

## A HISTORICAL AND ETHICAL ANALYSIS OF THE CONSTITUTIVE EFFECTS OF CAMERAS

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**Abstract**

Throughout history, cameras have shaped people's behavior, perception, norms, and identity formation. Institutions have used these constitutive effects of cameras in their own advantage. Hence, how cameras shape people is not predetermined. With these lessons from the past in mind, we can take a critical stance toward emerging camera applications. After all, thanks to advances in computer vision, many new uses of cameras are coming our way. Cameras are now put to use for augmented reality, automated surveillance, emotion recognition, facial recognition, and machine vision. Just as cameras have shaped people's behavior, perceptions, norms, and identity before, and thereby served the systemic power of institutions, these emerging technologies could do the same. To protect people's autonomy and emancipatory progress in society, the constitutive effects of past, as well as emerging camera applications, are critically examined in this paper.

## 1 INTRODUCTION

A new era for cameras has begun. Until now, cameras have been used by private persons to collect memories, by journalists to capture news-worthy events, by the entertainment industry to make movies, by scientists to collect data, by law enforcement to surveil citizens, and so on. Throughout its history, the quality of cameras has increased continuously, and with that, the quality of images increased too. But what remained the same all this time, is the fact that cameras were almost exclusively used to produce pictures and videos for the human eye. Recent advancements in computer vision technology change this. Computer vision – a subfield of AI – enables the emergence of many new uses of cameras. For example, cameras are now used for augmented reality, automated surveillance, emotion recognition, facial recognition and machine vision. Although these emerging technologies and their uses vary widely, they have in common that they make use of cameras and automatically interpret the images captured by those cameras. Augmented reality (AR) is the enhancement of real-world environments with digital features. Famous examples of augmented reality are the (failed) Google Glass project and the (successful) game Pokémon Go. Automated video surveillance entails that footage of surveillance cameras is analyzed automatically, rather than by human operators, using video analytics functions such as motion detection, object detection, and tracking. Emotion recognition and facial recognition retrieve information about a person's identity or emotions from their facial features. Machine vision, finally, is the ability for machines or robots to navigate by means of cameras. For example, self-driving cars use machine vision (along with other types of sensors and analytics) to navigate traffic. In this article, I will refer to these different computer vision technologies with the umbrella term 'smart camera applications' and understand them as the next stage in a long history of the camera<sup>1</sup>.

Given the increase in possible uses of cameras, it is important to carefully consider the impact that cameras have on individuals and societies. Toward that end, this paper offers a critical analysis of the constitutive power of cameras – in particular the mentioned smart camera applications. When I say that cameras have constitutive effects or constitutive power, I mean

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<sup>1</sup> Note that throughout the entire article, the focus lies on the development and adoption of camera applications in the Western world.

that they are able to shape people's behavior, identity, norms, and perception. By shaping people's behavior, identity, norms, and perception, cameras constitute (to some extent) who we are and how we live. The notion of constitutive power is akin to Michel Foucault's (1926-1984) focus on the creative rather than the destructive effect of power (2002). By suggesting that cameras have power, I do not mean to ascribe them the kind of agency or autonomy required to independently exercise power. Rather, I mean that cameras, like other technologies, can represent authorities and facilitate power relations.

The critical analysis presented in this paper is inspired by the tradition of critical theory. The analysis is critical in the sense that it analyzes power relations and evaluates them in light of their impact on autonomy and emancipatory progress. The power relations I seek to identify and analyze are constitutive power relations – i.e., the ways in which cameras shape people. For the purposes of this paper, I understand autonomy as the ability to form and follow one's own judgement (self-legislation) and the ability to form and own one's life-story (self-development). Furthermore, I recognize that autonomy is not developed independently, but in relation to and communication with others.

Finally, my critical analysis of emerging smart camera applications is supported by a historical analysis of cameras. The historical analysis highlights five different contexts in which cameras have caused changes to the ways in which people act, think, are, or to the ways they see the world. These contexts are: private memories, journalism, research, surveillance, and social media. I chose to discuss these five issues because each reflects a way in which cameras have had constitutive power over individuals or society. Hence, the history presented in the next section is not a history of the camera, but mostly a history of the constitutive power of cameras. However, on the basis of the consulted historical literature, I conclude that the issues discussed also reflect some of the key moments in the history of the camera.

## 2 A HISTORY OF THE CONSTITUTIVE EFFECTS OF CAMERAS

The historical analysis presented in this section is predominantly focused on photography, as this was for a while the most common use of cameras, but it also considers the emergence of film and its role in journalism, research, surveillance, and social media. The presented history is necessarily a brief and incomplete one, but will help us to understand the constitutive effects of cameras.

### 2.1 THE EMERGENCE OF PHOTOGRAPHY

The camera obscura – a dark box or room that “projects an inverted image of external objects on to the opposite wall” (Derry & Williams, 1960, 652) – is a centuries-old technology that has been used in ancient China, the Arab world, and early-modern Europe. However, it was not until the nineteenth century that someone figured out how to capture a projected image and materialize it, or in other words, how to make an image last. At the time of invention, this practice was called ‘heliograph’ or ‘sun-writing’, and nowadays we know it as ‘photography’. It is widely believed that the first photo ever was taken by Joseph Nicéphore Niépce around 1826 (Emerling, 2012). It was an image of his garden in France. Although it was a huge breakthrough at the time, the first photographic process was very limited. Taking an image took around eight hours, images were very unsharp, it was relatively costly and it was not possible to make copies. About a decade later, Niépce's colleague L.J.M. Daguerre developed the daguerreotype process (Derry & Williams, 1960). The daguerreotype process required a twenty-minute exposure, which was much faster than Niépce's sun-writing, but still very long when taking pictures of

people<sup>2</sup>. Almost simultaneously with Niépce and Daguerre, a different photographic process was developed in England. In 1841, Henry Fox Talbot introduced the calotype (Green-Lewis, 2017). The calotype process had an important advantage: the ability to develop many positives out of a single negative frame (Derry & Williams, 1960). Given the innovative spirit of the time, combined with the fact that the camera obscura had been around for a while, it was no surprise that the calotype and daguerreotype were invented independently, yet almost simultaneously. As Walter Benjamin wrote: the time was ripe for the invention (Benjamin, 1931).

Throughout the second-half of the nineteenth century, photography evolved to be quicker (requiring an exposure of only one-thousandth of a second by 1900) and cheaper (through the discovery of more appropriate materials to capture and develop an image) (Derry & Williams, 1960). The first steps towards film were made in the nineteenth century as well. In the 1880s, the French physiologist Étienne Jules Marey first captured movement by inventing a way to take twelve images per second. This technology was further developed by Thomas Edison and the Lumière brothers. In 1895, the first film was shown to a wider public and in 1920, the first films with sound were introduced (Derry & Williams, 1960).

As a new tool for recording and memorizing information, photography was of course valuable to scientists. But throughout time and different cultures, we also see that remembering is an important social practice. Jennifer Green-Lewis (2017) describes how in the Victorian culture of the nineteenth century, remembering was seen as a virtue and people wanted to be remembered themselves as remembering others. Green-Lewis notes that, when photography first emerged in Victorian society, it was seen as a threat. People feared that photography would take away their ability to remember. However, they eventually embraced photography as a new memory practice, and taking portrait pictures and family photos became common among well-off Victorian households. So, photography changed how people memorize things and therefore also changed how they relate to history and how they narrate their life-stories. Following the concept of 'narrative identity' (Ricoeur, 1991), one can therefore conclude that the emergence of portrait pictures and photo albums have changed how people develop their identity.

## 2.2 FROM 'SAY PRUNES' TO 'SAY CHEESE'

As an artform, photography first had to fight a prevailing anti-technological view of art. Only after several established painters embraced the new technology, the practice of taking portrait pictures gradually took over from portrait painting (Benjamin, 1931). Because early portrait pictures followed a long tradition of portrait painting in Europe, the fact that people hardly ever smiled in early portrait pictures can be explained as the effect of the portrait painting convention. In line with this convention is the fact that smiling was seen as something "characteristic of peasants, drunkards, children, and halfwits, suggesting low class or some other deficiency" in Victorian culture (Kotchemidova, 2005, p. 2). While it is now an established practice in Western culture to smile in front of the camera, the beauty standard in the nineteenth century was a small mouth – the imperative used to be 'say prunes' instead of 'say cheese' (Kotchemidova, 2005). A different, common explanation of the serious faces in early portrait pictures is that pictures used to require longer exposure times, and it is more difficult to hold a still face when smiling. Dental hygiene was also much lower at the time, perhaps making teeth something that people tried to hide. Finally, there might be a lack of smiles in early pictures because sitting in front of a camera and creating an image or replica of oneself was simply something that scared or discomfited many. According to Christina Kotchemidova, this

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<sup>2</sup> Daguerre did however take the first ever image of a person – by accident. In 1838, Daguerre took a picture of Boulevard du Temple in Paris. While Daguerre took the picture, a man was getting his shoes polished, which made him stand still long enough to appear in the photo.

idea is supported by the fact that today still “[c]hildren are often frightened by cameras” and “[m]any tribal cultures avoid having their likeness taken” (2005, p. 6).

Kotchemidova argues that people eventually started to smile for the camera not because of improved dental hygiene or because people slowly got used to the gaze of the camera, but because the American company Kodak taught the masses to ‘say cheese’<sup>3</sup>. In the first half of the twentieth century, Kodak virtually monopolized the photographic industry. They were the first to bring photography to the masses, by creating affordable cameras and by making photography as easy as possible. Until then, getting one’s picture taken was expensive and therefore something exclusively for the well-off. Kodak radically changed this when they introduced the \$1 Brownie camera in 1900. Furthermore, picture taking and picture development both used to be tasks of a photographer, until Kodak separated these two activities to make photography more accessible for amateurs. From then on, picture development could be left to Kodak. Accordingly, Kodak’s slogan was “You press the button, we do the rest”. In addition to making photography affordable and accessible, Kodak worked hard to make it seem fun to get one’s picture taken and the company actively tried to make people associate photography with special, joyous occasions – such as Christmas, birthdays, or a day at the beach. First and foremost, Kodak made extensive use of an emerging advertising strategy at the time, that is, associating a product with happiness. The Kodak girl, who continuously appeared in Kodak’s ads, always seemed to have a blast while taking pictures and the people in the pictures that Kodak published always showed a bright smile as well. Secondly, Kodak actively instructed amateurs as well as professional photographers on how to take pictures through pamphlets and dedicated magazines. For instance, Kodak suggested strategies for taking away people’s discomfort in front of the camera and encouraged professional photographers to advertise their business more during the holidays. Thus, Kodak’s economic power in the first half of the twentieth century enabled the company to also exercise social power. Kodak directed how people behave around cameras and what role cameras and images came to play in people’s private lives. The fact that the English phrase ‘say cheese’ is used all over the world, shows that smiling in front of the camera is not a determined response, but a cultural construct that spread through globalization.

### 2.3 PHOTOJOURNALISM

By the end of the nineteenth century it was common, expected even, that news articles were accompanied by pictures (Tagg, 1988). It was easy to integrate images in written news, Marcy Dinius (2012) argues, because photography was part of the media discourse long before images appeared in the media. The invention of photography and the developments thereafter were namely reported on elaborately, in newspapers all over Europe and North-America (Dinius, 2012). Consequently, when photos eventually emerged in the media, readers already knew exactly what they were.

To this day, photos and videos play an important role in journalism. Images function as a piece of evidence; they give credibility to a story. Images also allow people to see things they have never seen before, such as different cultures or exotic animals. Because of its unique ability to confront people with things they otherwise would not see, photojournalism was successful in raising awareness about societal issues, such as poverty and discrimination. Although many might think of this as a huge advantage of photojournalism, Susan Sontag was worried that constant confrontation with images of suffering might decrease people’s natural empathetic response to others’ suffering. She writes that photography “does not necessarily strengthen conscience and the ability to be compassionate. It can also corrupt them (...) after repeated exposure to images it also becomes less real.” (Sontag, 1977, p. 20-21). It, therefore, is up for debate whether or not images have improved the emotional impact of journalism, but one

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<sup>3</sup> However, it is unclear still who first coined the phrase ‘say cheese’.

thing seems clear: adding images to spoken or written news changes how people consume news.

A second concern that the emergence of photojournalism raised had to do with the right to privacy. Photography made it possible to document otherwise private or semi-private moments and make them public via newspapers and magazines. In a famous 1890 article in the *Harvard Law Review*, Samuel D. Warren and Louis D. Brandeis point out that the rise of photojournalism posed unprecedented threats to privacy. They refer to the emergence of pictures in the news as “the evil of the invasion of privacy by the newspapers”, citing a recent court case where an actress fought the fact that her picture was taken and published in a paper without her consent (Warren & Brandeis, 1890, p. 195). Because of these new threats to privacy, Warren and Brandeis called for new laws to extend the protection of persons to privacy. While it is nowadays a given that privacy is a human right, something to be protected by law, it was not until the emergence of photography in the press that people started to perceive it as such. Moreover, the importance of the right to privacy has grown with the emergence of new technologies that continued to invade the private sphere in new ways and document new aspects of people’s lives.

## 2.4 IMAGES AS EVIDENCE

Photography and film were also quickly embraced in science, medicine, law, and politics, as valuable tools for recordkeeping and as sources of evidence (Tagg, 1988). As already mentioned, photography served the sciences because it offered an entirely new way of recordkeeping. Photography first of all contributed to the study of physiognomy or the supposed link between facial features and moral character. Although physiognomy is now widely considered to be a pseudoscience, it was very popular among eighteenth and nineteenth-century scientists. At the time, there was a “cultural obsession (...) with recording a face and reading one’s character, intellect, social standing, etc.” (Emerling, 2012, p. 137). Photography allowed “the face itself to be reenvisioned as a sort of visual archive – a field of newly detailed, classifiable information about human beings” (Gates, 2011, p. 158). Also, it was a physiologist (the aforementioned Étienne Jules Marey) that first invented film, being interested in capturing and studying the bodily movements of humans and other animals. Furthermore, photography (and later also film) became important in law and politics, because law enforcement contributed great evidential value to images (Tagg, 1988). Photography started to be used in policework, for example at the scene of a crime or as a means of monitoring suspects. In part because of the use of photography in policing, images started to be presented in court as a piece of evidence in a case.

All in all, both in science and law enforcement, photography gained status as a reliable source of evidence. However, the adoption of photography in these practices was not something spontaneous or natural. In both contexts, there appeared manuals to instruct scientists and policemen on how to take appropriate pictures – much like the manuals that Kodak produced to instruct professional photographers and amateurs on how to take family snapshots. Because of the role that such procedures and instructions played, John Tagg (1988) suggests that photography’s ongoing status as a document of truth or source of evidence is not given, but instead the result of the power exercised by important societal institutions in the nineteenth century.

## 2.5 SURVEILLANCE

In addition to being a valuable source of evidence, law enforcement also adopted (and continues to adopt) camera technologies because they are incredibly useful tools for surveillance. Surveillance is a central means of social ordering and is now often, although not exclusively, done by means of video cameras (Lyon, 2001). Surveillance cameras are not only

meant to gather evidence in the case of a crime, but they are also used to exercise social control over people's everyday behaviors. Surveillance cameras are put in place to make sure that people behave according to the rules in traffic, in stores, at work, and so on. With every new development in camera technologies, the scope of surveillance increases. Developments in camera technology have even been promoted and steered by law enforcement, for the sake of surveillance. Research on facial recognition, for instance, started in the early 1960's with funding from the US Department of Defense (Gates, 2011, p. 12). The development and use of surveillance technology also increased significantly after the terrorist attacks known as 9/11 (Gates, 2011). Law enforcement's interest in surveillance technologies leads them to heavily influence the development and adoption of camera applications. Through surveillance cameras and other surveillance technologies, law enforcement has also been able to effectively discipline people's behavior. On top of that, surveillance practices changed people's sense of privacy in public and constituted an understanding of the face as an objective representation of who we are.

## 2.6 SOCIAL MEDIA

Once Kodak introduced affordable cameras, they became a product of mass production and mass-consumption. During the first half of the twentieth century, it became standard for the average European and American household to take pictures of family celebrations and collect them in a photo album. Consequently, a new generation grew up with a "photographic consciousness" (Green-Lewis 2017, p. 117). They were used to seeing photographs on a daily basis (e.g. in newspapers or on posters), learned about their own family history through photo albums, and started perceiving certain moments as worth remembering (i.e., worth photographing).

People's photographic consciousness has only increased since Kodak's \$1 Brownie camera came on the market. Amateur photography and film continued to become easier and cheaper, especially with the arrival of digital cameras and smart phones. As a result, people take more and more pictures and seem to perceive ever more objects and events as something they should take a photo of. It also appears as if many of us find special occasions and experiences less real or valuable when we are not able to share a picture or video of it. Social media platforms like Facebook, Instagram, Snapchat, and TikTok have played an important role in continuing the development of photographic consciousness. Social media has influenced what things people photograph or film, how people pose or wish to look in an image, who they share images with, and which format they prefer to share images in (square images, filtered photos, disappearing images, short videos, etc.). Social media also affected the practice of keeping physical photo albums, as it allowed people to share images and videos with loved-ones and acquaintances online. Social media offers new forms of storytelling and remembering, and images and videos are an important element in that. The digital representation of people's selves and their life stories has become an important part of individual identity – it shapes not only how people are perceived by others, but also how they see themselves. The latter is far from always a positive thing. It has been shown that the filters and photoshop that create perfect images on social media often have a negative effect on people's self-image, and thus on their mental health (Jiang & Ngien, 2020).

Because of its potential for storytelling and remembering, social media meets a deep-seated human desire for narration and nostalgia<sup>4</sup>. It is the same desire that led aristocratic families to embrace photography in the Victorian age and for people to embrace portrait painting before that (Green-Lewis, 2017). The desire to take a picture of a certain moment can be understood as a looking forward to looking back. After all, as soon as a picture is taken, the moment is past.

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<sup>4</sup> The desire for nostalgia is also reflected in the popularity of social media filters and retro instant cameras that make pictures appear as if they were taken mid-twentieth century (Green-Lewis, 2017).

A picture can never capture something as it is, only as it was (Emerling, 2012). Therefore, photography has strong ties with memory and a significant impact on how people come to perceive the past – their own past as well as that of others. The human desire for narration is met by social media, because to many people, especially young people, social media has become an important tool for communicating to others who they are. Through the images they share, the angle they choose when taking an image, the filter they use, the caption they add, and so on, one can create a story about one's identity. In other words, social media – with the central role that images play on these platforms – constitutes how people shape and communicate their (narrative) identity.

### 3 LESSONS FROM THE PAST

As I explained in the introduction, the term 'constitutive power' refers to the variety of ways in which power relations shape people's identity, behavior, norms, and so on. In the previous section, I outlined a brief history of the constitutive effects of cameras. In this section, I argue that there are two important lessons to take away from the historical analysis of cameras. First, cameras can be said to have or mediate constitutive power for various reasons: cameras shape people's behavior, societal norms, how people see the world, and how people see themselves. Secondly, history shows that the changes cameras cause are not predetermined. Cameras' constitutive effects have always been directed and influenced by powerful institutions. In this section, I take a closer look at both of these takeaways from the history of the camera, before moving on to the discussion of emerging smart camera applications.

Let us start with the constitutive effects of cameras. Cameras have come to play an indispensable role in society: it has become hard to imagine contemporary societies without security cameras, passport photos, television, holiday pictures, video conferencing, etc. A first constitutive effect of this wide adoption of cameras is that they changed various societal norms and practices. Photography and film brought new epistemic norms about truth and evidence in both science and law. When photography became a product of mass consumption, it changed the cultural norms regarding smiling and remembering. Photography and video surveillance also affected how people value privacy, culturally and legally, as well as what aspects of one's lives are considered to be private. Secondly, cameras have had constitutive effects on people's self-development and identity formation. In some cases, camera technologies have negatively affected people's self-image – for example because people are inclined to compare themselves to the perfect images they see in magazines or on social media. Photography and film also changed how people can narrate their identity – for example by allowing them to choose which images they share with others and by enabling people to create a narrative of their lives through photo albums and social media. Thirdly, seeing the world through images has reconstructed how people memorize their own histories as well as general historic events. Seeing the world through images shaped how people consume news and information, by giving it a strong visual bias (Kotchamidova, 2005). And cameras made people perceive certain moments and objects as picture-worthy, thereby radically changing the real-life experience of those moments. When one goes sightseeing today, one will find that many tourists seem to be more focused on getting a good shot than on taking in the real-life view.

Because cameras have fundamentally changed and shaped people, we can say that cameras have or mediate constitutive power. Moreover, the constitutive power of cameras is a diffuse sort of power – cameras have shaped people and society not in one direct way, but in many small ways. Taking all the little influences of cameras together, it is clear that they have left a big impact on individuals and society. The understanding of power as something that constitutes the subject and that functions through micro-mechanisms, is central in the work of Foucault. This constitutive view of power is extremely valuable, but there are some other relevant elements to the power of cameras that are worth mentioning.



Cameras not only shape subjects with regard to behavior, views, and identity, the history outlined above also shows that the constitutive effects of cameras are sometimes coincidental but often intended. That means that cameras are often actively used as a tool to exercise power. We have seen that cameras have served economic power (e.g. Kodak's business model), social power (e.g. using images to raise awareness about certain news stories), political power (e.g. video surveillance). The important takeaway here is that the constitutive effects of cameras are not predetermined, rather, the ways in which cameras impact subjects and society are heavily and intentionally steered by institutions. Taking pictures of celebrations and smiling for the camera is not the inevitable consequence of the invention of photography, but something Kodak made us do (Kotchemidova, 2005). Police units in the nineteenth century actively promoted the epistemic status of images as evidence (Tagg, 1988). The dependence of law enforcement and security practices on cameras is the result of the governmentality of modern states (Foucault, 1978). The importance of images in how people consume news has been made possible by the attention newspapers gave to photography from the moment of invention (Dinius, 2012). And social media played an active role in making images central to how people perceive themselves and how they are perceived by others (Green-Lewis, 2017). So, alongside the notion of constitutive power, it is relevant to consider systemic or institutional power in the context of cameras' impact on society.

The idea that photography, film, and video surveillance have had constitutive effects on people's behavior, norms, and identity, resembles Foucauldian analyses of power and the subject as well as recent work in philosophy of technology. The idea that technology can mediate our interaction with the world is central to post-phenomenology (e.g. Verbeek, 2010). The normative changes caused by camera applications are in line with work on techno-moral change (e.g. Swierstra, 2013; Swierstra, 2015). And the insight that cameras have been a tool of power to institutions resembles Langdon Winner's famous claim that artefacts have politics (Winner, 1980). The present analysis of the history of cameras is innovative, first of all, because it combines these different insights and, secondly, because it focuses specifically on camera technologies. Despite the increasingly central role that cameras play in everyday life, the technology's impact and development have not received much attention in the philosophy of technology.

## 4 ANTICIPATING AND EVALUATING THE FUTURE

Having learned about the constitutive power of previous camera applications, it is now time to turn to the emerging smart camera applications that I mentioned in the introduction: augmented reality, automated surveillance, emotion recognition, facial recognition, and machine vision. While these are very different technologies, they share a reliance on computer vision techniques and on cameras. With the emergence of these and other computer vision technologies, cameras continue to play new roles in everyday life and are increasingly present in society. In this section, I argue that being aware of the constitutive power of previous camera technologies and the role of institutions in this, is helpful when anticipating and evaluating the potential impact of emerging smart camera applications. I first discuss how the mentioned smart camera applications might change people's norms, views, behavior, and identity in similar ways as previous camera technologies have. Second, I discuss whether this is undesirable, looking at the impact such changes have on people's autonomy and, consequently, on emancipatory progress in society. For these purposes, I understand autonomy as the ability to form and follow one's own judgment (self-legislation) and the ability to form and own one's life-story (self-development). One develops autonomy in relation to and communication with others.

Just as cameras did before, emerging smart camera applications may also constitute people's behavior, perception, norms, and more. Augmented reality (AR), for starters, is a very powerful

tool for businesses or other institutions to control how people perceive the world around them. Photography and social media created a photographic consciousness that shaped how people look at the world, themselves, and other people (Green-Lewis, 2017). Augmented reality makes it possible to shape perception in a much more direct way, by adding features or information to what people see in real-time. Imagine a product like a pair of AR glasses with an embedded camera, that adds information to the real-life things one sees (a more successful version of Google Glass). Such AR glasses would affect in the most literal possible way how one sees other people and the world around them. Such direct influences on people's perception and understanding of the world threaten people's ability to form their own opinions or views. Moreover, while individuals lose autonomy, the institutions that develop and sell these products, gain power: they get to steer how people start to see the world<sup>5</sup>.

Automated surveillance, secondly, increases the information or data that surveillance cameras collect as well as the domains in which surveillance cameras can be implemented. As a result, the intended and unintended effects of surveillance cameras on behavior are likely to grow stronger. People will be surveilled more often and surveillance will entail not just that they might be seen by a human eye, but that they are analyzed by a smart system. This may affect autonomy in the sense that people are effectively less often free to follow their own judgement (self-legislation) or by compromising people's sense of freedom to be themselves and express themselves (self-development).

Emotion and facial recognition, thirdly, can increase the association between one's identity and one's face – which was previously endorsed by the adoption of photography by physiognomists and the popularity of using images for identity management purposes. Emotion and facial recognition would thereby change how people understand and form their identity as well as how they are perceived by others. Moreover, emotion recognition can change affective norms, just as photography has in the past, and therefore regulate how people express certain feelings. The latter would for example be the case in situations where emotion recognition is applied to support human-human interaction or human-machine interaction. Emotion and facial recognition systems also label people – for example as 'female', 'aggressive', 'sporty'. The labels people get can again shape how they perceive and develop themselves and how they are perceived and treated by others. Emotion and facial recognition may thus compromise self-development in various ways.

Machine vision, fourth and finally, decides not only how robots see and respond to the world around them, but can also affect people's own understanding of their environment, when they adopt or try to understand the machine's perspective. Take the aforementioned example of semi-automated cars: when driving such a vehicle, people learn how it interprets and responds to the phenomena it sees, which in turn might affect a person's own behavior in traffic. As in the case of AR, this may affect people's self-legislation while at the same time contributing to the systemic power of tech companies over the behavior of the masses.

When adding up all the small constitutive effects of smart camera applications, it becomes clear that these technologies can form a serious threat to people's autonomy and, with that, emancipatory progress in society. What contributes to the threat to autonomy, is the fact that cameras' constitutive effects often facilitate the systemic power of certain societal institutions. From the history of the camera, we learned that the constitutive power of cameras is not predetermined. Institutions or systems of power can direct how cameras shape people. Once a

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<sup>5</sup> Of course augmented reality can be empowering too, by increasing people's knowledge and understanding of their environment. For example, live subtitles can be very helpful to deaf people or when two parties do not speak the same language. Real-time emotion recognition can also help autistic people to improve interpersonal interactions, which could in turn strengthen their social relations.

product becomes widely adopted and embedded in a society, these institutions are not only able to shape individual experiences and views, but they also bring about change at a societal level.

## 5 CONCLUSION

It may seem innocent, or even inevitable, that new technologies change people's behavior, norms, practices, identity formation, or view of the world. The historical analysis in this paper has shown that cameras have continuously changed and shaped people, and it seems hard to believe that we are worse off because of it. However, what one should take away from the history of (the constitutive effects of) cameras, is that camera technologies can change who we are, how we think, how we act, and how we perceive the world, in innumerable small ways and, by doing so, cameras facilitate the systemic power of institutions. With many new camera applications coming our way, due to developments in computer vision, it is important to be aware and to be critical of the constitutive effects of cameras. Taken together, these constitutive effects have the potential to compromise people's development and exercise of autonomy.

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