or not, it is kind of black and white, maybe snow, or maybe just a black and white picture of a forest, all that I remember is black and white and trees.

Eddie Hamilton

- Image one: The Tractor was red and it was ploughing the field, from right to left.
- Image two: A guy holding an eagle on a mountain, it had it in their right hand and it was sunset

Ting-Yu Liu

- Image one: I think it was something to do with nature, green stuff, some bushes, bright colours
- Image two: Was something to do with military, a car or someone with a gun, mostly blue, the object was black, an earthy coloured ground

Matteo Bandi

- Image one: A tractor, red, on a green field, trees in the background, and I remember seeing the sky, I don't remember the person driving the tractor, it was a sunny day
- Image two: Sunny day, a male, on the top of a hill, some other hills in the background, kind of a sunset, a big majestic bird flying over his head

Freyja Sewell

- Image one: A tractor going through a brown field with green trees behind
- Image two: Can't remember, I think there was a person in it

The results show a clear tendency. The majority remembers the first image in much higher detail and can recall content, colours and positions very well. Two out of six remembered both picture's content to a nearly similar extent.

The output strengthened my belief in playing and exploring as a fairly strong enhancer of a person's ability to process and store information. It does not only show the importance of

curiosity in terms of how we challenge apathy and demotivation, but also how we can increase our ability to learn and remember in other areas of our everyday life.

If we can freely play – The first question on the survey sheet, all six participants had to answer after the three minutes' magnets play, asked them to describe their emotions they experienced during the activity: “*Fun*”, “*childlike enjoyment*”, “*happy and concerned about what to do*”, “*joyful, fresh and curious*”, “*excitement*” and “*fun*”.

These answers correlate well with theories about learning. A while back, in 2003, a study conducted by the British government stated, how children entering school have much less capabilities of properly articulate, follow simple instructions and remember short rhymes.²⁴ A lack of playful learning in their homes due to substitutes like television and computers was claimed to be one reason. This problem must have gotten worse in the last ten years, since we now have millions of computers, mobile phones, internet access nearly everywhere we go and most importantly social media networks and services that aim to drag in every last bit of our attention and time.

It becomes clearer, when we look at how babies learn to use their body, react to their environment and start to make decisions based on experiences. Professor Jean Piaget rejects the idea of intelligence and knowledge being a thing that inevitably grows over time, only by influences from the outside. Instead he claims, interacting with the environment at free will is what develops skills.²⁵

This is much to do with diversive and perceptual curiosity, as spoken about earlier. Exploring the environment for novel stimuli and then investigate further to eliminate uncertainty or to satisfy interest. An inherent urge to explore and play activates our correlates with our curiosity.

Coming back to the adults in our experiment, striking parallels can be found. Although it's still a bit of a chicken-and-egg problem. It's unclear which one influences which. Is it fun and excitement that makes us curious, or is it us being curious and therefore we're enjoying the activity more? Here, it doesn't matter. What is important is the fact that as soon as we can experiment, interact and play with an object, the level of curiosity is increased and thus our information processing systems works better.

²⁴ Dorothy G Singer; Roberta M Golinkoff; Kathy Hirsh-Pasek, *Play=learning : how play motivates and enhances children's cognitive and social-emotional growth*, (Oxford; New York: Oxford University Press, 2006), p. 5

²⁵ Alison Stallibrass, *The Self-Respecting Child*, (Boston, Massachusetts: Da Capo Press; New Ed Edition, 22 Jan. 1989), p. 117

04. Gravity

Gravity is amazing. I'm excited and even a little bit nervous, every time I can learn something new about it, someone shows me an innovative way of playing with it or when we get one step closer to explaining its function and its causes. Even though it has nothing to do with my everyday practice, I find it thrilling to engage with it – at free will, without any external motivation, I just want to know and understand.

Many of the theories in physics, chemistry and biology can be explained in Laymen's terms. However, some phenomena like magnetism, time or gravity are much more complex and therefore hard to explain and often even harder to understand.

Scientists are constantly working on theories regarding our planet, its deepest places, the tiniest particles – seeking for explanation for everything around us, from small to big, from Higgs to the vast infinity of our universe, to multiverses and through time. Some subjects are so extremely complicated, that it takes even the best scientists years and years to understand and explain. So many things are yet to be explored and understood, which is amazing.

Recently, on the 14th March in 2013, scientists at the large hadron collider in CERN confirmed the existence of the smallest particle yet discovered. The Higgs Boson, which was firstly claimed to exist in the 1960's.²⁶ This, again, shows curiosity's impact on our behaviour. Scientists have been so eager to prove the existence of the yet smallest particle known, that they've worked on it for over 50 years. They built the largest particle accelerator in the world, with over 10,000 scientists constantly working on it for over ten years. This effort in research might be mostly driven by the human instinct curiosity, to bring sense to and understand our world. Is that still for the sake of survival, like William James suggested it nearly 127 years ago?

This chapter aims to gain insights through reflecting on personal experiences with the natural phenomenon gravity. "*Gravity is what makes pieces of matter clump together*"²⁷, matter attracts matter. This is why we are standing on the ground, instead of flying around. Objects are drawn to the ground, instead of rising into the air. Earth's matter is so incredibly huge, that it attracts everything around it with a strong force. But this is just a small piece. Gravity is meant to alter time. It is assumed that being near a black hole, a clump of matter of tremendous density, makes time tick slower.²⁸

Yet, the theory of gravity is explained and understood and it does make sense as a logical conclusion, based on our theoretical and practical research, it feels like a magical force we can neither see, nor visualize in our heads.

There are thousands and thousands of examples of how gravity is utilized to entertain our mind. Marble runs, skiing, ball games, water installations, super heroes. Marionettes, like Heinrich von Kleist describes in *On the Marionette Theatre*, move their individual parts highly based on its

²⁶ *Particle Fever*, dir: Mark Levinson, 2013

²⁷ <https://spaceplace.nasa.gov/what-is-gravity/en/> (accessed 03 June 2017)

²⁸ *Interstellar*, dir: Christopher Nolan, 2014

gravity center. “*He asked me if I hadn’t in fact found some of the dance movements of the puppets (and particularly of the smaller ones) very graceful. This I couldn’t deny.*”²⁹

Think about gravity as a force for just a moment. What makes us standing on the ground? Why do objects not just float around in the atmosphere? Why can’t we manipulate this force, while we can do it with others, even artificially create them? There are no invisible strings, neither is there something pushing down from above us, nor is it magnetism. It is matter attracting matter, a basic law of our universe.

This has made me desperately curious for a long time now. A tremendous crave for an understanding, for an answer. Leading to numerous thoughts spent, discussions held, videos watched and knowledge acquired. Every time I discover a new article about it, someone talks about it or I see a related video, I follow the lead. And I’m not done with it. Something in my brain wants to fill this gap of knowledge.

Yet, the opportunities to learn more about it are very constrained by time. Time is required to satisfy curiosity. Time is precious, so people prioritize their interests. There are other objectives in my life that have higher priorities. I need to put effort into my education, which I have been spending time and energy on for the last decade. If I wouldn’t do that, I would fall behind, I would miss out on important practice, knowledge and experience and therefore my skills and abilities would not evolve in the same way I want them to. Is this fear? Am I scared to follow my instinct of curiosity about gravity, to learn more about it? If it is fear, does it compete with curiosity? Is it an internal conflict and who resolves it? Am I consciously deciding or is it a reflex? If it is consciously, what is affecting this decision making? Experience, social environment or other instincts?

In that specific case it is none of those. It is a combination of external and internal motivation. Firstly, a capitalistic society, strongly shaped by money and success, as an external motivation to follow my path as straight as possible, without taking too many detours into other, perhaps to me very interesting worlds. Secondly, my internal motivation to become amazing at something, something related to what I’m doing, which for I need time to practice and think, time to educate myself, to get better.

²⁹ Heinrich von Kleist, “On the Marionette Theatre (Über das Marionetten Theater)”, *Berliner Abendblätter*, 63 (1810)

iii. Apathy

01. What is Apathy

*“The greatest danger to our future is apathy.”*³⁰

– Jane Goodall

A “lack of interest, enthusiasm or concern.”³¹ Apathy is, when there is no interest in a particular topic or task. No ambition or motivation to gather information or to acquire knowledge within a particular field. The term apathy is most commonly used to describe an attitude of either a single person or a group of people towards a particular field, like for example politics, climate change and food security. Based on its definition, apathy is described as an internal symptom. Something that is truly up to the person and derives from a lack of motivation to engage and inform. Tom DeLuca asks in his book *The Two Faces of Political Apathy*: “What if apathy is not freely chosen, the problem is not all us?”³² A legitimate question to ask. Apathy has different reasons which can be categorised.

02. Reasons for Apathy

a. Information Satiation, or: Just Answers

*“Fifty-two percent of those who get news alerts do not click through to the full story or search for more information. [...] That equates to roughly 66.5 million Americans, based on U.S. population at the time of the Pew Research Center survey, who receive push notifications, but do not click through or search for any more information. [...]”*³³

Todays information overflow through networked media is diminishing our interest for numerous matters we should be informed about.

³⁰ Jane Goodall, ‘The Power of One’, *Time*, <http://content.time.com/time/magazine/article/0,9171,1003125,00.html> (accessed 14 June 2017)

³¹ <https://en.oxforddictionaries.com/definition/apathy> (accessed 12 June 2017)

³² Tom DeLuca, *The Two Faces of Political Apathy*, (Philadelphia, Pa: Temple University Press, 1995), Preface

³³ Kristine Lu, Katerina Eva Matsa, ‘More than half of smartphone users get news alerts, but few get them often’, *Facttank*, <http://www.pewresearch.org/fact-tank/2016/09/08/more-than-half-of-smartphone-users-get-news-alerts-but-few-get-them-often/> (accessed 01 June 2017)

*“But they are useless. They can only give you answers.”*³⁴
– Pablo Picasso

While saying this, Picasso was talking about calculators and computer-like machines. In terms of todays way of how we use computers and the internet, computers connected in the biggest network there was in human history, he is right and wrong. It is true, the internet with all its content, is a place to find answers to nearly anything. And it is not only about answers to questions you ask, but much more answers to questions you didn't even think about. The difficulty with raw answers is: if you know the answer you don't need to ask the question, hence, you don't need to engage with the subject again. And there is another thing to it, if you see the answer more than once, most likely in different variations, you can even become apathetic, studied by Berlyne in 1950 in rats. When repeatedly exposing them to the same stimuli, its drive to investigate and discover was reduced.³⁵

Looking at climate change and how it is communicated to the public, those theories and criticism reflects. We are continuously and repeatedly exposed to opinions, facts and statistics about the condition our planet is in now and will be in in several years. There are scientists on television, talking about molecules, celebrities asking us to change our behaviour for the good and politicians debating about changes to better the planets situation. Friends on Facebook are posting videos about the consequences climate change will bring and already does, often without even watching them. All this leaves little to no time to intensively think about our own behaviour and what we can and need to do about it. It leaves us no room to develop curiosity about it. Even though we know what's going on, it seems like we don't really care much.³⁶

An interesting comparison to understand how the phenomenon of repetition can in some cases render a subject less meaningful is language. A simple example: You're a young teenager, around seventeen years old, and you have a partner, a boyfriend or girlfriend, whom you like a lot. After a couple of months, your partner tells you, that he loves you. These are the magic words of the world and you hear them for the first time. Your brain goes completely mad, you're surprised, happy, inspired and a billion thoughts jump right through your mind from one end to the other. You tell your very best friends and talk about it, it's a massive thing, you engage with the situation.

About one year later, after every phone call, you tell each other how much you're in love. But the meaning fainted, it lost its power. (The love itself most likely didn't lose its strength, but the words).

Your brain went numb to that words through repetition over time. Your reaction to those words coming from the same person decreased massively.

³⁴ William Fifield, ‘Pablo Picasso: A Composite Interview’, *The Paris Review*, 32 (1964): p. 62

³⁵ Daniel E. Berlyne, ‘A Theory of Human Curiosity’, *British Journal of Psychology*, 45 (3) (1954), p. 180

³⁶ Will Dahlgreen, „Global survey: Britain among least concerned in the world about climate change“, *YouGov UK*, <https://yougov.co.uk/news/2016/01/29/global-issues/> (accessed 19 June 2017)

b. Explain it simple and tailored

There are several contemporary examples in politics, outlining why being educated about a particular topic is essential for decision making within the same field, whereas Britain's politicians campaigning right before the Brexit (United Kingdoms leaving the European Union) votum in the UK is one of the best contemporary examples.

Brexit, a simple yet complicated A or B decision with an extensive impact on not only people in the UK, but the entire world, is one perfect stage to manipulate the masses. Its consequences are massive changes in economy, society, international relations and politics, barely negligible for a single person and even less so for someone, not informed about the subject at all. Yet, it's as simple as stay or leave.

However, about 46 million ³⁷ people voted in the referendum. An enormous number of people, which of a majority is not well enough informed ³⁸ to take on such a decision. Those are then influenced and "brain washed" by false, incomplete, but very simple statements, made by politicians for the sake of their own reputation and popularity amongst voters.

An example: Boris Johnson, now Foreign Secretary in the UK ³⁹, told the public "*we send the EU £350 million a week, let's fund our NHS instead. Vote Leave*" ⁴⁰. What did he do? He made a statement, easily understood and believed by most, especially those who are undereducated, but not feasible: take a huge amount of money being spent for being part of the EU and use it to improve the health care system, something most of UK's people have had personal experiences with and everyone agrees on that improvements are necessary. Although he didn't clarify that this exact amount will be spent for health care, smart wording made it look like it.

As soon as a couple of factors play well together, people get recruited to an idea really, really quickly. Once they're not well enough informed about the world in which the idea lives in, they're not able to think about it in a critical way. Plus, the idea fits well to their personal motives, opinions or ethics. If that is the case, an adult can be influenced as easy as a child, or what is even the difference? Just a notification, a punchy headline (which often doesn't even reflect the content of the article behind it well) or any other short, sharp and personalised information is enough to shape someone's opinion.

It gets even scarier. A company in the United States, Cambridge Analytica, specialized to do exactly that. They "*[...] activated an invisible machine that preys on the personalities of*

³⁷ http://www.bbc.co.uk/news/politics/eu_referendum/results (accessed 14 June 2017)

³⁸ David Runciman, 'How the education gap is tearing politics apart', *The Guardian*, <https://www.theguardian.com/politics/2016/oct/05/trump-brexit-education-gap-tearing-politics-apart> (accessed 19 June 2017)

³⁹ Ashley Cowburn, 'Boris Johnson stands by £350m extra NHS funding after Brexit campaign claim', *Independent*, <http://www.independent.co.uk/news/uk/politics/tony-blair-theresa-may-win-general-election-jeremy-corbyn-labour-leader-uk-prime-minister-a7705026.html> (accessed 14 June 2017)

⁴⁰ Ashley Cowburn, 'Brexiters condemned for not backing £350m NHS amendment to EU withdrawal bill', *Independent*, <http://www.independent.co.uk/news/uk/politics/brexiteers-condemned-for-not-backing-350m-nhs-amendment-to-eu-withdrawal-bill-a7570336.html> (accessed 14 June 2017)

individual voters to create large shifts in public opinion."⁴¹ This is alarming. Automated behavior influencing at massive scales, world wide and without anyone knowing – powered by money. In the context of this work it is most important to understand that those techniques make use of peoples' unawareness, caused by a form of apathy, partly created by ourselves through constantly being online and connected and as a consequence allowing information to thunder down on us at all times.

c. Amotivation

Amotivation is a psychological condition, where a person experiences a reduction or complete loss of motivation to start or carry on with something.⁴² In terms of apathy, amotivation is giving us a great insight into why people are not tackling global issues, why they are not changing their behaviour for the better.

Studied by Bandura in the nineties, amotivation is mainly to blame on a believed low level of self efficacy.⁴³ It's important to say that this does not necessarily reflect someone's actual capabilities of doing something. It is much to do with the belief in personal ability, consisting of two main factors. Firstly, one's belief on how suited he or she is to undertake a task, and secondly, how satisfactory the outcome of her or his actions will be.

Those beliefs are affected by decisions and their results in the past. Success will raise the level and failure will lower it. Not solely personal success and failure, but also social and historical. On top of that, observations in your environment at a time will influence your level of motivation. For example, simply your colleagues around you dismissing a course of action for any kind of reason will increase amotivation, but it also works the other way around. As shown by psychology students in an experiment they conducted in the classroom, where one half of the class offers positive feedback and interest through gestures and facial expressions, which then led to an increase in the teachers' self efficacy. The teacher talks with more enthusiasm to the "interested" half of the class, while he gently dismisses the other half.⁴⁴

We can see this kind of theory apply in teaching more and more as we continue to understand our brain better. Encouraging is better than punishing, even in situations, where things went bad. This strengthens our will to stand up after we fall. A social influence, which helps us to raise our level of believed self efficacy. Plus, it can help to explain up to a certain extent, why some people can fail and retry easier than others, simply because being encouraged and endorsed by others weakens the pain of failing.

⁴¹ Berit Anderson, 'The Rise of the Weaponized AI Propaganda Machine', *Medium*, <https://medium.com/join-scout/the-rise-of-the-weaponized-ai-propaganda-machine-86dac61668b> (accessed 12 June 2017)

⁴² Jung Suk Lee, Suwon Jung, Il Ho Park, Jae-Jin Kim, 'Neural Basis of Anhedonia and Amotivation in Patients with Schizophrenia: The role of Reward System', *Current Neuropharmacology*, 13 (6) (2015), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4759314/> (accessed 20 June 2017)

⁴³ Frank Pajares, 'Overview of Social Cognitive Theory and of Self-Efficacy', *n/a*, <https://www.uky.edu/~eushe2/Pajares/eff.html> (accessed 20 June 2017)

⁴⁴ Nick Chater, 'The nudge theory and beyond: how people can play with your mind', *The Guardian*, <https://www.theguardian.com/theobserver/2015/sep/12/nudge-theory-mental-manipulation-wrong> (accessed 20 June 2017)

iv. Shape Curiosity – For The Better (Conclusion Part 1)

We don't entirely understand the intrinsic and biological roots of curiosity. It has been studied to be a combination of two ideas. A primary instinct, not only seen in humans, but in all highly developed species residing on our planet. Although it is hard to ultimately prove this assumption, based on academic studies and research, it seems logical and comprehensible. Secondly, an acquired skill that is shaped by every single event throughout a human's lifespan.

The second idea allows us to believe that the causes that shape curiosity offer room for interventions. A space in which we can freely shape our desires to reveal the unknown and alter what we're interested in. Like a soundtrack that has its harmonies written down, but still leaves room for us and others to improvise over it, play with it and transform it into a masterpiece of music.

01. Methods

In order to make information more attractive and usable for our brain, we need to change the way we design and communicate it, especially in areas where no explicit personal interest exists. Here we're going to use information design as a hypernym to put different disciplines under one umbrella. To describe methods for it, generalised. Information design is an amalgamation of disciplines such as visual design, product design, interaction and information psychology⁴⁵, describes the way of how we layout information, which information is made available when and where, how it is accessed and which channels of communication we use.

a. Make it exploratory

Exploring belongs to one of our primary actions. We do it as babies, as children and a little less as adults. It doesn't necessarily mean we don't like to explore during our adulthoods, but it introduces the fact that we have other affairs requiring attention.

Looking at political manifestos where parties communicate their values and challenges, significant key points that work against exploratory behaviour can be clearly identified: First and foremost, when looking at this years Conservatives party manifesto, it is a document with proud 88 pages.⁴⁶ A massive amount of information in just pure text, only structured by punchy headlines (blatantly with the intent to approach undereducated people who just read headlines) that requires motivation to read. There are no references and no way out of the

⁴⁵ https://www.hdm-stuttgart.de/english/applicants/bachelor/study_course?sgang_ID=550032 (accessed 21 June 2017)

⁴⁶ <https://www.conervatives.com/manifesto> (accessed 21 June 2017)

document. It is clearly a dead end piece of information, no space for exploring further into different subjects that might be of interest to the reader, without actively putting effort into research.

If we compare the way the information in these manifestos is edited to news websites on the internet, we might start to understand, why Beyoncé's new-born twins are a lot more interesting than the Conservatives manifesto (apart from the fact that many admire perfect public figures). These kind of news leave room for interpretation and exploration. They're not ultimate. They ask questions, make cross references, mix medias, stimulate different senses. It stimulates our senses and triggers a crave for more information – even if it is then not about Beyoncé's twins, but about the biological process behind the emergence of twins.

In product design we can identify a similar thing. Objects with a clear intention and affordance like a ball or a Yoyo deliver a vast amount of possibilities to use it in different ways. They allow you to play and explore. Just imagine how many different games were invented and are yet to come, just by using a ball as the central object of attention. Those games can help to solve social, physical and mental issues. They bring people together, they are used for charity and to raise awareness. Just a simple product developing in so many different directions.

In order to increase curiosity, we need to offer more than just a dead-end piece of information or function. It has to be designed like a room containing the core information on the inside and windows all around to allow a view on everything related and connected, so we can discover in as much directions as possible, without neglecting a fair amount of guidance.

b. Interaction for the sake of discovery

Physical interaction means consciously using several senses at once. Sight, hearing and touch. This allows us to explore a subject in a much more diverse way. We can see this clearly in the undertaken experiment with magnets. Solely engaging with the subject over three minutes made the participants highly curious, with the will to learn more. This is to do with the fact that input, which can be unique or believed to be unique, also creates unique output. An action is followed by a reaction, which is then observed and evaluated. This is also a form of exploring and opens up new possibilities of how to design to increase perceptual curiosity.

Information and products can be designed to offer any individual a unique way of engaging with it, like a camera that creates unique output every time it's used, or a poem which is interpreted individually from one to another. Create a belief to discover something that no one else has discovered before. Create space within your design where the person can move freely.

c. **Play as a supporting mechanism**

Play enacts as a critical component in a human's early stages of development. Because the joy and excitement that comes with play, it increases our brain activity and allows us to generate knowledge more efficiently by enhancing the mechanisms that conflate information bits into memories. Acting at absolute free will and do what we think works best, free to engage with a given framework as we please.

An idea, to further investigate into the influence of play for curiosity: two classes consisting of around ten students each. The first class is having a football match, while the lecturer occasionally throws in pieces of information that none of them could possibly know. The second one on the other hand will receive that information during a normal teaching session in the classroom. Who will be better in constructing new memories?

In order to increase curiosity, playfulness needs to be taken more serious in design, similar to interaction. The difference lies in the seriousness of the interaction. The intention of a pure interaction is not joy, although it can bring joy. It can be linear and planned. Whereas play is meant to be enjoyed, is nonlinear and should be seen as doing something completely out of free will.

d. Leave headroom

The worst scenario is an ultimate statement. The receiver has no chance of developing his own ideas.

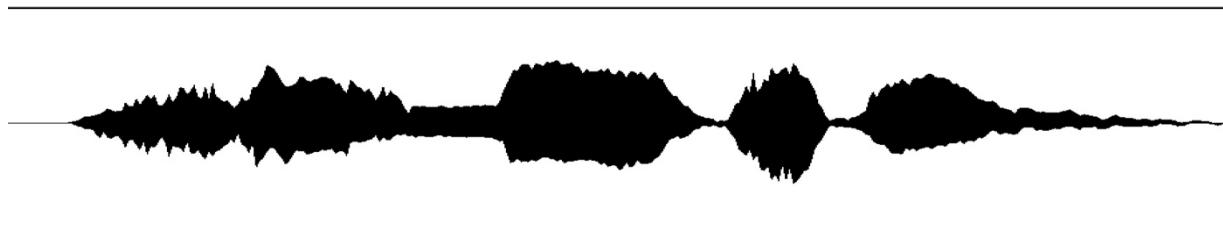


Figure 10: Marcel Mueller, Headroom available, 2017



Figure 11: Marcel Mueller, Headroom unavailable, 2017

In digital sound production, headroom means to render a song below the maximum volume (see Figure 10), which is zero decibel in the digital world. This gives the musician the option to change dynamics by making some parts and frequencies louder than others and therefore add more character to it and make it sound more interesting. This is called mastering. The less headroom the pre-rendered song has (see Figure 11), the harder it gets to work with it, like an over-exposed picture simply doesn't contain enough information to work out contrast, everything is just white. We need headroom to work with the source, to process and interact with it.

Communicating information is similar. Think of the information source as the un-mastered, pre-rendered version of your song. If the source of your information is saturated with a hundred per cent of what can be said about a particular subject, the receiver has no room to work with that information. It leaves him with nothing to figure out, nothing to develop his own ideas and opinions about it.

In the forest, there is earth, pine trees, grass, roses, foxes, snails and ants.

An exact (yet to reduce complexity simplified) final statement of what a forest looks like. The description was complete, no headroom.

In the forest, there are loads of different animals and plants. There are all kinds of living beings. Under the surface, above it and even in the air.

In the second scenario, curiosity has possibly been evoked in the receiver's head. Motivation to dig deeper, find those creatures, or at least learn about them, see if fantasy and imagination fit reality.

In order to increase epistemic curiosity, comprehensive and unexplorable answers must be reduced or prevented. Headroom is an important component that opens up opportunities for our brain to develop our own opinions and ideas.

e. Establish meaningful connections

What is a meaningful connection? A meaningful connection is a connection of two or more distinct subjects. Something we want to communicate and raise curiosity for joined with something that is already of interest. The chances to place a seed that can grow into curiosity about the deliberate communicated subject increases drastically.

Cambridge Analytica, which was spoken about earlier, is specialized to tailor information to increase the chance to catch the viewer's attention. This turned out to work incredibly well in politics.⁴⁷ Blatantly, the company is being used with absolute wrong intentions. But the idea behind it is helpful to illustrate the impact of tailoring information as such, to then wake interest in the viewer.

In order to increase curiosity, generalised information must be reconsidered. It is clear that not everybody is interested in everything, an impossible utopia. Uniquely designed information helps to catch people's attention, who might have abandoned particular problematic subjects. On top of that, if not just used as a trigger, but throughout the entire communication process, the ability to remember and to develop individual ideas increases significantly.

⁴⁷ Carole Cadwalladr, 'The great British Brexit robbery: how our democracy was hijacked', *The Guardian*, <https://www.theguardian.com/technology/2017/may/07/the-great-british-brexit-robery-hijacked-democracy> (accessed 22 June 2017)

02. Should we?

Whether we should or should not try to influence people's curiosity is out of question. From an ethical perspective, influencing people seems only right, when used for the sake of all people's well being. Realistically, this will not be the case as long as we live in a capitalist world, or any other world with a goal, other than all things well being.

A clear distinction between influencing behaviour and influencing curiosity has to be made in order to understand the ethical aspect behind it. Behaviour is something proactive that describes a person's actions, responses and decisions. A mass behaviour change affecting a group of people, a nation or the entire world is a direct interference, altering people's lives, perhaps even puts some of them on the line. But it can also change it for the better. Behaviour change is an active intervention that, in a perfect world, should be in no one else's hands other than yourself.

Changing or shaping what someone is curious about on the other hand is significantly different. It doesn't produce immediate change. It can lead to behaviour change, but not without the individual taking part in that decision. Curiosity helps us to inform ourselves in the first place. Is that ever wrong? Probably not. It is important to be informed about as many aspects as possible, nevertheless if good or bad. In fact, awareness of as many different perspectives as possible is what enables the concept we call free will. This is why decisions are even possible, we are able to weight facts against each other to then make a decision, based on our moralities.

So yes, we should influence curiosity. Best case scenario: for the better. Make people more aware of real world issues we're facing. Climate change, hunger, racism, poverty, homelessness, extinction and countless other things.

v. Conclusion Part 2

We know countless things, we just don't think about them much, because there is no room for us to think. Uncertainties miss where they're needed. Governments construct an image of being in control, which leaves us with a belief in them that isn't always justified. Because they're not. No one really is.

But, what story do I want to tell once I am old? I want to say: *I fought for a better world*. To understand what curiosity means and what it does, will greatly influence this story.

Curiosity is versatile. We are born with it. It's like the fundament of every building, whereas our mind is an ever growing city. It is an incubator for our ideas and beliefs. It opens our eyes and widens our field of view. It steers our decisions into the right direction. Yet, what is right and what is wrong is someone else's decision to make.

And other than expected, there are ways to take advantage of it.

Bibliography

BOOKS

- Carter, Dr. Kenneth E & Seifert, Dr. Colleen M. Learn Psychology (Burlington, MA: Jones & Bartlett Learning, 2012)
- DeLuca, Tom. The Two Faces of Political Apathy, (Philadelphia, Pa: Temple University Press, 1995)
- Martin, Steve. Born Standing Up: a comic's life, (London: Pocket, 2008)
- O'Neil, Harold F. & Drillings, Michael. Motivation: Theory and Research (Abingdon: Routledge, 1994)
- Singer, Dorothy G; Golinkoff, Roberta M; Hirsh-Pasek, Kathy. Play=learning : how play motivates and enhances children's cognitive and social-emotional growth, (Oxford; New York: Oxford University Press, 2006)
- Stallibrass, Alison. The Self-Respecting Child, (Boston, Massachusetts: Da Capo Press; New Ed Edition, 22 Jan. 1989)
- Wells, H. G. The Door In The Wall: And Other Stories, (CreateSpace Independent Publishing Platform, 2015)

JOURNALS

- Berlyne, Daniel E. 'A Theory of Human Curiosity', British Journal of Psychology, 45 (3) (1954)
- Berridge, Kent C. & Kringelbach, Morten L. 'Pleasure systems in the brain'. Neuron, 86 (3) (2015), p. 1
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4425246/> (accessed 08 June 2017)
- Collins, Robert P & Litman, Jordan A & Spielberger, Charles D. 'The measurement of perceptual curiosity', Personality and Individual Differences, 36 (5) (2004), <http://www.sciencedirect.com/science/article/pii/S0191886903002058> (accessed 7 June 2017)
- Da Costa Andrade, Edward Neville. 'The Early History of the Permanent Magnet', Endeavour, 17 (65) (1958)
- Fifield, William. 'Pablo Picasso: A Composite Interview', The Paris Review, 32 (1964)
- Lee, Jung Suk & Jung, Suwon & Park, Il Ho & Kim, Jae-Jin. 'Neural Basis of Anhedonia and Amotivation in Patients with Schizophrenia: The role of Reward System', Current Neuropharmacology, 13 (6) (2015),
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4759314/> (accessed 20 June 2017)

ONLINE ARTICLES

- Anderson, Berit. 'The Rise of the Weaponized AI Propaganda Machine', Medium, <https://medium.com/join-scout/the-rise-of-the-weaponized-ai-propaganda-machine-86dac61668b> (1sed 23 June 2017)n somethingirection. Yet, what is right and what is wrong is someone else our field of view. It steers ou(accessed 12 June 2017)
- Cadwalladr, Carole. 'The great British Brexit robbery: how our democracy was hijacked', The Guardian, <https://www.theguardian.com/technology/2017/may/07/the-great-british-brexit-robbery-hijacked-democracy> (accessed 22 June 2017)
- Chater, Nick. 'The nudge theory and beyond: how people can play with your mind', The Guardian, <https://www.theguardian.com/theobserver/2015/sep/12/nudge-theory-mental-manipulation-wrong> (accessed 20 June 2017)

Cowburn, Ashley. 'Boris Johnson stands by £350m extra NHS funding after Brexit campaign claim', Independent, <http://www.independent.co.uk/news/uk/politics/tony-blair-theresa-may-win-general-election-jeremy-corbyn-labour-leader-uk-prime-minister-a7705026.html> (accessed 14 June 2017)

Cowburn, Ashley. 'Brexiters condemned for not backing £350m NHS amendment to EU withdrawal bill', Independent, <http://www.independent.co.uk/news/uk/politics/brexiteers-condemned-for-not-backing-350m-nhs-amendment-to-eu-withdrawal-bill-a7570336.html> (accessed 14 June 2017)

Dahlgreen, Will. „Global survey: Britain among least concerned in the world about climate change“, YouGov UK, <https://yougov.co.uk/news/2016/01/29/global-issues/> (accessed 19 June 2017)

Gallagher, James. 'Prize for cracking brain's 'feel good' system', BBC News Health, <http://www.bbc.co.uk/news/health-39183178> (accessed 12 June 2017)

Goodall, Jane. 'The Power of One', Time, <http://content.time.com/time/magazine/article/0,9171,1003125,00.html> (accessed 14 June 2017)

Lu, Kristine & Matsa, Katerina Eva. 'More than half of smartphone users get news alerts, but few get them often', Facttank, <http://www.pewresearch.org/fact-tank/2016/09/08/more-than-half-of-smartphone-users-get-news-alerts-but-few-get-them-often/> (accessed 01 June 2017)

Pajares, Frank. 'Overview of Social Cognitive Theory and of Self-Efficacy', n/a, <https://www.uky.edu/~eushe2/Pajares/eff.html> (accessed 20 June 2017)

Runciman, David. 'How the education gap is tearing politics apart', The Guardian, <https://www.theguardian.com/politics/2016/oct/05/trump-brexit-education-gap-tearing-politics-apart> (accessed 19 June 2017)

Saville, Emma. 'How curiosity changes our brains', The Washington Post, <https://www.washingtonpost.com/posteverything/wp/2014/10/03/how-curiosity-changes-our-brains/> (accessed 05 June 2017)

Von Kleist, Heinrich. "On the Marionette Theatre (Über das Marionetten Theater)", Berliner Abendblätter, 63 (1810)

WEBSITES

<https://en.oxforddictionaries.com/definition/curiosity> (accessed 23 June 2017)

<http://www.froebelweb.org/> (accessed 08 June 2017)

<http://www.neuroscientificallychallenged.com/glossary/mesolimbic-pathway> (accessed 01 June 2017)

<https://spaceplace.nasa.gov/what-is-gravity/en/> (accessed 03 June 2017)

<https://en.oxforddictionaries.com/definition/apathy> (accessed 12 June 2017)

http://www.bbc.co.uk/news/politics/eu_referendum/results (accessed 14 June 2017)

https://www.hdm-stuttgart.de/english/applicants/bachelor/study_course?sgang_ID=550032 (accessed 21 June 2017)

<https://www.conservatives.com/manifesto> (accessed 21 June 2017)

MOVIES & TALKS

Csikszentmihalyi, Mihaly. Flow, the secret to happiness,
https://www.ted.com/talks/mihaly_csikszentmihalyi_on_flow#t-1112873 (accessed 13 June 2017)

Interstellar, dir: Christopher Nolan, 2014

Particle Fever, dir: Mark Levinson, 2013

1. What emotions did you experience during the three minutes of playing with the magnets?

FUN

2. Why do magnets attract other ferromagnetic material?

MAGNETISM + MAGIC

3. Why do magnets attract and repel each other?

POLES

4. Where do magnets come from (how are they made)?

MAGNESIUM + OTHER NATURAL ELEMENT?

5. On a scale from one to five, how good do you think is your understanding of how magnetism works?

1 [X] 2 [] 3 [] 4 [] 5 []

- a. If you're well aware of how magnetism works in theory, do you think you can imagine visually what is holding them together?

I THINK I CAN

6. On a scale from one to five, how fascinated are you by magnets?

1 [] 2 [] 3 [] 4 [] 5 [X]

7. On a scale from one to five, how curious are you about magnetism?

1 [] 2 [] 3 [] 4 [] 5 [X]

- a. If you are very curious about magnetism, would you consider yourself eager to explore this curiosity?

YES

1. What emotions did you experience during the three minutes of playing with the magnets?

scared, fun.

power.

2. Why do magnets attract other ferromagnetic material?

Junior high school science class.

3. Why do magnets attract and repel each other?



4. Where do magnets come from (how are they made)?

Nature + Men processed.

5. On a scale from one to five, how good do you think is your understanding of how magnetism works?

1[] 2[] 3[] 4[X] 5[]

- a. If you're well aware of how magnetism works in theory, do you think you can imagine visually what is holding them together?

YES!

6. On a scale from one to five, how fascinated are you by magnets?

1[] 2[X] 3[] 4[] 5[]

7. On a scale from one to five, how curious are you about magnetism?

1[] 2[] 3[] 4[X] 5[]

- a. If you are very curious about magnetism, would you consider yourself eager to explore this curiosity?

YES. But no really :-)

1. What emotions did you experience during the three minutes of playing with the magnets?

EXCITEMENT

2. Why do magnets attract other ferromagnetic material?

POLLED / 'DIRECTIONS' ?

3. Why do magnets attract and repel each other?

POLLED SEE 3

4. Where do magnets come from (how are they made)?

No IDEA

5. On a scale from one to five, how good do you think is your understanding of how magnetism works?

1 [] 2 [] 3 [] 4 [] 5 []

a. If you're well aware of how magnetism works in theory, do you think you can imagine visually what is holding them together?

-
6. On a scale from one to five, how fascinated are you by magnets?

1 [] 2 [] 3 [] 4 [] 5 []

7. On a scale from one to five, how curious are you about magnetism?

1 [] 2 [] 3 [] 4 [] 5 []

a. If you are very curious about magnetism, would you consider yourself eager to explore this curiosity?

1. What emotions did you experience during the three minutes of playing with the magnets?

Joyful, fresh, curious

2. Why do magnets attract other ferromagnetic material?

They love each other

3. Why do magnets attract and repel each other?

I forget

4. Where do magnets come from (how are they made)?

by electric? by the natural
magnets?

5. On a scale from one to five, how good do you think is your understanding of how magnetism works?

1 [] 2 [] 3 [] 4 [] 5 []
now → *when I was in junior high school*

- a. If you're well aware of how magnetism works in theory, do you think you can imagine visually what is holding them together?

yes

6. On a scale from one to five, how fascinated are you by magnets?

1 [] 2 [] 3 [] 4 [] 5 []

7. On a scale from one to five, how curious are you about magnetism?

1 [] 2 [] 3 [] 4 [] 5 []

- a. If you are very curious about magnetism, would you consider yourself eager to explore this curiosity?

To ask Marcel.

1. What emotions did you experience during the three minutes of playing with the magnets?

Happy, concern about what to do.

2. Why do magnets attract other ferromagnetic material?

strong nuclear force, same fundamental force which causes electricity. strong, weak, gravity...

3. Why do magnets attract and repel each other?



4. Where do magnets come from (how are they made)?

No idea where they come from but they are made by aligning all of the charged electrons

5. On a scale from one to five, how good do you think is your understanding of how magnetism works?

1[] 2[] 3☒ 4[] 5[]

- a. If you're well aware of how magnetism works in theory, do you think you can imagine visually what is holding them together?

yes

6. On a scale from one to five, how fascinated are you by magnets?

1[] 2[] 3[] 4☒ 5[]

7. On a scale from one to five, how curious are you about magnetism?

1[] 2[] 3[] 4[] 5☒

- a. If you are very curious about magnetism, would you consider yourself eager to explore this curiosity?

yes.

1. What emotions did you experience during the three minutes of playing with the magnets?

childlike enjoyment

2. Why do magnets attract other ferromagnetic material?

shit I don't know, I should

3. Why do magnets attract and repel each other?

!!

4. Where do magnets come from (how are they made)?

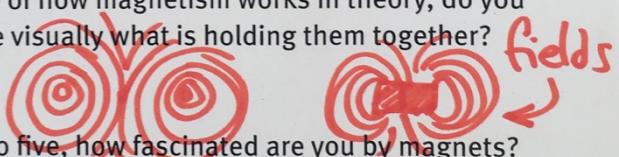
some magnets are natural
some are made through electric current

5. On a scale from one to five, how good do you think is your understanding of how magnetism works?

1[] 2[] 3[] 4[] 5[]

- a. If you're well aware of how magnetism works in theory, do you think you can imagine visually what is holding them together?

yes



6. On a scale from one to five, how fascinated are you by magnets?

1[] 2[] 3[] 4[] 5[]

7. On a scale from one to five, how curious are you about magnetism?

1[] 2[] 3[] 4[] 5[]

- a. If you are very curious about magnetism, would you consider yourself eager to explore this curiosity?

sort of ...