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Versatile Camcorders

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Versatile Camcorders

Looking at the GoPro-Movement

With contributions from

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Content

Environment

Foreword

This book concerns the complex interrelations between a camera technology – the GoPro – and its modes of media production, their aesthetics, and the connection to the environment in which it emerged. It is meant as a contribution to a scholarly field that analyzes paradigmatic technological developments in their context, such as, for instance, the Walkman, the synthesizer, the DVD, or the iPhone. The idea to address this topic arose from a longer exchange that began in 2015 at a conference where both of us gave lectures that in part dealt with the GoPro.

The publication was preceded by a workshop with the authors at the Brandenburg Centre for Media Studies on June 21 and 22, 2018.

We would like to thank all those who participated for their enthusiasm and their substantial contributions to a topic that has so far received scant attention. We also thank Daniel Hendrickson for his conscientious translation and careful proofreading of the texts.

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Winfried Gerling and Florian Krautkrämer

Looking at a Versatile Movement: An Introduction to the Book and the Camera

Winfried Gerling, Florian Krautkrämer

The GoPro has lastingly changed the conditions for making images by conceiving the body and the device as a jointly acting unit. The device is small, robust, mobile, and can be used in a variety of ways, usually attached to the body or a piece of sports equipment. Hardly any other technology has so thoroughly and effectively staged the connection of media production and its aesthetics to the environment in which it is created. The presumed self-staging of users is therefore always also a staging of technology, which is skillfully utilized by the brand for its distribution purposes.

The development of this device, which is relatively simple in terms of technology but conceptually unique, gave rise, much like the iPhone, to its own culture and aesthetics: a culture that connected making images with action, thus producing a direct relationship between media production, technology, and "life."

Nick Woodman, the CEO of the GoPro Company, became an economic hero of the start-up scene in the Bay Area as the producer of the first small, robust action-cam as a new type of camera. In 2013, at the age of 38, he was one of America's youngest billionaires.[1] Woodman founded GoPro in 2002 after taking a year off when his previous start up had gone insolvent. During this time he pursued his passion for surfing, noticing that it was impossible to take good surfing photos with the amateur equipment available at the time. His experience led to developing the idea of a wristband with a waterproof case, which could hold a very simple, analogue, non-focusable, and easy-to-use viewfinder camera. The name of the company came from the need to produce professional images by easy means under difficult conditions: **go pro**fessional.

A mythology of the typical American self-made man has grown up around the founder. He is supposed to have sold jewelry from out of his VW bus to finance his new business. But what is often not reported in this story is that his father loaned him 200,000 dollars, while his mother

[1] "Youngest Billionaires of the 2013 Forbes 400", in: *Forbes* www.forbes.com/pictures/eimh45igdg/7-nick-woodman/#7288dacae39d (last seen: 12.8.2019). By 2019 his estimated worth had shrunk to 800 million dollars.

gave an additional 35,000 to finance the business, after already having started two non-successful businesses.[2]

Due to the founder's personal experience, the first GoPro was exclusively sold in surf shops starting in 2004, complete with batteries, wrist strap, and a waterproof case. It quickly became clear to users that the camera was also a good choice outside the water to document a wide variety of sports activities where you needed your hands for something other than holding a camera. So even the analog version of the camera was used by a large number of (extreme) sports fans.

The digital GoPro was introduced in 2006 as one of the first cameras to record both videos and still photographs. It became a great economic success. It secured the company the high revenue of $800,000 versus $350,000 in the previous year. By 2007, the revenue had risen to $3.4 million[3] and grew exponentially until the end of 2014. GoPro was the fastest-growing producer of cameras worldwide at the time.

The company went public on the stock market in June 2014. Since then, the stock price has risen from $36 to $90 in 2014 and has steadily dropped further until today at around $4 (Juli, 2020).

2015 was the first hard year for GoPro: The company shipped more cameras than ever, but its revenue dropped 31 percent between the fourth quarter of 2014 and 2015.

And in 2016 the losses were even higher than in the previous year, but in 2017 the losses could be significantly reduced. Nevertheless, GoPro was looking for a buyer with the help of JP Morgan at the beginning of 2018, but since 2019 there no longer seems to be any plan to sell the company. The release of the GoPro Hero 7 in the fall of 2018 made the company profitable again.[4] The GoPro Hero 7 is the GoPro that has had the most sales worldwide.[5] In October 2019 GoPro released the suc-

[2] Ryan Mac: "Five Startup Lessons From GoPro Founder And Billionaire Nick Woodman", in: *Forbes*, 13.3.2013, www.forbes.com/sites/ryanmac/2013/03/13/five-startup-lessons-from-gopro-founder-and-billionaire-nick-woodman/#4f10f03c546e (last seen: 12.8.2019).

[3] "GoPro's revenue Wave," in: *Forbes*, www.forbes.com/pictures/emdh45gfif/gopros-revenue-wave-2/#7a3613fe7a36 (last seen: 12.8. 2019).

[4] Sean O'Kane: "GoPro turns its first profit since 2017, thanks to the Hero 7," in: *The Verge*, 1.2.2019, www.theverge.com/2019/2/6/18214446/gopro-earnings-profit-hero-7-holiday-season (last seen: 12.8.2019).

[5] It is notable that sales of simple digital cameras have declined by 84% worldwide since 2010. The reason for this is the constant improvement of the cameras in smartphones. The market for high-quality digital cameras has remained relatively stable since 2010, and the market for action cameras is still growing, although competition has risen significantly. By now there are a great number of providers for these cameras, but no provider other than GoPro has so far managed to establish such a stable community for its product. Felix Richter: "Digital Camera Sales Dropped 84% Since 2010," in: *Statista*, 27.5.2019, www.statista.com/chart/5782/digital-camera-shipments/ (last seen: 12.8.2019). "Unit sales of action cameras worldwide from 2010 to 2017 (in millions)", ibid., https://www.statista.com/statistics/326898/worldwide-unit-sales-action-cams/ (last seen: 12.8.2019).

Fig. 1: Analog GoPro

Fig. 2: First digital GoPro

cessor model, the GoPro Hero 8, which includes both a few technical changes as well as an integrated mount and the possibility of attaching lighting to the side.

The GoPro Hero is a very small, relatively affordable high-tech camera with an interesting concentration of essential features that were – and continue to be – developed and refined with a close eye toward the target community.

Essential to the camera are its three modes of image production (video, single photographs, and time lapse) and its ability to record (stereo) sound.

One essential feature of the camera is the extreme wide-angle lens (fish-eye) with a fixed focal length of about 16mm (in relation to full-frame format).

The first GoPros omit much that has become standard in the digital camera world: no GPS, no zoom lens, no mobile connection, no complex user settings. All of this, however, is to the benefit of the extraordinary mobility and durability of the device. The missing functions and the lack of display (until GoPro Hero 4), just like the lack of connectivity to mobile networks, could be replaced by a smartphone or tablet. The initial limitations of the camera allowed for a meaningful concentration of essential functions, and the device could be kept very small. But this also marked its conceptual difference to conventional cameras. In response to technological developments and the expectations of users, the presumably missing functions have now all been integrated into the small device: displays, GPS, Bluetooth, WiFi, etc.[6]

One important aspect of the marketing of GoPro is that for a long time it was almost entirely unnecessary to spend money on advertising, since the content for advertising clips was produced by the users themselves, or the dissemination of user-generated clips on YouTube and GoPro's own YouTube channel alone were, or are, effective enough already.

> In place of an art director, acting cast, and team of videographers, GoPro simply hands a wearable camera to an amazing athlete and gets back advertising and marketing gold. Regular customers have become advertisers on a smaller scale, shooting high-quality video, loading it onto YouTube and social networks, and advertising the capabilities of the cameras to friends, family, and complete strangers.[7]

[6] On the technological development of the camera and its consequences, see the article by Winfried Gerling in this volume (pp. 27–43).

[7] Kevin Bobowski: "How GoPro Is Transforming Advertising As We Know It," in: *Fastcompany*, 7.4.2014, https://www.fastcompany.com/3032509/how-gopro-is-transforming-advertising-as-we-know-it (last seen: 12.8.2019)

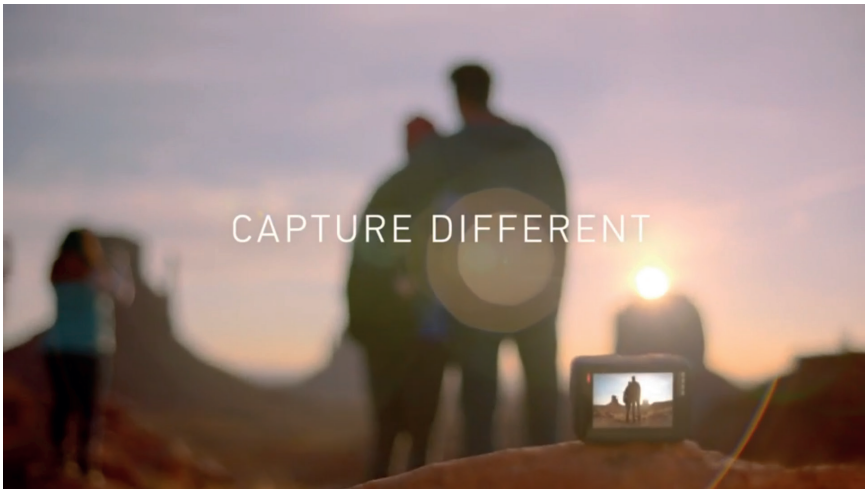


Fig. 3: GoPro commercial 2016

While the net profits from 2010 doubled to 24.6 million dollars in 2011, GoPro only spent 50,000 more on marketing, and in 2013 GoPro once again saw their profits rise to around 28 million dollars and spent only 41,000 dollars more on marketing (total marketing expenses in 2013: approx. $158,000[8]).

Partnerships were entered to mutual benefit with a variety of other brands: for instance with Marriot Hotels (Adventure Traveling), Virgin (Sales and Streaming), Xbox (Streaming), and Red Bull (Content Partner). Furthermore, competitions have frequently been held in the GoPro community at relatively low expense for the best surfing video or the best basketball trick shot, etc.[9] Events are often developed by Red Bull, for instance. These include international wingsuit[10] or mountain bike competitions. There could also be events that drew worldwide attention, such as Felix Baumgartner's spectacular space jump in 2012.[11] Red Bull sponsors the event and GoPro provides the cameras.[12]

8 Shanhong Liu: "GoPro's sales and marketing expenditure worldwide from 2012 to 2018", in: *Statista*, 18.2.2019, https://www.statista.com/statistics/451138/gopros-marketing-expenditure-worldwide/ (last seen: 12.8.2019).

9 Marty Biancuzzo: "Why GoPro is Set for a Strong Wall Street Debut," in: *Wallstreet Daily*, 21.5.2014, www.wallstreetdaily.com/2014/05/21/gopro-ipo (last seen: 31.7.2018).

10 "Dive into the world's only wingsuit slalom race," in: *RedBull*, https://www.redbull.com/se-en/2016-aces-wingsuit-race-videos (last seen: 12.8.2019).

11 "Felix Baumgartner – Red Bull Stratos – Complete Space Jump – GoPro," YouTube, 16.10.2012, https://www.youtube.com/watch?v=hV39QwDY_JQ (last seen: 12.8.2019).

12 Both companies have an extremely high number of subscribers on YouTube: GoPro 7.6 million/Red Bull 8.7 million, as of: August 2019.

The videos produced from these events are then shared on social media platforms like YouTube, Facebook, Twitter, and Instagram, and they then spur other GoPro users to produce similar or even more spectacular images, each trying to outdo the other. This sometimes puts them at significant danger, which is mentioned in many of the videos and commentary as the actual impetus to carry out these actions. So images are intentionally created by accident, images whose production can or should go out of control. Feeling like one is in the moment and at the same time knowing that this moment is being recording by the attached camera is as important as the action itself.[13] Showing a spectacular action, which is right at the edge of an accident, is the focus of these images.

The voluntary, but in part also existential integration of users into the process of production and marketing is a typical strategy for digital media companies. Martin Lister characterizes this as follows: "Forms of social media [...] are now also recognised as ways of 'monetizing' the labour of amateurs and selling it back to them."[14] GoPro manages to do something here that only very few hardware producing companies can achieve: to establish a community that "labours" for them. As a rule, the productive surplus value in this "like economy"[15] tends to become regenerated in contexts of social media companies or in the form of purchasing recommendations like those suggested by Amazon and Google.

After a stagnation in camera sales GoPro produced its first scripted TV ad in 2016 in collaboration with an advertising agency. Its third quarter results were far below Wall Street expectations. Then about a week later GoPro was forced to recall its new drone. The eagerly awaited new product fell from the sky.[16]

For any other brand, this change in marketing would not make a big difference, but for a camera company that built its cult-like following on the back of an extensive catalog of user and brand-generated content from surfing and snowboarding to flying pelicans and kitten-saving firefighters, all shot with its wearable cameras, it represents a significant shift.

[13] On the aspect of risk, see Winfried Gerling: "Be a Hero – Self-Shoots at the Edge of the Abyss," in: Julia Eckel, Jens Ruchatz and Sabine Wirth, (eds.): *Exploring the Selfie – Historical Theoretical and Analytical Approaches to Digital Self-Photography*, London 2017, pp. 261–283.

[14] Martin Lister: "Introduction," in: Martin Lister (ed.): *The Photographic Image in Digital Culture*, London, New York 2013, pp. 1–21, here p. 2.

[15] See for instance Carolin Gerlitz: "Die Like Economy – Digitaler Raum, Daten und Wertschöpfung," in: *Generation Facebook: Über das Leben im Social Net*, Oliver Leistert and Theo Röhle (eds.), Bielefeld 2011, pp. 101–123.

[16] On the aesthetics of drone videos, see the essay by Tobias Conradi in this volume (pp. 105–120).

At that time the company changed its slogan from "GoPro be a HERO" into "GoPro capture and share your world."

With the stagnation in sales, GoPro management recognized that they were liked by a much larger community that didn't own the camera. These people liked the videos and the gesture of risk in them, but they didn't know why they should buy a camera like this. As GoPro Senior Vice President of marketing Bryan Johnston put it:

> The brand will always have its core DNA, it's where we grew up in the action-packed, surf, skate, snow, motorsports world, and it will always be a part of what we do and who we are, [...] We've done a ton of research, trying to understand the brand, what people like about GoPro, and the funny thing is, the more research we did, the more we looked at people on the edge – who loved GoPro but didn't have one. They told us one very simple thing: Just show us why we need a GoPro. Explain it to us, make the message simple, and we'll respond. So that was the goal with this ad.[17]

And so an audience was addressed with this ad that was not predominantly involved in sports or extreme sports, but was parents with children, couples traveling, people who were just having fun, etc. The GoPro was supposed to become the universal camera worn on the body, no longer standing between the user and the motif, thus also distinguishing it from the smartphone.[18] The clip first shows people always with a smartphone in their hands to take photos, asking: "is this really in the moment" and "is this really playing with your kids" in order then to show images that were taken with the GoPro that do not interrupt or dominate the action to say: "keep playing", "keep dancing", "just keep doing". The GoPro does not stand between the person and the action being recorded, taking a photo whenever it's wanted, supported by the voice control that was introduced in 2016.

Since 2013, GoPro has been developing apps and desktop applications as part of its core business. From 2011 on, the company has been investing in software development primarily by buying developers such as Cineform – a video codec developer. On the one hand the apps serve to activate the camera by remote control from a smartphone or tablet, but also to edit and distribute the images recorded, even from the laptop or desktop computer. Starting with the GoPro 7 live streaming became

[17] Jeff Beer: "Why GoPro Changed Its Marketing Strategy To Go Beyond The Action," in: *FastCompany.com*, 16.11.2016, https://www.fastcompany.com/3065745/why-gopro-changed-its-marketing-strategy-to-go-beyond-the-action (last seen: 12.8.2019).

[18] In this respect GoPro has a certain conceptual relation to the so-called lifelogging cameras or wearable cameras, such as Narrative Clip and OrCam MyMe for example.

possible as well, on a variety of social media platforms like Facebook, YouTube, Twitch, and Vimeo.

In 2018, as a further mainstay for the sale of action-cams, the manufacturer started relying on a new subscription model GoPro Plus for the future. It includes exchange of damaged devices, even in the case of one's own negligence. However, in addition to a monthly subscription fee, a replacement fee must be paid. This service is currently only available for a limited number of countries. The subscription also includes a cloud service to store unlimited videos and photos and a discount of 50% on mounts and accessories at gopro.com.

Since the GoPro Hero 4 the camera has been delivered in an elaborately designed box. Actually more in a kind of vitrine, which is supposed to indicate the special value of the camera. This emphasis on value became necessary in particular because by now there are competitor products that cost under 50 dollars. Part of this quality is the brand itself, which continues to present itself as the action-cam, and just adding the tag GoPro on social media platforms generates significantly higher click rates than without it.

Fig. 4: GoPro in its packaging

A whole series of special products has been developed or further developed around the GoPro. The first tests were made by the founder Woodman during one of his sports activities, racecar driving. He mounted the camera with the wrist strap on the steering wheel of his racecar and subsequently experimented with mounts from a 3D printer. Many users did similar things, using 3D printer technology to produce a variety of mounts. This maker and DIY culture gave rise to many products, such as mounts for bicycles, surfboards, helmets, flat surfaces, a wide variety of cases for 3D shots with two GoPros and for 360° recordings with 4-6 GoPros[19] etc., but also mounts for rockets, drones, and extreme jumpers.[20]

In addition, the so-called selfiestick plays a central role in producing images with the GoPro. It is somewhat peculiar that GoPro entered the market for mounts only at the end of 2007, initially leaving other manufacturers to define the market. The mounting system for the camera has by now become the norm for many other manufacturers as well, much like the standard tripod thread for conventional cameras.

Due to its relatively low price the camera is also sometimes called into action by professional filmmakers in large camera arrays (for bullet-time) and in order to attach it to things or moving objects and subjects, to show their often inaccessible worlds from "its" point of view. The BBC, for instance, attached GoPros to a sinking whale in their nature documentary Our Blue Planet II.[21]

The versatility of the GoPro is the basis for the device's relationship – as an image-producing machine – to the body (object/subject), its environment, and the socio-technological embeddedness that inseparably links the activity of the body in its surroundings with producing and processing images.

As Marty Biancuzzo describes in the Wall Street Daily, GoPro managed to construct a "mass media ecosystem that will turn GoPro into its own content network."[22]

[19] See for instance the many printable models at "Search Engine for 3D printable Models": https://www.yeggi.com/q/360+gopro/ and https://www.yeggi.com/q/stereo+gopro/ (last seen: 07.2.2020).

[20] On the aspect of tinkering with 360° equipment and the GoPro, see the article by Christophe Merkle in this volume (pp. 153–165).

[21] Ed Yong: "The Making of Blue Planet II's Incredible Deep Ocean Episode," in: *The Atlantic*, 29.1.2018, www.theatlantic.com/science/archive/2018/01/the-making-of-blue-planet-2s-incredible-deep-ocean-episode/551729/ (last seen: 07.2.2020). On the perspective of fishing, of fish-eye lenses, as well as underwater photography, see also the essay of Nanna Heidenreich in this volume (pp. 191–204).

[22] Marty Biancuzzo: "Why GoPro is Set for a Strong Wall Street Debut," in: *Wall Street Daily*, 21.5.2014, www.wallstreetdaily.com/2014/05/21/gopro-ipo (last seen: 31.7.2018).

The entire production and communication runs over popular social media channels, and users are already familiar with how to use them.

The 'ecosystem' that GoPro has constructed over the course of time therefore facilitates a unique connection between the device – the GoPro with its specific features – and bodies, action, surroundings, and ubiquitous, mobile, smart computing environments and their worldwide networking. While the smartphone has seen to the rise of a culture of image sharing and distribution, generating the particular aesthetics of the selfie and a certain immediacy of participation, GoPro has joined in with this culture of sharing, focusing on the cooperation between the device and the body in action and thus creating a specific perspective that puts the device and the subject into the scene at the same time. This is meant to give the viewers of these distributed images the feeling of taking part, of having the same view as the person recording, or of being close to it:[23] "Being there."[24]

One of the biggest challenges in getting a foothold in the amateur market segment lies in the lack of suitability for daily use in comparison to the mobile phone camera. The GoPro camera has to be brought along intentionally, and in addition it is not universally deployable: you can record films and photos with it, but you cannot edit or send them directly from the camera. Nonetheless, GoPro has managed to tap into a broad layer of alternative users and a variety of possible applications in addition to the original clientele of extreme sports enthusiasts. Alongside the sports clips, the GoPro is used for documenting, surveilling, beach vacations, in science,[25] or in street battles in the Syrian civil war.[26] This can be discerned because users often voluntarily share their material. They publish it on a variety of platforms, marking their videos with a tag or in the title as one that was shot with a GoPro.

But the area where the GoPro can make the biggest impression through its versatility and the skills of its users is sports. Whether wing suit jumping, roofing, parkour, mountain biking, or just downhill skiing: the focus here is on the often spectacular visual evidence of a successfully completed athletic performance that also simultaneously demonstrates the adaptability and resilience of the camera.

[23] On the problem of the exocentric subjective perspective, see Philippe Bédard in this volume (pp. 45–61).

[24] See: Phillip Vannini and Lindsay M. Stewart: "The GoPro gaze," *Cultural Geographies*, 24:1, 2017, pp. 149–155.

[25] On the usage of action-cams by NASA see the essay by Anne Quirynen in this volume (pp. 121–133).

[26] On the use of the GoPro by IS fighters, see the essay by Simon Menner in this volume (pp. 135–152).

Especially in the area of sports, the idea of an involved perspective for live television broadcasts is significantly older.[27] Already back in 1965 the quarterback of the Denver Broncos wore a helmet with an integrated camera that provided footage during the game. Illustration During the 1991 football season several quarterbacks were regularly equipped with cameras, and the live footage was integrated immediately into the broadcast. Despite overwhelmingly positive feedback, the experiment was not continued, perhaps because the technology was not wireless and the players could not easily remove their helmets.[28] Due to newer and significantly cheaper technology, there were new attempts made with helmet cameras in the 2016 college season, although they were restricted to training sessions, since according to NCAA rules, cameras and microphones are banned on the field during a game.[29] It is a different case with the various rugby leagues and tournaments, where the referees wear an action-cam on their chests, which is mainly meant to make it possible to retrace certain rules decisions.

With regard to sports, it seems as if the GoPro is above all interesting for those who need the device in order to depict their activities in the first place, whereas those sports that are already largely visible only use these cameras as an additional possibility, if at all. So, for example, one can sometimes see the GoPro on the heads or the upper bodies of mascots or assistants after the actual event as well as a behind-the-scenes camera, which provides exclusive material for the broadcast.

This various and versatile usage of the small camera partly conceals the fact that the technology is not only used in the civilian sector, but also for surveillance and control. The steady increase of dashcams and private surveillance systems as well as the adaptation of jurisprudence in order to be able to use the images created by them in court as well, is thus the interface that links civilian and police technology.[30] The degree to which leisure-time civilian usage encourages the acceptance of

[27] On the relationship between "liveness" and "lived time" see the essay by Nanna Verhoeff and Iris van der Tuin in this volume (pp. 93–103).

[28] A brief overview of this short period of experimenting with the helmet camera can be found here: http://www.worldleagueofamericanfootball.com/id151.html (last seen: 26.6.2019).

[29] In addition, the use of SchuttVision, the camera system that can be mounted on the helmet, was not planned for TV broadcasts, but was conceived for coaching purposes. See also: Lya Wodraska: "College football: Helmet cams could give teams a new point of view," in: *The Salt Lake Tribune*, 17.8.2015, https://archive.sltrib.com/article.php?id=2785043&itype=CMSID (last seen: 26.6.2019).

[30] On the use of body-worn cameras by the police and the military, see the essay by Florian Krautkrämer in this volume (pp. 79–90).

ubiquitous surveillance technology would be another interesting question in this context.

The embedding of the photographic device in a ubiquitous and smart computing environment had been unique and has relied on a technological environment that only became established in the last decade and half.[31]

In this environment, there is no longer a photographer who takes a picture to show it to others. Image production consists of a complex relationship between conscious and intentional decisions and a technological unconscious[32] whose condition is the networked machines bound to bodies. What becomes visible in the end – or what gets attention – is also determined cybernetically: normalized by means of automatic image processing in the camera and defined as interesting by algorithms in the net.[33]

The images produced with the GoPro are always also images of described environments. What usually remains in the off space of the image becomes visible, when for instance the cameras worn by other participants are recorded, when recordings are made in the group, or when several cameras are worn on the body of the person recording. These images are then the visible part of a self-referential techno-collective environment, which produces a unity of this complex technological body and its perception.

Such cameras are also visible in feature films, and have long already been applied quite neutrally as a useful tool for exploring and registering the environment. They are therefore both a prop (diegetic camera) as well as the foundation for longer first-person shots. Often these small and robust cameras serve for surveillance, thus normalizing in film what must be negotiated slowly in reality. In Jurassic World (Colin Trevorrow, USA 2015) for instance, the raptors, fast and dangerous dinosaurs, are equipped with night vision cameras that provide live images of the hunt for the great T-Rex. In Hardcore Henry (Ilya Naishuller, RUS/USA/VRC 2015) the camera was already implemented for the cyborg, and the whole film is shot from this point of view, bringing pictures to the cinema screen that are otherwise only known from roofing and parkour clips as well as first-person shooters from the computer screen. The GoPro is

[31] On the complex interrelationship between the perspective of the GoPro and worldwide computer networks, see the essay by Jan Distelmeyer in this volume (pp. 63–77).

[32] Nigel Thrift: "Remembering the technological unconscious by foregrounding knowledges of position," in: *Environment and Planning D: Society and Space*, Vol. 22, Nr. 1, 2004, pp. 175–190, here p. 186.

[33] See: Winfried Gerling, Susanne Holschbach and Petra Löffler: *Bilder Verteilen – Fotografische Praktiken in der digitalen Kultur*, Bielefeld 2017, p. 100 and p. 138.

a kind of supporting actor in the film The Martian (Ridley Scott, USA 2015). Living alone on Mars, the astronaut Mark Watney uses a GoPro, which is also clearly recognizable as such in the film, as a kind of diary, in which he speaks and records his activities in the form of a selfie. He also constructs a special mount for himself, which allows him to take the camera along during his outdoor activities, documenting them with a special over-the-shoulder shot.[34] Apart from that, Hollywood often uses the camera during action scenes, where it can provide images, for instance from a car as it tumbles over.[35]

Whether diegetically motivated or not, the search for extreme perspectives has characterized the feature film for much longer than there has been digital video. For the film Napoléon (F 1927) Abel Gance positioned his camera on the backs of horses in order to provide the most involved perspective. And in the famous snowball scene at the beginning of the film, a subjective shot of a flying snowball is imitated. To achieve this the camera was mounted on a guillotine-like construction, by means of which the height of the camera could be shifted by pulling a cable, and which had wheels so that one could quickly push it over the field along with the extras during the shot. And already in 1923 Jean Epstein filmed a ride on a swing carousel from the carousel itself for Coeur Infidèle (F).

Using the somewhat lighter and cheaper 16mm cameras, artists increasingly began to experiment as well, mounting the camera on various objects and above all on their own bodies. For his short film Kassel 9.12.67 (GER 1968) Adolf Winkelmann developed his own Snorricam construction, with which he had mounted the camera on his upper body in such a way that he was directly looking into it as he walked, and it could follow all his movements. Around 1974 the experimental filmmaker Margaret Raspé had developed a Super 8 helmet camera with which she could film her everyday life from an extreme POV perspective.[36]

[34] The film was praised for its set design, since it carefully matched the expected future of the twenties. This does not apply, of course, to the GoPro model used, which looks exactly like the then current HERO 4 model in the film, which is also visually different from the current models.

[35] It is often not easy to discern which camera and which lens were used to produce a film. In certain cases this is specified in the log sheets in the *American Cinematographer*, for example with the film The Hitman's Bodyguard (Patrick Hughes, USA 2017), in which the GoPro Hero 4 was used as one of the cameras (Simon Gray: "Killer's Keepers," in: *American Cinematographer* 98,9 (2017), pp. 52-65, here p. 65.)

[36] For this reference we would like to thank Maria Morata and her lecture "Pre GoPro: Camera Visions," which she held at the workshop that forms the basis for this publication. On experimental predecessors of the GoPro see also the essay by Julian Jochmaring in this collection (pp. 177–190).

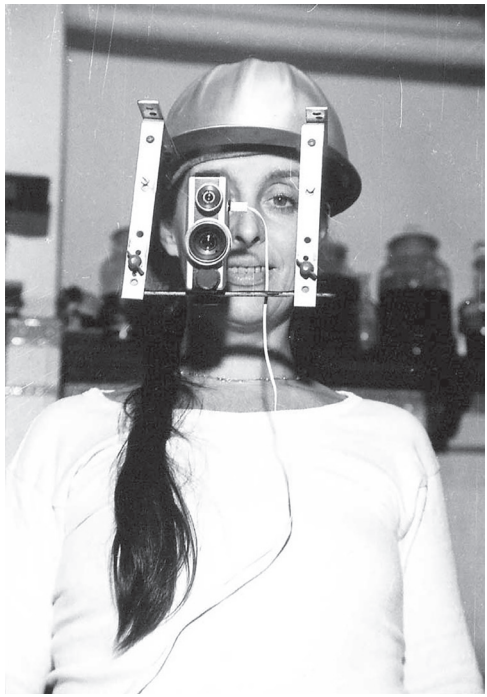


Fig. 5: Margaret Raspé had developed a Super 8 helmet camera

By now the playful use of perspective has permeated large parts of moving image production. The visual possibilities of the GoPro are reflected popularly in the series Breaking Bad (AMC, USA 2008–2013), in which the POVs are shown of objects like shovels, steel brushes, or robot vacuum cleaners on which a camera has been mounted. For the areas of documentary and art, the use of the GoPro has become especially well known through the film Leviathan (Lucien Casting-Taylor, Véréna Paravel, USA 2012), which documents the dangerous work of deep-sea fishing. The turbulent shooting situation made it nearly impossible to work with conventional shooting equipment on the ship, so the filmmakers also used GoPros. Not only did they capture spectacular visual material with these, but they also deliberately sought out unusual perspectives in which they put the camera on the floor and let it drift in the water, wove it into nets or mounted it on workers' helmets. The film thus has a raw and uncontrolled effect. Only by looking more closely do we realize that an aesthetic of surfaces is created through this. The montage causes the world of water to be constantly interwoven with that of the

workers on the ship, without having to have too much to do with the danger of the profession or the exploitation of the seas.[37] The fact that the GoPro is interesting for animal films, precisely due to its images that are recorded as if by chance and by surprise, can be seen in numerous clips on YouTube where animals pilfer the cameras from those filming.[38]

These examples make it clear that GoPro, like the 16mm camera as well or portable Nagra sound equipment,[39] not only changes the perspectives in film, but also the way that films are made – and thus also how we reflect on film. Small, robust, and handy action-cams emphasize the body, not only of the camera, but also of those filming.[40] Furthermore, they encourage experimentation and an expansion of what can be represented on film. Despite the company's significant crisis in the meantime and the decline in sales, the brand GoPro stands for a certain aesthetic, certain ways that media is dealt with, and certain usage contexts. This can be seen above all in YouTube, where users voluntarily supply their material with the indication that it was shot with a GoPro.[41] The camera's promise of authenticity and lifestyle, however, also presents the danger of the possibilities, since despite the expansions, a strong standard has worked its way in, one that goes hand in hand with the commercial exploitation of amateur film production. For all the camera's versatility, GoPro, due to its successful YouTube channel and its advertising, has had a strong influence on how GoPro videos should look. Competitions, as well as the possibility that one's own video will be selected by the company's curators and marketed on its channel,[42] can be understood as the aesthetic guidelines for a successful GoPro video.

This is exactly the context behind the decision to hold a workshop and publish a collection of essays not only on a phenomenon, but also deliberately on a particular brand. The critical reference to the potential

37 On *Leviathan* see also Oha Landesman: "Here, There, and Everywhere: *Leviathan* and the Digital Future of Observational Ethnography," in: *Visual Anthropology Review* 31,1 (2015), pp. 12–19.

38 See also the essay by Marek Jancovic in this volume (pp. 205–218).

39 On the influence of portable equipment on fiction film and especially on documentaries, see David Bordwell and Kristin Thompson: *Film History: An Introduction*, Boston 2010, p. 447 as well as Bill Nichols: *Introduction to Documentary*, Bloomington 2017, pp. 132ff.

40 On the transformation of film space due to ubiquitous recording technology, see also Florian Krautkrämer: "Revolution Uploaded. Un/Sichtbares im Handy-Dokumentarfilm," in: *Zeitschrift für Medienwissenschaft* : zfm/ed.: Gesellschaft für Medienwissenschaft e.V 11 (2014), pp. 113–127.

41 On the success of the GoPro in social networks, see also the essay by James Trew in this volume (pp. 167–174).

42 Cf. James Trew: "Extreme exposure: Inside GoPro's burgeoning media empire," in: *engadget*, 29.5.2014 https://www.engadget.com/2014/05/29/gopro-media-business/ (last seen: 7.12.2019).

and dangers of the new possibilities always already involves being at the service of a brand, not only by constantly mentioning it in the publication, but also by referring to it even in the title. On the other hand, consistently avoiding mentioning the camera by referring to the general type of camera (action-cam) would be only a barely restrained concealment of who the most influential manufacturer of the camera is. In addition, it would not be historically correct, since the influence of the action-cam as well as the fact that there are many providers in this segment, also stems from the success and special marketing of the GoPro company. It was precisely the inflationary use of the brand name on social networks, indeed not only as an indication of the production technology, but above all as a promise for a certain kind of video, that moved us not only to examine the camera as a device, but also to understand "GoPro" as a term that, although never detached from the profit oriented interest of its manufacturers, is at the same time evidence of a deep-seated revolution in amateur film and the way that cameras have penetrated our daily lives. The GoPro is certainly not responsible for the extent to which we produce and distribute (moving) images, but as a phenomenon the name underscores exactly this.

PERSPECTIVES

GoPro Hero Camera Technology – The Production of the Companion View

Winfried Gerling

The initial conception of GoPro arose from the need of surfing founder Nicholas D. Woodman to develop a camera that functions well, or even at all, in circumstances that are technologically hostile to the use of conventional cameras. Surfing and the difficulty of conveying this experience through media present an occasion for thinking about a small, waterproof, and easy-to-use camera that works and can be operated in the context of sports activities, or better yet: that does not have to be operated at all.

Bradford Schmidt, a friend of Woodman's and later an employee at GoPro, describes the reason behind this idea as follows: "Although it had been a surf trip any pictures of myself actually surfing were conspicuously absent. I had traveled alone, so all the shots were limited to perfect waves without a surfer in sight, taken from the beach before I paddled out. The photos felt strangely empty, considering the euphoria I'd experienced riding those waves."[1]

He implicitly formulates two important concepts for the development of the GoPro: on the one hand to convey something that can presumably only be experienced by few people, and on the other the difficulty of the environmental conditions under which such cameras would need to function.

The mode of "being there", as Wolfgang Hagen[2] has called it in the context of smartphone photography, is as essential as showing extraordinary experiences in an often spectacular nature. The GoPro in its development is close to the body and yet it conveys a view from outside. It is meant to testify to the fact that its wearers were there, while at the same time the viewers are meant to imagine themselves in the image.

In a retelling of the history of the technological development of the GoPro I will essentially delve into basic functions and important expansions or changes exhibited by the singularity of the GoPro, and by extension

1 Bradford Schmidt: "History of GoPro as recalled by Bradford Schmidt", in: Bradford Schmidt and Brandon Thompson (eds.): *GoPro – Professional Guide to Filmmaking*, San Francisco 2015, p. 3.

2 Wolfgang Hagen: "'Being There!' Epistemologische Skizzen zur Smartphone-Fotografie," in: Gundolf Freyermuth and Lisa Gotto (eds.): *Bildwerte. Visualität in der digitalen Medienkultur*, Bielefeld 2013.

with the action-cam in general. By concentrating on the apparatus as a technological object,[3] GoPro's video and image processing software, as well as networking by means of social media,[4] will hardly play any role.

1. GP Hero

The first GoPro is an analogue 35mm camera with a 28mm wide-angle lens, which cannot be focused. It comes with a waterproof case and an essential gadget, a strap that can be used to attach the camera to the arm.

Fig. 1: GP Hero with wrist strap

The development of the camera starts from a usage area that to this day tends to be served by (semi-)professional camera such as the Nikonos.[5] The Nikonos entered production as the direct successor to the

[3] See: Gilbert Simondon: *Die Existenzweise technischer Objekte*, Zürich 2012, p. 19ff.
[4] See the article by James Trew in this book (pp. 177–190).
[5] The camera came on the market in 1963 and was manufactured until 2001. The history of the technical development of the Nikonos can be read here in great detail: https://imaging.nikon.com/history/chronicle/history-nikonos/index.html

Calypso, which was developed by Jacques Yves Cousteau.[6] These were amphibian cameras, protected from water, dust, and rust. No external case was necessary.

This distinguished them from all other underwater cameras at the time. Although they were developed as an underwater camera, they were referred to as all-weather cameras and were quickly implemented in other damp, sandy, and muddy conditions such as those of the rainforest. They were, for instance, often used for surfing[7] and sailing, but were also deployed in the Vietnam War.[8]

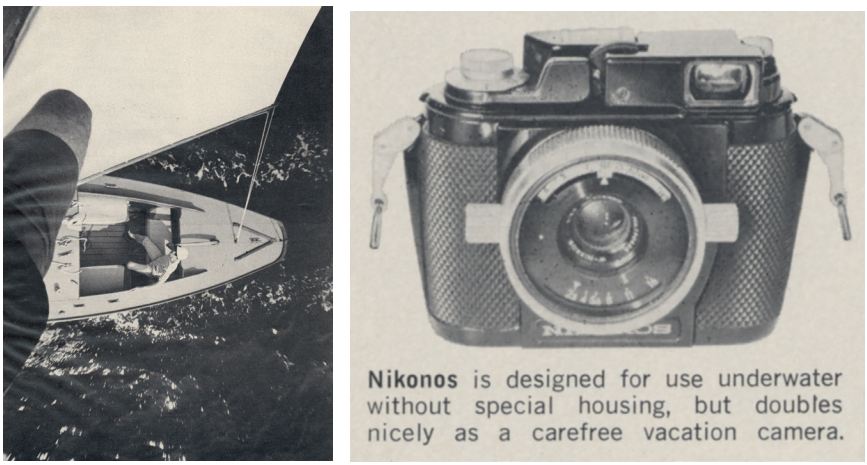


Fig. 2: Michael V. Korda: Sailboat 1966, and Nikonos Camera

Due to its construction, the Nikonos camera is well suited to use in environments that would be inaccessible to other cameras, thus creating unconventional perspectives such as those we know today from the GoPro.

Basically the Nikonos could be the veritable predecessor of the GoPro, in particular as to its versatility and fields of application. But what seems to interest Woodman more in the first development of the GoPro is not so much the camera itself as the freedom it gives its user from having to actively hold it, and this does not directly follow from the relatively

6 Wikipedia "Calypso", http://camera-wiki.org/wiki/Calypso (last seen: 22.2.2020).

7 We could refer here to surfing photographers like George Silk and Leroy Grannis. See: Malcolm Gault-Williams: *Legendary Surfers, Volume 3: The 1930s,* Morrisville 2012, p. 227.

8 Kyoichi Sawada – a Japanese photographer who worked in the Vietnam War – called it the "workhorse of the war", and further: " […] if they ever develop it to the point where you can load it fast, and use longer lenses with it, it will become the basic camera of photojournalism." Les Barry: "The New War Photographers" in: *Popular Photography*, March 1966, pp. 60-61 and 136-139, here: p. 138.

elaborate camera technology of the Nikonos. The essential quality of the GP Hero is the strap around the arm, which can be seen in the fact that one consideration during the prototype phase was to develop a case with a strap that could hold a variety of cameras.[9] The special quality of the first GP Hero is therefore that it is attached to the body and small enough not to get in the way. It is simply there, and so other forces affect the camera and the image it creates than when using conventional cameras with viewfinders. As Julian Jochmaring succinctly states in this volume, the swamp itself should film (photograph), or in this case, the wave. The influence of the environment becomes an essential factor of this form of photography.

The moving environment of the GoPro is the condition for producing an image, since it exerts influence over the image. It is a significant component of the aesthetics of image production simply due to the fact that the camera is there in the world, and is exposed to it just like the body that carries it. At any rate, the camera shows up here as simultaneously influenced and mutually conditioned by the carrier and the environment. Gravity has the same effect on the camera as it does on the body that carries it. The only decision made by the person is to wear the camera in the first place, and in what situation. With the first analogue GoPro, however, one still decides on the moment to release the shutter, which recedes into the background as the GoPro continues to develop.

The GoPro shows itself to be resistant to an aesthetics that has been established since the Renaissance, and which is meant to approximate human sight, in which the picture horizon always provides a firm foundation. This aesthetics of central perspective leads to a transparency of the medium that it is meant to disappear behind.[10] It seems as if there were no apparatus/technology, and as if the very possibility of the image had always come from a decided, self-determined, although highly conventionalized stance/position of the person toward the world, against all opposition. GoPro pictures present this opposition by initially privileging the camera's moving, undirected position toward the world, and by showing a 'gaze' rather than a 'view.' "Here it is an observer who acts, turning a recording without a gaze into a sight."[11] Pictures emerge,

[9] On the importance of accessories, which make the camera concrete in the first place, see also Florian Krautkrämer's essay in this volume (pp. 79–90).

[10] See for example: Jay David Bolter and Richard Grusin, *Remediation. Understanding New Media*, Cambridge/Mass. 2000, pp. 21–23.

[11] Peter Geimer on Julius Neubronner's photographs from 1908, which emerged as the product of the interaction between a pigeon and a camera. See: Peter Geimer: *Bilder aus Versehen*, Hamburg 2010, p. 329.

"deliberately by accident," as the influence of the users' movement with the camera, which can create something non-intended.[12] Perspectives that, with the New Vision movement of the beginning of the twentieth century, were still being created[13] in a consciously revolutionary sense as technically inspired.[14]

2. The Digital GoPro

In describing the development of the digital GoPro our attention should be drawn to a few decisive turns in the GoPro's genesis. Initially and consistently developed as a *naïve object without reference*, starting with the second phase of its further development, the GoPro, with its built-in display, is made much more *conventional*, joining up with the history of developed cameras.

In 2006 the first digital GoPro "Digital Hero" was released, a camera that takes photos in the format of 640×580 pixels and video at 24 pictures per second in the format of 320×240 pixels, with a maximum duration of 10 seconds. Due to being attached to the arm, the display is placed on the front side of the camera. This display, however, does not show the image being recorded, but the status of the camera: recording mode, battery charge condition, memory capacity, etc. The camera does not have a viewfinder.

The Digital Hero is a camera that can record both photos and videos, and as such is one of the first consumer-oriented photo cameras that does both.[15] With its further development, however, much more emphasis is placed on the improvement of its video functions. While the resolution of the photos with the Digital Hero 2 remained unchanged at 5 MP from

[12] Winfried Gerling, Susanne Holschbach and Petra Löffler: *Bilder Verteilen – Fotografische Praktiken in der Digitalen Kultur*, Bielefeld 2018, p. 143.

[13] Alongside these images, there are potentially the experiments by William Turner, who could be seen as a precursor to a GoPro aesthetic: By having himself tied to the mast of a ship during a storm – at least so the story goes – in order to be exposed to the forces of nature, deliberate perceptions and subsequent pictures were produced that otherwise would have be missing due to concern for his own existence. They are meant to show something that otherwise is not made visible, and to create a sense of being-there.

[14] Of particular interest here would be Willi Ruge, who jumped out of an airplane with a parachute and a camera to photograph himself. See: Winfried Gerling: "Be a Hero – Self-Shoots at the Edge of the Abyss," in: Julia Eckel, Jens Ruchatz and Sabine Wirth (eds.): *Exploring the Selfie – Historical Theoretical and Analytical Approaches to Digital Self-Photography*, London 2018, pp. 261–284.

[15] Even before there were digital cameras, such as the Ricoh RDC 1, which in 1995 was the first digital camera to support recording pictures and videos with sound in the PAL format. Interestingly, the camera could also take photos with 10 seconds of sound.

Fig. 3: GoPro Hero with wrist strap

2007 until 2011 with the introduction of the HD Hero 2, arriving at the level of 12 MP with the Hero 3+ Black (2013), which has not changed to this day, the development in the area of video is more striking: from an initial 320×240 to today's 4,096×3,072 pixels.[16] It is accompanied by a clear expansion of the frame rates (slow motion), which is dependent on the processor and the memory speeds. While the maximum video resolution available in each case to this day (4K) in the standard speeds of the video system remains at 25 or 30 FPS and 24 FPS,[17] with the current Hero 7 for Full HD 1080 it is already at a maximum of 120 FPS, which makes slow motion possible at higher quality. What is essential here is that since the switch from analogue to digital technology, the GoPro has primarily been developed as a video camera that also makes photos. The basic modes of recording were already established with the Digital Hero: video, photo (self-timer), and time-lapse (since the Hero 7 also in the stabilized mode: time warp). The picture of the GoPro has

[16] Here is a short list of the expansions in video quality: 320×240 pixels (Digital Hero 2006), 512×384 (Digital Hero 3, 2007), 1280×960 px (HD Hero, 2011), 1920×1080 = Full HD (HD Hero, 2011), 3840 × 2160 = 4k (Hero 4 Black 2014), and the last expansion 4.096 × 3.072 = 4k/4:3 (Hero 5 Black).

[17] Using a frame rate that facilitates a transfer to analogue film standards points to professional usage of the camera.

mainly been conceived in horizontal format since 2018, although with the Hero 7 the production of high-format videos has been facilitated as a result of the influence of Snapchat, Instagram, and the like.

As for photo file format, JPG is basically used, RAW formats have been possible since the Hero 5 Black (2016) and in addition the HDR format starting with the Hero 6 Black (2017).

The video format used is H.264, and starting with the Hero 6 Black also the optimized HEVC format (H.265).

Lens:

The lens of the analogue GoPro is a fixed focus wide-angle lens at 28mm[18] with a focal aperture of f/2,8. The maximum aperture has not been changed to this day, the current focal length at full use of the sensor has remained at approximately 16mm (small picture equivalent/real approx. 3mm) in the area of an extreme wide-angle[19] and the lens is set up as a fish-eye. This means, straight lines that do not go vertically or horizontally through the center of the image are distorted in a barrel shape. According to the setting of the video resolution, the crop factor changes[20] and the effect appears stronger or weaker. The smaller the area of the sensor that is used, the less conspicuous the distortions, since they are most limited in the middle of the image. According to the crop factor with the current GoPro Hero 7, there is a small picture equivalent wide angle of 16-40 mm. The distortion of the fish-eye can be removed through picture manipulation with a mild loss of sharpness. At any rate, the fish-eye effect is desirable: "SuperView delivers the world's most immersive field of view. Good for body- or gear-mounted shots. More vertical 4:3 content is automatically stretched to full-screen 16:9 for stunning widescreen playback on your computer or TV."[21]

If the movement of the camera as directly linked to the movement of the users and objects is a characteristic of GoPro aesthetics, then a further characteristic of recording promoted by the company is the fish-eye effect.[22] In such videos this lens creates an additional rotating movement at the margins of the image, which supports the quality of action and integrates the user into the image.

[18] Due to the extreme wide-angle the depth of field of the lens is very large. Everything is sharp in the image from approx. 40 cm to ∞.

[19] Extreme wide-angle is introduced with the Hero 5 (2008). The lens has an FOV of approx. 170° and is thus almost a hemisphere.

[20] The area used on the sensor.

[21] Handbook GoPro Hero 5 Black, 2016, p. 44.

[22] See the article by Nanna Heidenreich in this volume (pp. 191–203).

Display:
The display on the first digital GoPro, which was without a viewfinder, is located on the front. In terms of sales, this decision might seem crazy for a digital camera, but conceptually it shows that the control over the image is not meant to be held by the gaze, but by the body. The image created can only be viewed after the fact on a television or computer. Only starting with the Hero 3 (2012) is there a possibility to control the camera via an app with a WLAN connection, showing a live image on a smartphone or tablet. This function, however, hardly plays any role when using the camera during the action. Starting from the Hero 3 there is also the possibility of coupling a display as a backpack on the camera. With the GoPro Hero 5 Black (2016) a touch screen with live view is integrated into the series on the back of the camera. An essential change in the concept, which can be understood as a cultural transformation, but also as a reaction to the growing competition from the established photography business by Sony, Olympus, and others (after 2010), which usually have a live view display. The unique feature of impossible image control is called into question by the competition.

Outsourcing functions to external devices originally let the GoPro appear to be a camera dependent on a technological environment that is also necessary to use it, such as a tablet, laptop, etc. This concept also includes the effort meant to be put into post-production at the computer, and the distribution of the results by means of YouTube, Facebook, and other channels. This means that the target group of the GoPro is a tech savvy, primarily male group with a strong leaning toward extreme sports. This market seems to have been largely saturated by 2015, or the often cheaper competition grew significantly, so that GoPro's turnover and profits sank considerably. In 2016 GoPro's sales dropped for the first time in the history of the company to such an extent that they had losses.[23] The company then changed its marketing strategies in response to these losses. Extreme sports fans continue to form a core target group, but the company also began to address young mothers and fathers.[24]

[23] See for instance: Jeff Dunn: "GoPro is not in a good place," in: *Business Insider*, 17.3.2017, https://www.businessinsider.de/gopro-cameras-revenue-dropping-chart-2017-3?r=US&IR=T (last seen: 18.3.2019).

[24] See the advertising video that introduces the Karma: "GoPro HERO5 + Karma: The Launch in 4K", YouTube, 19.9.2016, https://www.youtube.com/watch?v=vlDzYIIOYmM (last seen: 18.3.2019).

Interface:

The camera's interface is the condition for a coupling of body and apparatus, it takes some getting used to for anyone used to dealing with 'conventional' video or photo cameras. Until the integration of the touch display in the Hero 5 (2016) there were only three control buttons, which means an interface that (digitally) functions very discretely: selecting an item on the menu, making a choice and confirming it in order to move around in the somewhat complex and divergent structures of the menu. The logic of selection takes the foreground here: yes/no, on/off. You go along with this structure. Jan Distelmeyer[25] describes such a structure as an aesthetics of regulation [Ästhetik der Verfügung] – a simultaneity of how we regulate using interfaces and are regulated by their rules and tools. The possibilities for use would thus be subject to a preconceived combination of software and hardware and its programming. A mode is chosen before recording, which as a rule is not altered during recording, in part because the result can only be seen later by means of another device. Going along with the structure presupposes a learning process here. This kind of interface suggests a very technological relationship to the apparatus, which is in turn meant to give the user the feeling of being a nerdy (tech) professional.

With the integration of the touch display in 2016 the interface is more heavily oriented to the GUIs of smartphones. It is more intuitive or based on generally familiar interface guidelines and therefore accessible to a larger target group. During this time we can observe the transformation in the company's communication mentioned above, it increasingly appeals to a wider audience.[26] In the context of the expanded usage of language assistents, the most essential functions can also be activated by voice control starting in 2016.[27] This feature makes it possible to start the recording process even without a free hand. For the aesthetic of GoPro photos this is a step that brings it closer to video aesthetics. If before you wanted to have a photography in the action aesthetics of video, this was only possible as a still from a video recording at significantly lower resolution. Now you just call out: "GoPro, take a photo." This, for instance, is also possible during video recording.

[25] Jan Distelmeyer: *Machtzeichen – Anordnungen des Computers*, Berlin 2017, pp. 89–91.

[26] See for example: "GoPro: Introducing HERO5 Black", YouTube, 19.9.2016, https://www.youtube.com/watch?v=tjOX0sC4TX4 (last seen: 18.4.2019).

[27] Possibilities for voice control: GoPro, start recording; GoPro, stop recording; GoPro, take a photo; GoPro, shoot burst; GoPro, time-lapse mode; GoPro, start time lapse; GoPro, stop time lapse; GoPro, video mode; GoPro, photo mode; GoPro, burst mode; GoPro, turn off; GoPro, HiLight.

Sound:
Even the first digital GoPros could record sound. As a rule, the position of the microphone is on the top of the case. When using the protective housing the sound becomes duller because not all frequencies penetrate the case to the same degree. If the camera is used without the case, or there is no protective housing necessary, such as in the more recent models (starting with the Hero 5 Black/2016), the sound is significantly improved. Starting with this model a stereo microphone is also built in, which either records stereo sound or can be used to offset loud noises created by wind or movement between the two channels. There is also the possibility to connect an external microphone through a USB port.[28]

Contrary to typical arrangements in the video area, the directional characteristic of the microphone is not to the front. The internal microphone does not predestine any direction, recording sound all around the camera. This also includes the user's breathing, cries of joy, etc. The sound exemplifies how the construction and usage of the camera – also the use of several cameras at once –[29] calls into question any designation of the off space.[30] Users and cameras are potentially always in the image. The sound must be omnidirectional in order to be able to move sound from the off space into the on space at any moment.[31]

As a rule, sound is saved as an .mp4 file. Starting with the Hero 5 Black (2016) an uncompressed .wav file can also be saved.

Stabilization:
Video stabilization has been integrated into the camera starting with the Hero 5 Black (2016). For all the previous models this can only be done in post-production. The stabilization used is a digital processing of the image in the camera (Electronic Image Stabilization), and not a physically functioning optomechanical stabilizer, such as those built into the lens or the sensor of larger cameras. It is not possible at the highest possible

[28] The following models can be equipped with an external microphone: HERO8 Black, HERO7 Black, HERO6 Black, HERO5 Black, HERO5 Session, HERO4 Black / Silver, HERO3 + Black, HERO3 Black.

[29] See: Florian Krautkrämer: "All filmed on a GoPro HD Hero 2: Über Veränderungen im Familien- und Amateurfilm," in: Ute Holfelder and Klaus Schönberger (eds.): *Bewegtbilder und Alltagskultur(en). Von Super 8 über Video zum Handyfilm. Praktiken von Amateuren im Prozess der gesellschaftlichen Ästhetisierung*, Cologne 2017, pp. 234–249, here p. 243.

[30] See: Gerling et al.: *Bilder*, op. cit., pp. 141–144.

[31] And so it only seems appropriate for GoPro to bring a 360° camera like the Fusion on the market in 2016. This camera, however, much like with the Karma Drone, finds itself in a different competitive situation, since the segment of 360° cameras has already been covered by other companies.

resolution, since the space on the sensor is needed to compensate for movement. The GoPro Hero 7 Black introduced so-called HyperSmooth Stabilization, which allows for a significantly increased stabilization and works for the first time in 4k. Since this is a computationally intensive picture analysis and processing software (AI software) in the broadest sense, this is only possible due to a faster processor and twice as much RAM (2GB).

The camera's shakiness[32] is read as a marker of authenticity, so the stabilization of the image in the GoPro is also a step in the direction of retro-conventionalizing its aesthetics. By now the style of shaky authenticity seems to have been run its course, and HyperSmooth falls in line with the aesthetics of the Steadycam, recording with the gimbal and drone or with elaborate crane shots or the virtual camera pans possible in digitally created cinema. What is trivially existential in the GoPro images is replaced by the presumed loftiness of professionalism. Stabilized slow motion increases this effect.

Live Streaming:

The possibility of live streaming, introduced with the GoPro Hero 7 Black, intensifies the production of co-presence in the technology. The unique spatio-temporality of photographic mediality, which has been described as "an illogical conjunction between the *here-now* and the *there-then*,"[33] is even more strongly displaced in the direction of a mediated co-presence,[34] which is conveyed over spatial distance. The 'here' of the person photographing is connected to the 'there' of the observer, and the time 'now' is abolished as a separating factor: "a connection between friends in the present, and not just a pretty picture,"[35] as the description in the app Snapchat puts it. If this separation of space and time had already been undermined in the posting of selfies, the abolishment of documentary distance lies in the live streaming of these images.[36]

[32] Krautkrämer: "All filmed on a GoPro HD Hero 2," in: Ute Holfelder and Klaus Schönberger (eds.): *Bewegtbilder und Alltagskultur(en).*, op. cit., p. 242.

[33] Roland Barthes: *Image, Music, Text*, New York 1977, p. 44.

[34] See: Miko Villi: "'Hey, I'm here right now': Camera phone photographs and mediated presence," in: *Photographies*, Vol. 8, Nr. 1, pp. 3–21. And Miko Villi: *Visual Mobile Communication: Camera Phone Photo Messages as Ritual Communication and Mediated Presence*, Helsinki 2010, p. 135.

[35] Description of the app in the Apple App Store, 2014.

[36] See: Gerling et al: *Bilder Verteilen*, op. cit, p. 26.

Since the Hero 3 there has been the possibility of networking and controlling the camera with a smartphone/tablet via WLAN[37] and starting with the Hero 5 Black (2016) GPS data can also be shown.

3. Mounts

In 2007 Woodman starts attaching the camera to objects in order to test out the possibilities this creates. From these experiences of attaching the wrist strap onto the steering wheel of his race car, Woodman started experimenting with various mounts from a 3D printer in 2007. By the end of 2007 the wrist strap is the only mount sold by the GoPro Company. During this time other manufacturers were developing mounts for the GoPro, creating a lucrative business segment. Starting in 2011, with the HD Hero 2, the camera is sold with a variety of attachments. Alongside the mount for the arm, other standards have become established: the head strap, mounts for a helmet, the chesty, all kinds of adhesive mounts, suction cups, extension arms, etc.[38] This development has led to a standardization of attachments/screws, etc., which most manufacturers of other action-cams use today.

It is significant that the camera is never positioned on one of these mounts between the gaze of the user and what is being recorded. It is more or less on the side of the user and shares the same space, especially when filming with several cameras. In the context of the selfie, Paul Frosh has observed a tendency: "The space of photographic production/enunciation is effortlessly unified with the space of the picture itself, and not photographing oneself as part of an event or scene becomes an aesthetic, social, political and moral choice rather than a *sine qua non* of the photographic act."[39] For the GoPro's pictures, there cannot, nor should there be a decision against the presence of the self in the picture. The camera with the fish-eye is mounted on the body and thus the body is (almost) always part of the visual space being recorded. The space in front of or behind the camera is dismissed in favor of its accompanying activity. The camera becomes the user's companion. Perspectives arise that a human eye could never see. Although the intentional integration

[37] Starting with the Hero 4 (2014) Bluetooth is added as a connecting option.

[38] An extension presentation of mounts can be found in: Bradford Schmidt and Brandon Thompson: *GoPro*, op. cit., pp. 45–83.

[39] Paul Frosh: *The Poetics of Digital Media*, Politi 2018, p. 123, see also: Paul Frosh: "The Gestural Image: The Selfie, Photography Theory, and Kinesthetic Sociability," in: *International Journal of Communication,* 9, 2015, 1607–28, here p. 1611.

Fig. 4: Mounts

of this camera-companion in the space or on the body of the self can be presumed, it would be a form of the selfie, I assume, made by delegating to the technology pictures of an environment that records itself. The selfie of an environment, which not only consists of the camera, but of other bodies, surroundings, hardware, software, networks, and social media. In his text for this volume, Jan Distelmeyer calls this kind of picture production "videt" – "it sees." Expanding on this one might say: The environment "(it) sees" itself. This sight (vision) as a distancing of a kind of seeing centered on the human being has justifiably been described as a "nonhuman, decentered and distributed"[40] vision by Joanna Zylinska. Human sight, however, should not be pitted against mechanical sight.

[40] Joanna Zylinska: *Nonhuman Photography*, Cambridge/London 2017, p. 39.

Rather, she wants to "position the human as part of a complex assemblage of perception in which various organic and machinic agents come together – and apart – for functional, political or aesthetic reasons."[41]

4. Karma Gimbal/Drone

In the same year that the Hero 5 (2016) was released, the Karma Drone with an integrated Karma Gimbal[42] was introduced. The gimbal is a 3-axis stabilizer that, much like a Steadycam,[43] always holds the camera in the balance, or in position to the horizon, which is preselected, and at the same time stabilizes, that is, compensates for shaking. Since the body of cameras like the GoPro is too small to work purely on systems based on physical, cardanic inertia, the gimbal is equipped with sensor technology that registers movement and compensates by electric motors controlled by computer.[44] If the movement of the GoPro had always been coupled with its carrier until the introduction of the gimbal, the picture with the gimbal, much like with the Steadycam, has a tendency to decouple the camera and its carrier. At any rate, normalizing the picture means less reference to the carrier. In a discussion about the question of whether the gaze of the GoPro is embodied or disembodied,[45] the picture with the gimbal tends toward a disembodied view. It is indeed generated from the body, but it eliminates the rough, shaky, insecure, and direct movements of the body. It is constitutive that this body that carries can also be a race car, a bicycle, or something similar. For this reason the Karma Drone, which is equipped with the Karma Gimbal, is a decisive further development of this disembodied view. So a picture of the drone also never shows up in these videos. It is absent. The view from above allows for the world to appear more abstract and at the same time easier to access or control.[46] The recording area covered by the drone moves between the Steadycam on the ground, the crane, and the helicopter,

41 Ibid., p. 14.

42 Much has been said about GoPro's Karma Gimbal, particularly that there were already many and cheaper gimbals from other companies. None of them, however, was conceived in such a way that the GoPro could be operated directly with the handle.

43 Based in their function purely mechanically on gravity.

44 Gimbals can thus also be used for actively controlling the camera via remote control.

45 See: Phillipe Bédard: "Disembodied perspective: third-person images in GoPro videos," *Alphaville: Journal of Film and Screen Media*, 9, 2015, pp. 1–15.

46 See: Christoph Asendorf: "Bewegliche Fluchtpunkte", in: Christa Maar and Hubert Burda (ed.): *Iconic Worlds – Neue Bildwelten und Wissensräume*, Cologne 2006, pp. 19–49.

but it is clearly distinct in its movement.[47] In more recent GoPro videos, pictures of drones are often used to contextualize or explain the immediacy and disorientation of the images by the cameras attached to human bodies. Raging downhill drives by mountaineer bikers, race courses that are visually difficult to understand, become comprehensible through the montage with the image from the drone.[48]

The Karma Drone, however, is an economic failure. Introduced in the autumn of 2016, the end of production was already announced in January 2018. The market for consumer drones has already been established and GoPro can hardly compete so quickly with the products already introduced. Significant difficulties with the software development arose and the drones abruptly crashed too often, which brought them bad press and ultimately led to the end of production. Perhaps this is only of consequence for the company since the special aesthetics of GoPro images has nothing to do with the aesthetics of drone images. On the other hand, here as well their extreme versatility is supposed to be shown, the GoPro can be deployed simply everywhere. The images with the drone are then entirely decoupled from the body, even if the body imagines itself as an extension of the field of vision. It is, however, a subject centered image. The images of the GoPro, as the sight of a companion, imagine a much stronger differentiation between the carrier and the observer. The coupling to a recognizable body allows the technology to appear less transparent and emphasizes its active character.

5. And goes where you won't | And goes where you can't

The development of the GoPro can be described as a discontinuous continuity, which barely cultivated conceptual uses from previous developments such as the Nikonos. Perhaps the GoPro in its genesis as a technological object does not at all belong to the species of "camera." As an entrepreneur in digital culture, Nick Woodman naively begins at zero with a certain historical amnesia, conceiving everything anew and

[47] Maximilian Jablonowski: "Dronies. Zur vertikalen Ästhetik des Selbst," in: Ute Holfelder and Klaus Schönberger (eds.): *Bewegtbilder und Alltagskultur(en). Von Super 8 über Video zum Handyfilm. Praktiken von Amateuren im Prozess der gesellschaftlichen Ästhetisierung*, Cologne 2017, pp. 222–233.

[48] See for example: "GoPro : Audi Nines MTB 2018 Highlights," YouTube, 5.10.2018, https://www.youtube.com/watch?v=E6SkBii0Ink (last seen: 21.3.2019) as well as: "GoPro: Kilian Jornet – Running Ridges," YouTube, 18.3.2019, https://www.youtube.com/watch?v=MRzeLDkWT1c (last seen: 21.3.2019).

Fig. 5: GoPro Evolution

tinkering[49] his way to a first pragmatic solution, the main argument of which initially lies in the strap around the arm and not in the development of a high-tech camera.[50]

The development of the GoPro allowed the manufacturer to become the fastest growing camera manufacturer in the world for a time.[51] It also, however, led to an economic crisis from which the company has not completely recovered to this day. Nonetheless, the construction of

49 "In our own time the 'bricoleur' is still someone who works with his hands and uses devious means compared to those of a craftsman. […] His universe of instruments is closed and the rules of his game are always to make do with 'whatever is at hand.'" Claude Levi-Strauss: "The Science of the Concrete," in: *The Savage Mind*, Chicago: University of Chicago Press 1968, pp. 1–34, here pp. 16–17.

50 Woodman realizes this as a globalized tinkler ['bricoleur' in Levi-Strauss's terms], who had already developed the first products with finished products from China. Due to the ongoing trade war between the USA and China, however, GoPro shifted parts of its current production to Mexico. See: Sean O'Kane: "GoPro will move some manufacturing out of China because of Trump's trade war," in: *The Verge*, 10.12.2018, https://www.theverge.com/2018/12/10/18133926/gopro-trade-war-tariff-china-nick-woodman-cameras (last seen: 15.3.2019).

51 Jefferson Graham: "GoPro Hero 2 ready to capture extreme sports video," *abc-News*, 26.10.2011, https://abcnews.go.com/Technology/gopro-hero-ready-capture-extreme-sports-video/story?id=14813409 (last seen: 22.3.2019).

the camera has worked its way around the world and has founded a new kind of camera genre: the action-cam. It has thus effected a sustained change of cultures with the camera.

This genre emphasizes a series of particular characteristics that, as I have attempted to show, come from the camera and have retroactive effects back on it, develop it, or restrict it. The developments of the camera were initially driven by Nick Woodman, respectively the GoPro company, in close cooperation with users, social media, and a capital-driven market, which sometimes was quick to pass judgment on the developments. The GoPro as a technology – much like the smartphone – has generated a special view to the world, which I refer to here somewhat tentatively as the view of a companion technology.[52] This view is that of an interplay between many agents and a decidedly "non-human" view. The environment films/photographs, the strap (wrist) is broken and the GoPro "[...] goes where you won't, and goes where you can't."[53]

[52] I would like to suggest positioning companion technology between Donna Haraway's "cyborgs and companion species." That, however, would be a different essay. In the interplay with companion technology, users are neither cyborgs nor is technology a species, but it does what Haraway observes for both: "Cyborgs and companion species each bring together the human and non-human, the organic and technological, carbon and silicon, freedom and structure, history and myth, the rich and the poor, the state and the subject, diversity and depletion, modernity and postmodernity, and nature and culture in unexpected ways." Donna Haraway: *The Companion Species Manifesto Dogs, People, and Significant Otherness*, Chicago 2003, p. 4.

[53] GoPro: "Introducing Hero 7 Black in 4k – Shaky Video is Dead", YouTube, 20.9.2018, https://www.youtube.com/watch?v=G9KDqfpCgws (last seen: 13.3.2019).

Going Beyond the Human Perspective: GoPro Cameras and (Non-)Anthropocentric Ways of Seeing

Philippe Bédard

Introduction

As ubiquitous as it has been in the world of extreme sports, the GoPro has also secured its place in the public consciousness as a tireless companion in a quest towards the evermore panoptic capture of all of life's adventures. Over the last decade, this unassuming and tough little camera has grown beyond the simple task of capturing *images of actions* and onto the duty of recording one's *experience in action*. For instance, photographer and pioneering videographer Vincent Laforet wrote the following in a blog post arguing for GoPro's status as "one of the most significant cameras ever invented": "The GoPro more so than any tool that ever preceded it, has allowed people to focus more on experiencing the moment, as opposed to focusing on capturing it."[1] Nick Paumgarten pushes this reasoning further when, in an essay penned for the *New Yorker*, he lauded the GoPro's uncanny ability to let him peer into his son's way of seeing the world: "I didn't need a camera to show me what he looked like to the world, but was delighted to find one that could show me *what the world looked like to him*. It captured him better than any camera pointed at him could. This was a proxy, of sorts."[2] These comments contribute to GoPro's ethos, which the company embraces in its own marketing material, such as its 2017 campaign for the Hero 6 family of cameras whose tagline was "Live the moment. Capture the moment. Share the moment,"[3] and as recently as 2018 with their "GoPro: Experience Different" ad, which featured exclusively point-of-view (or POV) shots of people living their "different experiences" and goes as far as to suggest: "different is out there [...] just keep an eye out for the

1 Vincent Laforet: "The GoPro & it's Place in History," in: *Vincent Laforest Blog*, 2014, http://blog.vincentlaforet.com/2014/09/30/the-gopro-its-place-in-history/ (last seen: 6.3.2019).

2 Nick Paumgarten: "We are a Camera: Experience and Memory in the Age of GoPro," in: *The New Yorker*, 22.9.2014, pp. 44–52, here p. 51, emphasis added.

3 GoPro: "GoPro HERO6: This Is the Moment in 4K," YouTube, 28.9.2017, https://youtu.be/vr0qNXmkUJ8 (last seen: 6.3.2019).

unexpected. You may even discover something new about yourself."[4] This begs the question: how does a camera so worn on the user's body see the world and how can the images it produces lead to understanding oneself better? Or better still, can a camera such as the GoPro, so often associated with human vision and experience, ever allow one to discover something *new* about oneself ?

The idea that a camera, such as GoPro, would somehow constitute an acceptable proxy or surrogate for human vision experience is a common, if problematic, occurrence in popular rhetoric. Unsurprisingly, it results from and feeds into a long history of dealing with cameras as analogous in some ways to humans, notably in the way they see or move through the world. Precisely because this way of thinking seems to be so pervasive, it requires that we stop and examine its rhetoric and its assumptions. In addition to questioning the reasoning that has led to GoPro videos being associated with the experience of the wearer, this situation invites us to reconsider the links between cameras and human experience at large: how do cameras build on human modes of navigation or perception and, conversely, what do they tell us about them?

For reasons that will be covered in this chapter, moving-image cameras have often been associated with human vision and experience, or discussed in anthropomorphic terms (i.e. as displaying some characteristic of what it is to be human). Using GoPro videos as a conducting thread through our analyses, the following chapter will expose the foundations of what has become a recurring strategy of discussing cameras (and GoPros chief among them) in anthropomorphic ways. Doing so will require that we explain the roots of such comparisons of filmic and human vision. This will allow us to focus on a particular trend in GoPro videos which contributes to subverting the kinds of highly normative and strictly limited modes of seeing endemic to dominant film practices. Indeed, this chapter will demonstrate how the inclusion of what we call "exo-centric" images in so many GoPro videos subverts the hegemony of *egocentric* points of view to which they so often subscribe and, in so doing, participates in a reflective "reversal of the gaze." Perhaps, in looking at these images which step outside of anthropocentric modes of seeing we may in fact achieve what GoPro suggests and "discover something new about ourselves."

[4] GoPro: "GoPro: Experience Different," YouTube, 9.5.2018, https://youtu.be/dAODE-Abg870 (last seen: 6.3.2019).

Anthropomorphizing the camera

A long-standing habit in discourses on cameras and camera movement has been to speak of the device in relation to the ways humans see the world. For instance, Jakob Isak Nielsen in his chapter "The Camera: Anthropomorphic Analogies" and Patrick Keating in a video essay titled "A Homeless Ghost: The Moving Camera and its Analogies" both offer a survey of a few such comparisons, which revolve around the idea that "the camera represents the eye of a person."[5] This proximity between camera and eye has led, more so than anything, to prognostications about the camera's ability to act in ways that appear congruent with human vision and experience, as well as to interpretations of various human traits in the moving image. This tendency to anthropomorphize the camera has been documented by Nielsen and Keating, but also by Edward Branigan and Teresa Castro when dealing with anthropocentric approaches to the study of cameras.[6] The authors note occurrences of descriptions of the camera as "inquisitive; sometimes it is a little inattentive,"[7] as expressing, "desire, attention, identification,"[8] or still as "impulsive, bold, curious, lewd, tactful, disorderly, exhibiting a sense of smell, and even 'smiling ironically.'"[9] In her "Animistic History of the Camera" Castro also lists how cameras have been discussed as participating in "'seeing,' 'gazing,' 'peeping,' 'feeling,' and even 'thinking'" and criticizes those who "have written emphatically on the camera's 'eye,' its 'soul,' and even its 'intelligence' and 'consciousness'" as being, following what Malcolm Turvey once said, "at worst, a

5 The original quote from filmmaker Friedrich Wilhelm Murnau reads: "To me the camera represents the eye of a person, through whose mind one is watching the events on the screen." Friedrich Wilhelm Murnau: "Films of the Future," in: *McCall's Magazine* (September 1928), p. 90; Jakob Isak Nielsen: *Camera Movement in Narrative Cinema: Towards a Taxonomy of Functions*, Ph.D. Diss., Aarhus University, 2007; Patrick Keating: "A Homeless Ghost: The Moving Camera and Its Analogies," in: *[in]Transition: Journal of Videographic Film & Moving Image Studies* 2/4 (2016), http://mediacommons.org/intransition/2015/12/29/homeless-ghost (last seen: 15.12.2018).

6 Edward Branigan: *Projecting a Camera: Language-Games in Film Theory*, New York, London 2006; Teresa Castro: "An Animistic History of the Camera: Filmic Forms and Machinic Subjectivity," in Diego Cavalotti et al. (eds.): *A History of Cinema Without Names*, Milan 2018, pp. 247–255.

7 Jens Albinus, quoted in Jan Oxholm and Jakob Isak Nielsen: "The Ultimate Dogma Film: An Interview with Jens Albinus and Louise Hassing on Dogma 2 – The Idiots," in: *P.O.V* 10 (Dec. 2000), https://pov.imv.au.dk/Issue_10/section_2/artc2A.html (last seen: 15.12.2018).

8 Keating: "A Homeless Ghost: The Moving Camera and Its Analogies," op. cit.

9 Branigan: *Projecting a Camera*, op. cit., p. 83. In a note to this passage (ibid., p. 257), Branigan goes on to enumerate still more human qualities that critics have attributed to the camera: bold and exhibiting a sense of smell; lewd; tactful; impulsive; disorderly; smiling ironically.

'misuse of perceptual concepts.'"[10] In our search for the cinematic roots of the anthropomorphism with which GoPro cameras are so often discussed, it is imperative to point towards the first-person image, commonly called "point-of-view shots" (POV). Whether in the now infamous LADY IN THE LAKE (Robert Montgomery 1947), in DARK PASSAGE (Delmer Daves 1947), in LE SCAPHANDRE ET LE PAPILLON (Julian Schnabel 2007), in ENTER THE VOID (Gaspar Noé 2010) or more recently in the action-packed GoPro feature HARDCORE HENRY (Ilya Naishuller 2015), the POV shot uses the camera as avatar for the character; placing the camera where the character would have been and ostensibly seeing and moving through the world like they would.[11] While others have pursued inquiry into the effects of such first-person images in narrative cinema,[12] suffice it to say for now that they have only become more ubiquitous in recent years with the miniaturization of cameras, such as the GoPro, which has only increased the tendency to place cameras where humans would stand and, as a side effect, to conflate human modes of moving or seeing with those of the camera.

Seeing just how pervasive anthropomorphic interpretations of the camera have been within the realm of cinema and further still today with the ubiquity of GoPro cameras, the question remains as to what the impetus might be for such readings. Regardless of whether such anthropocentric approaches to the camera are used in earnest or simply as stylistic fancies, we may wonder why cameras invite so many comparisons to human vision, perception, or experience in general. More importantly still, what might be the impact of a device, such as GoPro cameras, that has become so synonymous with human vision as to be understood as a *representation of vision*?

GoPro's tenuous relation with anthropomorphism

The story of GoPro's invention by Nicholas Woodman in the early aughts, which has likely been recounted *ad nauseam*, is worth revisiting briefly for what it reveals of a conflicting relation between the camera and the

[10] Castro: "An Animistic History of the Camera," op. cit., p. 247.

[11] Interestingly, while the POV shot aims to convey the approximate point of view of a character, it is not by definition limited to human characters. Case and point, Hardcore Henry shows us the perspective of a cyborg, while many notable POV shots are from the perspective of an animal, monster, or other non-human character.

[12] Notably Julian Hanich: "Experiencing extended point-of-view shots: A film-phenomenological perspective on extreme character subjectivity," in: Maike Sarah Reinerth and Jan-Noël Thon (eds.): *Subjectivity across media: Interdisciplinary and transmedial perspectives*, New York 2017, pp. 127–144.

Fig. 1: The original, wrist-worn GoPro Hero (circa 2004).

experience of its user. At the root of the invention of the camera in its original state (i.e. as a wrist-worn 35mm still camera) was a desire among surfers to capture images of themselves in action, or at least photos that could somehow translate the "euphoria" one experienced while riding, as Bradford Schmidt, one of GoPro's earliest testers and employees, once put it.[13] The initial solution, around 2002-2004 when the prototypes were first being tested and when the original GoPro Hero (fig. 1) was released, was to mount the camera on the wrist in such a way that allowed surfers to flip the camera up, look through the viewfinder and snap a photo of what was in front of them. Instead of Schmidt's disappointment in 2002 towards photos "limited to perfect waves without a surfer in sight, taken from the beach before I paddled out," this set-up allowed one to take images while "in action."[14] Furthermore, as this wrist-mounted position left its place to head and body-mounted uses of the GoPro over the years, this point of view meant the images were not only taken by the user, but more importantly *from* the wearer's perspective; a first-person point of view reminiscent of POV shots in narrative films. Indeed, while it may bear resemblance with the head-mounted cameras used in extreme sports recordings of the past (fig. 2), the GoPro occupies a peculiar role

[13] Bradford Schmidt and Brandon Thompson (eds.): *Gopro – Professional Guide to Filmmaking*, San Francisco 2014, p. 3.

[14] Ibid. Or, arguably, in *between* the action. While the photos could be taken while out at sea waiting for waves, for example, one still needed to stop and frame the image before capturing a shot.

Fig. 2: Carl Boenish using a 35mm helmet-mounted Eyemo camera. Photo R. Cottingham, American Cinematographer 53/6.

as personal recording device; the action recorded is *subjective*, in that it represents the perspective of the user-subject *in action* rather than simply capturing images of someone else's actions from a first-person POV.[15]

Taken from a viewpoint on the user's head and closely associated with the subject's own point of view, the GoPro also becomes subject to the way in which human vision and navigation interface with the outside world. Taking the head as a central point of reference,[16] the body relates to the world in an interior/exterior opposition that we can describe as *egocentric*, following the uses of the term in Piaget's account of infant psychology (the child sees herself as center of her world) and in Rudolf

[15] Note that the qualifier "subjective" is used here to refer to the intimate relation between the images and the subject producing them. It is not meant to refer to the distinction suggested by Alexander Galloway, following Edward Branigan, between POV shots (images taken from a character's approximate position and meant to stand in for their vision) and *subjective* shots (images that aim to represent a character's subjective perspective, down to their emotions, affects, etc.). Alexander R. Galloway: "Origins of the First-Person Shooter," *Gaming Essays on Algorithmic Culture*, Minneapolis: University of Minnesota Press 2006, pp. 39–69; Edward Branigan: *Point of View in the Cinema: A Theory of Narration and Subjectivity in Classical Film*, Berlin, New York 1984.

[16] Neurophysiologist Jacques Paillard concludes that the head serves as a point of reference for movements within the body itself (of the hands and eyes for example), and as a point that relates to external referents for purposes of outward motion. The head thus constitutes a *cephalocentric* referent that itself relates to *geocentric* references such as gravitational forces. Jacques Paillard: "Les Determinants Moteurs de l'Organisation de l'Espace," in: *Cahiers de Psychologie* 14/4 (1971), pp. 261–316; "Comment le Corps Bâtit l'Espace," in: *Science & Vie* 158 (March 1987).

Arnheim's description of the individual's relation to the world: "Perceptually a person is a viewer, who *sees himself at the center of the world surrounding him*. As he moves, the center of the world stays with him. Considering himself the primary center, he sees the world populated with secondary objects, eccentric to him."[17] Just as the eyes that move within the head they perceive to be the center of their world relative to an external world populated by objects and other subjects, the body-worn GoPro moves through space and produces images that are tinted by this egocentric mode. This connection has only been accentuated with the aforementioned adoption of options to mount the camera to helmets or to the user's chest, two positions that strengthen the "first-person" connotations of this point of view and feed into the long history of substituting camera for human experience.

However, one bit of GoPro lore that is seldom recounted has conversely led to a departure from the strictly wrist-mounted style of the original camera and towards more varied approaches to image production. It may also very well have been the impetus to move away from the body as a center of perception. In his "History of GoPro," Schmidt points to an anecdote about Woodman taking racecar driving courses around 2007:

> By then, GoPro was doing well enough that Nick [Woodman] could afford to attend race driving school, another one of his passions. During school, Nick had the idea to strap his digital wrist camera to the roll bar of his car to record video of himself driving on the track. As soon as Nick stepped back and saw his wrist camera mounted in this new way, a lightbulb turned on and Nick suddenly realized that GoPro could be much more than just a wrist camera company.[18]

In wanting to record images that didn't simply represent his experiences from his own point of view but rather images *of himself in action*, Woodman needed to remove the camera from his natural perspective (the egocentric view of the world *from* the body) and adopt a new perspective beyond that which is afforded to us. Removing the camera from its alignment with the human body's central mode of perception and navigation (its head, its eyes, oriented as they are from the center outwards) has led to a variety of original points of view in a subgenre of GoPro videos focused on producing the most unusual perspectives. However, between the factions of standard egocentric images and outlandish points of view lies a type of image we propose to call "exo-centric" images, which remains focused on the experience of the user while also departing from logical representation of space.

[17] Rudolf Arnheim: *The Power of the Center*, Berkeley, 1988, p. 36.
[18] Schmidt and Thompson: *GoPro*, op. cit., p. 6.

Fig. 3: The exo-centric technique (left) and its image (right)

Displaced from the head as the *de facto* mounting position for most GoPro, the exo-centric point of view is created when the camera is attached *at a distance*, such as when it is fixed in front of the helmet or behind the wearer through a length of rigid tubing (fig. 3). We have introduced both this peculiar mounting position and the visual effect it produces in an earlier paper focused on the opposition between what were then called first-person and third-person images,[19] but the implications of the newly christened "exo-centric image" in this inquiry into the relations between camera and human experience merit new attention. Specifically, in offering a view of the body *in action* from a perspective beyond one's natural perception of oneself, these exo-centric images invite us to rethink the rampant anthropocentrism with which authors have dealt with the filmic apparatus in relation to the human body; for we must remember that egocentric perspectives remain the norm in most action sports footage and that they contribute to the ubiquity of anthropomorphic interpretations of the camera. In order to more fully appreciate how a camera might merit comparisons with human perception and experience we must question how the "grand schemes" of the visual systems in humans and cameras function. More importantly still – and regardless of whether these comparisons or justified or not – we may need to consider the consequences of considering moving images as analogous to human vision.

Camera-eye analogies and "visualizations of sight"

In his important overview of the links between cinema and human perception, William C. Wees offers an account of the many similarities and fundamental differences between the way human vision and the cinematic

[19] Philippe Bédard: "Disembodied Perspective: Third-Person Images in Gopro Videos," in: *Alphaville: Journal of Film and Screen Media* 9 (Summer 2015), http://www.alphavillejournal.com/Issue9/PDFs/ArticleBedard.pdf (last seen: 6.3.2019).

image function. Of particular interest for this chapter are his opposition between factual descriptions of the human visual system (in relation to cinema) and images that become generally accepted as representations of this vision. First, his references to scientific descriptions of the camera-eye analogy both serve to explain and to criticize the recurrence of anthropomorphic accounts of the camera. Most notably opposed to analogies between camera and eye is Robert Boynton who, methodically and at great length, rebutted any similarity between the two, stating forcefully: "The eye most emphatically does not *work* just like a camera, and the differences are worth discussing. The eye is a living organ, while the camera is not [...]."[20] Boynton's obstinate pragmatism is met with criticism on Wees's part, who clarifies: "The fact that the eye does not work 'just like a camera' is indisputable, but it is also irrelevant, since the significant similarities between the two are metaphorical, not literal."[21] While they might not be *isomorphic*, camera and eye *do* share important similarities that go beyond the metaphorical; similarities which we should acknowledge if we seek to understand why cameras have such strong (if problematic) ties with human vision.

In contrast to Boynton, Wees presents the point of view of those who believe in certain fundamental similarities between the two entities, a position encapsulated by George Wald in his article "Eye and Camera":

> In both instruments a lens projects an inverted image of the surroundings upon a light-sensitive surface: the film in the camera and the retina in the eye. In both the opening of the lens is regulated by an iris. In both the inside of the chamber is lined with a coating of black material which absorbs stray light that would otherwise be reflected back and forth and obscure the image.[22]

Steeped in fact – the eye and the camera *do* both function by focusing light on a photosensitive surface – this analogy between camera and eye can lead to excesses and misinformation if not taken lightly. The trouble derives from an understanding of the image produced by techniques such as perspective, as well as optical tools such as photographic and cinematographic cameras, as what Wees calls "visualizations of sight." Defined as referring firstly to "pictures ('still' or 'moving,' drawn or painted or photographed) that are intended to be equivalents of our actual experi-

[20] Robert M. Boynton: "The Visual System: Environmental Information," in: Edward C. Carterette and Morton P. Friedman (eds.): *Handbook of Perception,* vol. 1, New York 1974, p. 290.

[21] William C. Wees: *Light Moving in Time: Studies in the Visual Aesthetics of Avant-Garde Film,* Berkeley, 1992, p. 24.

[22] George Wald, quoted in Wees: *Light Moving in Time*, op. cit., p. 21.

ence of seeing,"[23] and secondly to "diagrams, models, and instruments of various sorts that *reveal something about how sight occurs,* whether or not they were originally intended for that purpose,"[24] the expression "visualization of sight" invites us to think of images and optical machines as elements that are built upon – and more importantly contribute to – our understanding of human vision. The problem, of course, stems from the fact that artificial and highly standardized representations of the visual world (such as pictorial perspective during the Renaissance) have been misconstrued as "proofs" of the way human vision functions. Note, for instance, how in this passage Wald does not distinguish between the "images" that the eye and the camera project upon the former's retina or the latter's recording surface, which are produced under different conditions and therefore are not entirely similar. Images too easily thought of as visualizations of sight constitute an enticing and therefore perilous influence on our thinking about human vision; an impact which has only been made stronger and more insidious with the invention of cameras: "Because photography automatically incorporates geometrical perspective, it has confirmed perspective in the public mind, made it 'true' and, in [William M.] Ivins's phrase, 'clamped it on our vision.'"[25]

Wees argues that within a Western culture already rigidly organized by geometrical perspective – which "has been familiar for so long that its limits on and deviations from actual vision are hardly noticed at all" – the cinematic image constitutes "a powerful, yet peculiarly limited visualization of sight."[26] The limitations the author perceives within this image stem from the organization of vision initiated by perspective and the tools used for its creation; limitations that amount to "a mechanization and standardization of seeing that sacrifice much of what emotion, imagination, and the total visual experience offer to visual artists."[27] While Wees looks to experimental filmmakers over the twentieth century who embraced the full breadth of this so-called "total visual experience," one need only turn to the question of movement at the core of moving images media (and to contemporary practices such as GoPro videos) to expose both key similarities and differences between the way human and filmic vision function.

[23] Wees: *Light Moving in Time*, op. cit., p. 31.
[24] Ibid., p. 32. Emphasis added.
[25] Ibid., p. 44.
[26] Ibid.
[27] Ibid.

Questions of movement

Looking at movement, we find that a particular set of questions highlights interesting points of exchange between cinema and the psychology of perception in human subjects. Indeed, the field of psychology encounters a key problem when attempting to explain the way we as humans perceive movement in the world, specifically in such a way as to allow us to move *ourselves* within it as well. James J. Gibson tackles this problem with three interrelated questions that resonate with concerns within the domain of film studies: "How do we see the motion of an object? How do we see the stability of the environment? How do we perceive ourselves as moving in a stable environment?"[28] While these questions could find logical and simple answers within a "conceptual eye" – bereft of any "imperfections" or distractions – Gibson insists on situating vision in its *actual* context, that is, as a process undertaken within a living body that is in constant motion within an environment somehow perceived as fixed. Considering the eyes "perform saccadic or exploratory movements without ceasing during waking life,"[29] how is it indeed we can correctly discern between the movement of external objects imprinted upon the retina (what Gibson calls "objective motion") and the transformations of the retinal image attributed to the "subjective movements" of the eye or the body?

The solution proposed by Gibson – but also by Jacques Paillard – relates to the range of subjective cues of movement. When the body moves forward, for instance, cues from the vestibular system as well motor commands from various muscle groups help the body interpret the visual cues of movement as subjective. That being said, atypical situations of "passive locomotion," such as riding on a train, can confront the mind with conflicting information which may lead to sensory illusions. A cherished example in texts on the psychology of movement, the train also foregrounds the key to the problems faced within film studies, as exemplified in this passage from David Bordwell's "Camera Movement in Cinematic Space":

> But passive locomotion, say, riding on a train or bus, enforces a much greater dependence upon purely visual cues. When we sit in an un-moving train, the sight of a passing train can even mislead us into thinking that *we* are moving and the other train is stationary. Our dependence on visual cues is more strongly marked in a passive locomotion situation, *the situation most analogous to the cinema spectator's viewing situation*.[30]

[28] James J. Gibson: "The Visual Perception of Objective Motion and Subjective Movement," in: *Psychological Review* 101/2 ([1954] 1994), pp. 318–323, here p. 318.
[29] Ibid.
[30] David Bordwell: "Camera Movement and Cinematic Space," in: *Ciné-Tracts* 1/2 (1977), pp. 19–25, here p. 21. Emphasis in original.

For Bordwell, moving image media must convey the impression of movement on screen without having access to the many elements of motion perception in the human sensory system. Their reliance on strictly visual cues, however, may lead to confusion in some cases, such as when insufficient information is given on screen to indicate that the camera ever moved during production, or if the movements are such that they translate into visual cues our minds are not equipped to interpret adequately. This leads Bordwell to speak of a "camera-movement effect" that allows spectators to interpret camera movement regardless of whether or not (or even how) the camera was moved on set during filming. The author's question of "how camera movement asks to be 'read' perceptually,"[31] therefore invites us to question our tendency to rush to conclusions when it comes to interpreting camera movement. Specifically, it is the chance to question a reliance, in much thinking about film, on the analogy between filmic and human vision and, more specifically, on "a very limited and highly standardized version of 'visual life': focused, stable, unambiguous representations of familiar objects in three-dimensional space."[32] What, then, are some of the other ways camera-movement effects can be interpreted? And, furthermore, what can moving images interpreted in such non-anthropocentric ways tell us about the "grand scheme" of human perception?

Exo-centric images against anthropocentrism

While the miniaturization of video cameras has facilitated the production of exo-centric images, the technique used in its creation has been used throughout the twentieth and twenty-first centuries.[33] By attaching a camera *away* from the body through some rigid fixture, what results is a camera that moves through physical space in perfect synchrony with the body carrying it, if only that it maintains a fixed distance from the body throughout these submissive displacements. For instance, a common strategy among GoPro users is to produce an ersatz selfie by placing the camera in front of their faces through a pole extending from the helmet (see fig. 3). Such is the case in the videos "GoPro: 2500m Chamonix Wingsuit Flight" or "GoPro: Whistler's Dirt Merchant With

[31] Ibid., p. 20.
[32] Wees: *Light Moving in Time*, op. cit., p. 3.
[33] The earliest relatives of this technique can be traced back to 1913's Kri Kri e il Tango (anonymous), and its most notable early incarnation comes from F.W. Murnau's Der Letzte Mann [The Last Laugh], 1924.

Fig. 4: The exo-centric image in "GoPro: Whistler's Dirt Merchant With Yoann Barelli"

Yoann Barelli" among countless others.[34] In the latter, for instance, Barelli rides down a mountain bike trail with a camera placed some 30 cm in front of his head and pointed towards him, showing us his inappropriate getup (he is riding a road bike with the corresponding attire) in lieu of the trail he is perilously descending (fig. 4).[35] While it would be possible to look into the implications of this perspective in relation to the *selfie* – and indeed some have gone down that path, such as Marina Merlo, Florian Krautkrämer and Matthias Thiele, and Winfried Gerling – more fruitful conclusions may be drawn by focusing on the formal and phenomenological repercussions of this technical condition.[36]

[34] GoPro: "GoPro: 2500m Chamonix Wingsuit Flight," YouTube, 20.11.2015, https://youtu.be/RbcbjMhvjEs (last seen: 21.2.2020); "GoPro: Whistler's Dirt Merchant With Yoann Barelli," YouTube, 21.11.2016, https://youtu.be/gvL1agpqwvE (last seen: 21.2.2020).

[35] Some videos also feature a GoPro placed behind the body, as in "GoPro: Lion Hug," or a camera that rotates around the body from its exo-centric position, such as in "GoPro: Art Of The Double Cork With Bobby Brown." In either case, the exo-centric relation between camera, body, and space remains, as do the interpretations proposed here regarding images taken from the front of the body. GoPro: "GoPro: Lion Hug", YouTube, 3.10.2013, https://youtu.be/ZRd3lrukxu8 (last seen: 21.2.2020); GoPro: "GoPro: Art Of The Double Cork With Bobby Brown – TV Commercial," YouTube, 8.10.2013, https://youtu.be/8Ykv2i_VyKU (last seen: 21.2.2020).

[36] Marina Merlo: *Le Narcissisme du Selfie: Esthétique et Pratique de la Subjectivité Contemporaine*, Ph.D. Diss., Université de Montréal 2018; Florian Krautkrämer and Matthias Thiele: "The Video Selfie as Act and Artifact of Recording," in: Julia Eckel, Jens Ruchatz and Sabine Wirth (eds.): *Exploring the Selfie: Historical, Theoretical, and Analytical Approaches to Digital Self-Photography*, Cham 2018, pp. 239–259; Winfried Gerling: "Be a Hero: Self-Shoots at the Edge of the Abyss," in: Julia Eckel, Jens Ruchatz and Sabine Wirth (eds.): *Exploring the*

In spite of the physical movements of the camera resulting from its peculiar arrangement, Bordwell reminds us that the camera-movement effect is not necessarily produced by the displacement of the machine through physical space – or at least that the resulting effect is not simply naturally congruent with the instigating motion of the device. Following Bordwell's formulation then, how may we say the exo-centric images presented in these GoPro videos ask to be "read" perceptually? In both videos cited previously as in many others – and as we have demonstrated extensively in the past – exo-centric images communicate the presence of a body fixed in space at the center of a motion-filled world.[37] This interpretation is derived from Gibson and Paillard's conclusions on the psychophysiological conditions of the perception of movement, and from Bordwell's adaptation of these notions to the field of cinema, which insists that "monocular movement parallax must be read from the entire visual field" for a convincing impression of camera movement to be produced.[38] On the contrary, the visual information conveyed in "GoPro: Whistler's Dirt Merchant With Yoann Barelli" and other such exo-centric images point to the fact that the head of the subject remains a motionless point (i.e. it does not communicate having moved in the context of the space constructed in the image). It bears clarifying that while this interpretative process occurs during normal conditions of perception, the relative immobility of the spectator emphasizes the importance of purely visual cues in signifying a camera-movement on screen. And while Vivian Sobchack notably stated that camera movements were instinctively understood by viewers as representing the "embodied activity of a human consciousness as it is situated in and inhabits the world,"[39] the exo-centric image contradicts this interpretation by presenting a perception of space and mode of navigation that reject our embodied egocentric experience of the world.

Our reliance on psychophysiological concepts should make it clear that beyond an interesting formal effect, these exo-centric images also bear on our understanding of the visual systems for which they stand. And while Wees may have criticized an overreliance on the cinematic image taken as "visualization of sight," the same approach applied to a fundamentally non-anthropocentric point of view can bring to light seldom

Selfie: Historical, Theoretical, and Analytical Approaches to Digital Self-Photography, Cham 2018, pp. 261–283.

37 Bédard, "Disembodied Perspective," in *Alphaville* 9, op. cit.

38 Ibid., p. 22.

39 Vivian Sobchack: "Toward Inhabited Space: The Semiotic Structure of Camera Movement in the Cinema," in: *Semiotica* 41/1-4 (1982), pp. 317–335, here p. 317.

seen aspects of the relation between vision and the world. Much like an anatomical bisection that can bring new information to the fore – all the while appearing somewhat alien to the untrained eye – the exo-centric image shifts the way we see things in such a way that invites us to *consider* things from a new perspective. In a somewhat ironic turn, this point of view that departs from the human body as center of perception (making it a non-anthropocentric perspective) results in an image in which the human, the individual, is literally the center of the world. At first glance anthropocentric (or perhaps egotistical) in its foregrounding of the human figure, the exo-centric image falls beyond the realm of human apprehension in its departure from the *egocentrism* that governs our body's relation to the world. And in removing vision from the human body as a center of perception while also representing the body in such a way that we would never perceive it (be it ours or that of others), this perspective paves the way towards a more complex appreciation of images that does not limit them, as so often has been the case throughout the history of moving image media, to an anthropomorphic interpretation.

More to the point, the fact that a camera carried by the human body might produce images that are so starkly opposed to the modes of perception inherent to that body invites further reconsideration of the presumed anthropomorphism of images made through cameras in general, and of body-mounted cameras in particular. This brings to mind the process of viewing an anamorphosis in a painting, which Daniel Collins describes as requiring the spectator to adopt an *excentric* posture.[40] In removing oneself from the position assigned by the picture, the spectator of anamorphoses (much like that of exo-centric images) must also become conscious of her own subjective posture and approach the image anew. Doing so allows the viewer to take part in the production of the unusual image and to question the anthropomorphic qualities one so often takes for granted in images.

Conclusion

Florian Leitner, in an article titled "On Robots and Turtles: A Posthuman Perspective on Camera and Image Movement after Michael Snow's La Région Centrale," suggests that while dominant film practices only rarely make the camera show a character's first-person view, "the camera view

[40] Daniel L. Collins: "Anamorphosis and the Eccentric Observer: Inverted Perspective and Construction of the Gaze," in: *Leonardo* 25/1 (1992), pp. 73–82.

almost always imitates the human gaze in one way or another."[41] Leitner, like many before him, points to the types of movements performed by cameras as the most convincing similarity to the human body (as the head turns and tilts, so does the camera). But cameras can, of course, perform movements that no human body could naturally perform, such as those in many experimental films (Leitner focuses on La Région Centrale [Michael Snow 1971]), but also in exo-centric images which, relative to the egocentric worldview of humans, reverse the natural order of things.

More importantly still, these images serve to bring attention to the fundamental instability of the camera-movement effect. Much like the grand scheme of vision in humans – which learns to *anticipate* spatial and sensorial configurations and is prone to illusions in abnormal perceptual conditions – moving image media are based upon a carefully structured illusion, particularly in regards to the representation of camera movement and the construction of space. This is why Jordan Schonig, in dealing with the anthropocentric conceit in film-phenomenological approaches, concludes that:

> [...] phenomenological film theory's account of the moving camera does not describe an essential condition of camera movement but rather *an effect of particular ways of moving the camera* – forward movements-into-depth – which strongly evoke the sense of an embodied mobile perspective. Our tendency to bodily identify with the moving camera, then, is merely *one possible effect* resulting from particular kinds of movements within particular kinds of spaces.[42]

This illusion, which has urged Sobchack, Bordwell, and so many others to read into the moving camera as analogous to human perception and mobility, is conventionally upheld in dominant forms of cinema and media, but it can just as easily be broken through so-called "forbidden movements."[43] Exo-centric images are one such movement since they foreground the fragility of the illusion, and of the anthropomorphism that depends on it: despite the camera having moved in production (just

41 Florian Leitner: "On Robots and Turtles: A Posthuman Perspective on Camera and Image Movement after Michael Snow's La région centrale," in: *Discourse* 35/2 (2014), pp. 263–277, here p. 267.

42 Jordan Schonig: *Cinema's Motion Forms: Film Theory, the Digital Turn, and the Possibilities of Cinematic Movement*, Ph.D. Diss., University of Chicago 2017, p. 149. Emphasis added.

43 Bordwell: "Camera movement", in: *Ciné-Tracts* 1, op. cit., p. 24. Here again, the example Bordwell evokes is Michael Snow's La Région Centrale (1971). Schonig would focus on what he calls "spatial unfurling," a form of movement characterized by lateral displacement in shallow space as opposed to the travelling's forward movement into depth. Schonig: "Cinema's Motion Forms", op. cit.; "Seeing Aspects of the Moving Camera: On the Two-foldness of the Mobile Frame", in: *Synoptique: An Online Journal of Film and Moving Image Studies* 5/2 (2017), pp. 57–78.

as much even as any body-worn GoPro), the exo-centric camera appears motionless on screen, much like the body carrying it. More specifically, in turning the camera back onto the body of its wearer, these GoPro videos likewise invite a reversal of our gaze back onto the process of image making and the modes of vision that implicitly regulate them. We may only hope that such a new perspective on the body and its place in the world will go beyond unsettling our formal expectations and influence our own egocentric and anthropocentric worldview.

IT sees: Speculations on the Technologization of the View and its Distribution

Jan Distelmeyer

GoPro videos show something. Probably the most dominant gesture of GoPro aesthetics and the accompanying discourses and advertisements is that of a new visuality – "see the world in an all-new way."[1] My speculations begin here. The attempt, however, to look at several facets of this phenomenon in a rather tentative and exploratory way, aims at bringing together the visual with the non-visual. What eludes my view is also significant here. This is due in particular to the technological structure: to the functions and requirements of computer technology, whose mediation between human and algorithmic-electronic processes is based both in presenting and in concealing.

First of all, it is not to be overlooked that the form in which GoPro videos appear is usually anything but purely visual. When I am watching GoPro videos on video-sharing websites, I am almost always also hearing them. If a part of the GoPro complex consists of making an impression and being seen, what is to be heard is part of these procedures. In fact, I do not know of any GoPro video without sound. And more than a few of the clips that I have seen and heard on the company's YouTube channel also – in addition to the acoustic elements that should be described more precisely (crashing waves, the rustle of wind, etc.) – have music that creates a mood.

No doubt about it: The GoPro movement is not only massive (the GoPro channel on YouTube indicates over 1,900,000,000 views since March 2009, while the Apple Channel, for instance, has been viewed less than 500 million times since 2005).[2] It is also audiovisual. Nonetheless, the focus of what the company itself wishes to convey – "We make the World's Most Versatile Camera"[3] – rests on a particular visual aesthetic that is meant to be produced and disseminated. And it is just this that is the focus of most academic and journalistic writing on the GoPro movement.[4]

1 GoPro: "About Us": https://gopro.com/en/us/about-us (last seen: 04.1.2019).

2 See: GoPro: "About", YouTube, https://www.youtube.com/user/GoProCamera/about and https://www.youtube.com/user/Apple/about (last seen: 4.1.2019).

3 Apple: "About", Twitter, https://twitter.com/gopro?lang=de (last seen: 4.1.2019).

4 An exception to this is: Michael A. Unger: "Castaing-Taylor and Paravel's GoPro Sensorium: Leviathan (2012), Experimental Documentary, and Subjective Sounds," *Journal of Film and Video*, 69:3, 2017, pp. 3–18.

Richard Chalfen, Phillip Vannini, and Lindsay Stewart have emphasized three aims of the GoPro camera:

> (1) To record 'exciting', even unexpected, scenes of action and locations seldom, if ever, seen, and to offer new, fresh, original and memorable perspectives;
>
> (2) To record what the camera user sees while undertaking a particular unusual, difficult and dangerous activity;
>
> (3) To record what the camera user actually looks like or how the camera user appears while actually participating in such a particularly unusual, difficult, and dangerous activity, in short, often 'extreme' sports.[5]

In fulfilling these aims, as Vannini and Stewart deduce with reference to Chalfen, GoPro problematizes "more than any camera before the notion of presence and being there, 'allowing a viewer to believe she/he is/was there' together (or perhaps even in lieu of) with the adventurers/athletes/artists, and therefore generating 'scenes that could not be seen any other way'".[6] This is what constitutes the "GoPro gaze" and its mobility, "enabled by the smallness, lightness, versatility, and the no-limits attitude of independent, even solo, action videography."[7]

Such a *being there* – a presence-production through mediality and technology – in most cases implies not only facilitating seeing, but also hearing. It seems as if the GoPro discourse, with its interest in new modes of visibility ("new, fresh, original and memorable perspectives,"[8] "new and unusual points of view"[9]), revitalizes the old and in fact outdated disinterest in the sounds that accompany the appearance of these images (as before those of cinema film, television, video, and computer games) reworking them and thus always already introducing acoustic doubt over the "primacy of the visual"[10].

The fact that I will also deal with questions of the visual in the awareness of this problem is on the one hand due to the confrontation with the GoPro discourse and its emphasis on visualization. On the other hand, I will specify the modes of seeing as modes of capturing, which are made possible by the sensory capacities of computer technology. The

5 Richard Chalfen: '"Your Panopticon or Mine?' Incorporating Wearable Technology's Glass and GoPro into Visual Social Science," *Visual Studies*, 29, 2014, pp. 299–310, here p. 299; Phillip Vannini and Lindsay M. Stewart: "The GoPro gaze", *Cultural Geographies*, 24:1, 2017, pp. 149–155, here p. 152.

6 Vannini and Stewart: "The GoPro gaze," op. cit., p. 152.

7 Ibid, p. 153.

8 Chalfen: '"Your Panopticon or Mine?'" op. cit., p. 299.; Vannini and Stewart, op. cit. p. 152.

9 Phillipe Bédard: "Disembodied perspective: third-person images in GoPro videos," *Alphaville: Journal of Film and Screen Media*, 9, 2015, pp. 1–15, here p. 1.

10 Ulrike Bergermann; "medien//wissenschaft. Texte zu Geräten, Geschlecht, Geld", Bremen 2006, p. 327.

processes of capturing succeed because of the sensors on computer-based apparatuses that (as long as they are set up and programmed for this) interpret and export what is captured as images or sounds.[11] It is a matter of determining the structurally non-determined computer technology for each individual application.

My approach to GoPro as a medium for getting (oneself) seen addresses forms of looking that are always tied to other processes of capturing and mediating. Understanding this approach itself as speculation is meant to consider the question of *specula*, that is, of the place of observation. Who or what is "viewing" from where? Particularly in the GoPro movement, the form of technology that provides me my perspective as an observer and "user" always imposes itself upon me: the internal telegraphy of this computerized camera and its protocological networking. All this belongs and cooperates like in the short request of the GoPro website: "Capture + and share your world."[12]

Shared Views

What always comes up in advertising, reports, reviews, and scholarly texts about GoPro is an emphasis on the subjective. Ramón Reichert notes, for instance, with reference to "the medialization of war":

> The GoPro in war (named after the producer of action camcorders, GoPro) brings together two essential elements. First the traditional media satisfaction of the goal of representing war as close to reality as possible; second the self-staging of an extremely individualized war hero, who is prepared to share his personal experience with a digital audience; to achieve this GoPro creates a new stage. [...] The mobile miniature cameras used on the battlefield show war exclusively from a subjective perspective and point to the technology-based medialization of spontaneously lived reality.[13]

Much like Chalfen, Vannini, and Stewart, Reichert underscores this as an effect of a "novel aesthetics": practicing the view "of another," in which "the desire – not unfamiliar in media history – for the (medially

[11] See: Winfried Gerling, Susanne Holschbach and Petra Löffler: *Bilder verteilen – Fotografische Praktiken in der digitalen Kultur*, Bielefeld 2018, pp. 85–91; Wolfgang Hagen: "Anästhetische Ästhetiken. Über Smartphone-Bilder und ihre Ökologie", in: Oliver Ruf (ed.): *Smartphone-Ästhetik. Zur Philosophie und Gestaltung mobiler Medien*, Bielefeld 2018, pp. 75–104, here: pp. 99–103.

[12] GoPro: "Youth Speaks": https://gopro.com/en/us/content/goproforacause/youthspeaks.html (last seen: 4.1.2019).

[13] Ramón Reichert: "Action Cams. Bilder vom Krieg", POP. *Kultur und Kritik*, 10, 2017, pp. 52–59, here pp. 52–53.

produced) experience of closeness" would be promoted.[14] Shared views and subjective shots to get us to that *being there*.

This connection is particularly conspicuous in the reactions to the most well-known of all GoPro films, Leviathan (Lucien Castaing-Taylor, Véréna Paravel, USA 2012). Time and again a point-of-view aesthetic (POV) is emphasized, with the effect of immersion: "For filmgoers willing to immerse themselves, Leviathan proves a one-of-a-kind viewing experience," is how the review-appraisal platform *rottentomatoes.com* summarizes the "Critics Consensus."[15]

"Much of the film's imagery (and sound) came from cameras attached to the fishermen themselves, providing fragmentary, disorienting POVs in constant motion," wrote Chris Chang in *Film Comment* about Leviathan.[16] "In Leviathan, according to Kai Mihm in *epd Film*, one "even takes on the 'subjective' view of a fish."[17] "Leviathan offers not information but immersion," wrote A. O. Scott in the *New York Times* under the fitting title: "Or Would You Rather Be a Fish?"[18] "Leviathan is an immersive examination of a highly mechanized industrial process," reads Stephen Dalton's summary in the *Hollywood Reporter*.[19]

This last, notable impression of diving in, not into human experience, but into an industrial process (as a human experience) seems to be suggested precisely through the specific form and use of the technology, which I will go into further. It, this specific form and use, is closely linked to the lack of a viewfinder in this form of camera.

This is why I am skipping over the discussion of the quite problematic (and popular once again after the hype of the 1990s) term "immersion" here. Instead I would like to point to something else. Part of the power of Leviathan and a number of other GoPro videos is certainly that they support the impression of a subjective position. But this very familiar form, widely discussed as a POV aesthetic, is only one part of the GoPro movement and indeed – as the question of the relationship between body

[14] Ibid, p. 53.

[15] "Leviathan", in: *Rotten Tomatoes*, https://www.rottentomatoes.com/m/leviathan_2012/ (last seen: 4.1.2019).

[16] Chris Chang: "Rock in a Hard Place", in: *Film Comment,* https://www.filmcomment.com/article/leviathan-review-lucien-castaing-taylor-verena-paravel/ (last seen: 4.1.2019).

[17] Kai Mihm: "Kritik zu Leviathan", in: *epd Film,* 1.5.2013, https://www.epd-film.de/filmkritiken/leviathan (last seen: 4.1.2019).

[18] A. O. Scott: "Or Would You Rather Be a Fish?", in: *The New York Times,* 28.2.2013, https://www.nytimes.com/2013/03/01/movies/leviathan-from-lucien-castaing-taylor-and-verena-paravel.html (last seen: 4.1.2019).

[19] Stephen Dalton: "Leviathan Locarno Review", in; *Hollywood Reporter,* 8.9.2012, https://www.hollywoodreporter.com/review/leviathan-locarno-review-360373 (last seen: 4.1.2019).

and gaze will show – perhaps the most misunderstood. Nonetheless, what interests me here is initially the obviously different staging form of the GoPro movement. This is not subsumed in supposedly classical POV staging and breaks with the equation of view and eye.

Fig. 1: Providing Proof: GoPro Advertisement from 2015

Seeing/hearing is believing

Many examples combine the first and third characteristic/aims of GoPro according to Chalfen, Vannini, and Stewart: videos that do not produce a subjective perspective of the body of action and yet remain with that body that controls or carries-along this camera, which then turns that acting subject into the object of what the attached technology is capturing.

Typical examples of this are the countless shots of surf, ski, parachute, and other action, in which the attached GoPro camera accompanies the people in their actions by observing the action-body like a third, uninvolved, and at the same time attached eye. Held by hands, sticks, or other ways, they follow what happens. To a certain degree they are a foreign part of the action-body, allowing both to remain in view at the same time: body and space of action. This – as an involved view that is

at the same time a witness from "outside" – is how the call of the GoPro is meant to be fulfilled: "Prove you did, what they said you couldn't."[20]

There is a complex subject-object relationship running here, which can develop on the basis of a technology that goes well beyond producing this objectification of the subject: Videos in which the GoPro is used by people to film (above all) how they do something and are seen doing it. Videos with spectacular actions that are observed from an emphatically mediated proximity.

When these "proofs" are successful, they are nonetheless not only so according to a photographic indexicality, but also thanks to a soundtrack that equally conjures up presence. The space of action is divided by the airstream, the sound of waves, other atmospheric noises, and not least any number of commands and screams by those involved. The GoPro clip "Backflips for Breakfast," in which a snowboarder with a full cup of coffee in one hand and a GoPro stick in the other does a backflip only to take a drink from the coffee after a successful landing, combines environmental sound and screams with a music that is meant to function as precisely as the acrobatic number itself.[21]

Seeing and hearing is believing. But who or what saw or heard like what I can then see and hear, for instance, on YouTube? The crucial point seems to me to be that no one is looking through a viewfinder either for this or during this. "Don't stop doing what you're doing to capture what you're doing," runs the pertinent GoPro advertising slogan.[22]

Programmatic Technology: Videt

No human being has to set up the image and lens in such a way that would stand up to the verifying look through the viewfinder (or taking its place, an image of the viewfinder as a display). Instead there is a reliance on a view that is sourced out, one that is mobilized-stable as well as emphatically wide-angled. This view is meant to be relied on, as is the recording of the sound on location. The effect is of a faithful and confident delegation of perspective to a third party, something that is as little controlled while shooting as is the sound, for which there is no viewfinder anyway.

[20] Ibid.

[21] See: GoPro: "GoPro Awards: Backflips for Breakfast", YouTube, 25.10.2017, https://www.youtube.com/watch?v=g9ArG6H_z0Q (last seen: 4.1.2019).

[22] GoPro: "Don't stop what you're doing, to capture what you're doing", Twitter, 14.11.2016, https://twitter.com/gopro/status/797976112986886144?lang=de (last seen: 4.1.2019).

My suggestion is, first, to understand this "something" as technology. This technology is achieved and supported through computers – by a variety of programmable and networked "general-purpose machines," who take care of the production as well as the postproduction, distribution, reception, and annotation of these images and sounds. I would therefore like to call this "something" *programmatic technology*. This includes not only the entirety of the technological equipment, practices, and requirements like electricity, but also human activities.

Since perspective is faithfully given over to this "something", programmatic technology, to this "it" – as in "It just works"[23] – I would like, second, to suggest to reconsider the term video for this kind of footage. For instead of an "I" in "I see" (Latin: *video*), here an "it" appears ostentatiously. It is this "it" – this IT – that sees: programmatic technology.[24] In order to designate this form of footage more precisely, I will no longer be speaking of video here, but of *videt*: "IT sees."

The function of the viewfinder, or better yet: the confident renunciation of it, becomes an essential part of the form of this technology and of how it is used. Only since 2016, since the GoPro 5, are displays part of the standard equipment. Previously there was a so-called "live preview"[25] which could only be accessed over a WLAN connection with an additional smartphone or as special equipment with the GoPro Hero+ LCD (2015). Jordan Hetrick explains this in his guide *GoPro HERO: How To Use The GoPro HERO, HERO+ and HERO+ LCD*:

> But with the HERO or HERO+ when you go to record your first video, the first thing you will probably notice is that you can't see what you are filming. Yes, it's true there is no viewfinder! And since the HERO cameras are not compatible with any of the GoPro BacPacs, you cannot attach an LCD BacPac to the back of your camera. When using the HERO+, you can connect to the GoPro App to use your device as a remote viewfinder, which will help you orientate yourself with your new camera. Since the HERO is not compatible with the GoPro App or the LCD BacPac, learning where to point your camera and how far away you need to be is one of the biggest learning curves of the HERO camera, especially for a beginner. [...] Don't worry, with experience, you will be able to make a great estimated guess about what your camera is capturing through the lens.[26]

[23] See: "It just works. Seamlessly", YouTube, 19.9.2009, https://www.youtube.com/watch?v=qmPq00jelpc (last seen: 4.1.2019).

[24] It should not be forgotten that this "it" – the information technology – is not a neutral thing, but a heterogeneous ensemble of human assumptions, practices, and correspondingly designed infrastructures and apparatuses.

[25] GoPro: "Live Preview While Recording In The GoPro App": https://gopro.com/help/articles/Block/GoPro-App-Preview-While-Recording (last seen: 4.1.2019).

[26] Hetrick Jordan: *GoPro HERO: How To Use The GoPro HERO, HERO+ and HERO+ LCD*, New York 2015, p. 19.

John Carucci's GoPro guide responds to the lack of viewfinder with different reassurance than that of getting used to it: "Most models don't have a viewfinder: Though the viewfinder is one of the main parts of a camcorder, only one current GoPro includes a viewing screen. That's okay because you wouldn't look through a viewfinder for most situations. The lack of a viewfinder doesn't mean you have to imagine where the image will take place. Simply use Capture [...], which transforms your smartphone or tablet into a monitor."[27]

The GoPro program and additional devices: Other forms of programmatic technology can also help to compensate for the lack of a viewfinder function. This constellation gives a nice example of the openness of purpose of the computer technology at the basis of it, which turns all these apparatuses into *various-purposes machines*.

Cameras without Viewfinders

At any rate, cameras without viewfinders, for years the standard of the GoPro movement and thus the basis of "new and unusual points of view,"[28] are by no means a new appearance or exclusive expression of computer-based photography. Since the camera obscura, they instead form a recurrent phenomenon in the history of photography and cameras, which Lisa Cartwright and D. Andy Rice have examined with respect to film. In their article "Media Archaeology of Tiny Viewfinderless Cameras as Technologies of Intra-Subjective Action" they propose an outline of a historical frame for media archaeology that assumes the phenomenon of a camera without a viewfinder.

Furthermore, they add "that precedents may be found not only in the history of photography but also in the history of medical engineering and in media and performance art practice."[29]

For Cartwright and Rice this framework reaches from the early Brownie camera around 1900 through works by Valie Export in 1973/78, in which she experimented with two Super 8 cameras mounted on the body under

[27] John Carucci: *GoPro Cameras for Dummies*, Hoboken 2015, p. 26.
[28] Bédard: "Disembodied perspective: third-person images in GoPro videos", op. cit., p. 1.
[29] Lisa Cartwright and D. Andy Rice: "My Hero: A Media Archaeology of Tiny Viewfinderless Cameras as Technologies of Intra-Subjective Action," *Scholar and Feminist Online*, 13.3-14-1, 2016, http://sfonline.barnard.edu/traversing-technologies/lisa-cartwright-d-andy-rice-my-hero-a-media-archaeology-of-tiny-viewfinderless-cameras/0/ (last seen: 21.2.2020).

the title *Adjugated Dislocations* among others, up to GoPro.[30] Cartwright and Rice interpret viewfinderless photography as a process that expressly separates the eye from the process of making/taking photographic images. This perspective leads to a break that ultimately describes a new relationship:

> We replace the notion of the field of the gaze with that of the field of sensory activity. We do this to emphasize that these cameras offer not exactly a new way of organizing the camera-body to optimize visuality, but a new way of living with cameras as multisensory tools that afford the expression of distributed experience and cognition.[31]

While Cartwright and Rice, with their media archaeology of viewfinderless cameras, thus seek to advance to new forms of experience and perception through and with sensory tools, what is more important for me is the suggested trust – the suggested delegation, and therefore associated and motivated relationship to programmatic (and sensing) technology.

Dis/Embodied

This relation forms an aesthetic, or more precisely: a perspective, for which Philippe Bédard has suggested the name "disembodied view":

> Similar to GoPro videos, the third-person in video games refers to the point of view of a disembodied observer that is attached to, but outside of, the protagonist on screen and which stands in for the viewer/player. This third-person perspective is typically opposed to the more traditional first-person view (again in both cases), which allows the viewer or player to see the world through the eyes of their on-screen counterpart. Instead of trying to convey the subjective experience of the character/user – which would promote the vicarious identification of the player/viewer – the third-person view moves outside of the character/user and places him or her in relation to the surrounding environment.[32]

To speak of a disembodied view brings the important question of the relationship between the body and the gaze into play again. The response, however, of understanding this as disembodiment evades the significant

[30] In the 1990s photographing with the LOMO camera, in which, as Winfried Gerling, Susanne Holschbach, and Petra Löffler have emphasized, photos were to be taken "spontaneously, without reflection and without looking through a viewfinder, everywhere and at any opportunity," experienced a hype of their own, which even then focused "on a public perception of results and a global network of participants" (Gerling, Holschbach, Löffler: *Bilder verteilen*, op. cit., p. 34).

[31] Ibid.

[32] Bédard: "Disembodied perspective: third-person images in GoPro videos", op. cit., p. 5.

connection to the body, which is no less constitutive for "the aesthetic characteristics of these images, as well as the new mode of perception."[33]

In the GoPro *videts* a perspective is produced that does not have to be assumed by the eye during production (and the viewfinder intended for this). But that does not have to make the view disembodied. On the contrary, it is very often aimed at a body, which at the same time also contributes to producing this gaze by holding the camera, or because the camera is somehow attached to that body: "To record what the camera user actually looks like or how the camera user appears while actually participating in such a particularly unusual, difficult, and dangerous activity [...]."[34]

The view is therefore both disembodied and at the same time remarkably 'bodily'. This is how I would like to read another one of the GoPro slogans: "They'll never see exactly what you saw, but it's pretty damn close!"[35] The aesthetics of *videts* is not necessarily about my view, but about closeness. The view does not have to be mine or a staging of my perspective – it is a view that is "damn close."

Fig. 2: Proximity – pretty damn close: GoPro advertisement from 2015[36]

33 Ibid, p. 6.
34 Chalfen: '"Your Panopticon or Mine?'" op. cit., p. 299.; Vannini, Stewart (eds.), op. cit. p. 152.
35 GoProStore: "They'll never see exactly what you saw, but it's pretty damn close.": https://goprostore.wordpress.com/portfolio/26/ (last seen: 4.1.2019).
36 Ibid.

This proximity is both disembodied in the sense that the gaze is not from the human eye level and is far away from head and body, and is also embodied in being connected to that body by hands, holders, or other constructions, toward which the gaze is also mostly directed. Programmatic, computerized technology makes these videts possible, the images of "IT sees." This "IT sees" also allows us to reconceive Frieder Nake's thesis from 1984: The computer as a machine for the "mechanization of mental labor" ["Maschinisierung von Kopfarbeit"].[37]

Decisive here is that this technology both makes sure that the audiovisual *videts* appear on screens and over speakers, and that they can be spread on the internet. The simultaneous disembodiment and embodiment, thanks to machines that are oriented toward programming, automating, and networking and facilitated with sensors, makes it possible to have this special aesthetic. In 2017 GoPro announced new versions of the mobile apps "Capture" and "Quik" to "provide a streamlined experience for creating awesome video content": "People can automatically upload their content to GoPro Plus directly from their HERO5 cameras through the auto-offload feature or for older HERO cameras, through the Quik Desktop app."[38]

On the basis of programmatic technology, image production, distribution, registration, circulation, and archiving can not only be achieved through the same sorts of (computer) processes, but can also be automated. For decades now, this has been the promise and task of the "digital revolution," both mythical and real, or of *digitalicity*.[39] All these steps are forms of participating in a deeply material and also ideological infrastructure, which is meant to allow us to experience programmatic technology as sublime and at the same time as at our fingertips – as the divine and at the same time useful.

Roland Barthes meets Steve Jobs

As for the aesthetics produced in this way (by this form of delegation and reliance on the "it" of technology), it also seems to me essential how secure these wide-angle images are or promise to be. By "sure" I mean

[37] Frieder Nake: "Schnittstelle Mensch – Computer," *Kursbuch* 75, 1984, pp. 109-118.

[38] GoPro: "Quik and Capture Get Updates & GoPro Plus Now in Europe": https://gopro.com/de/de/news/quik-capture-app-updates-gopro-plus-available-in-europe (last seen: 4.1.2019).

[39] See: Jan Distelmeyer: *Machtzeichen. Anordnungen des Computers*, Berlin 2017, pp. 89–126; Jan Distelmeyer: "Carrying Computerization: Interfaces, Operations, Depresentations," in: Luisa Feiersinger, Kathrin Friedrich and Moritz Queisner (eds.): *Image – Action – Space. Situating the Screen in Visual Practice*, Berlin/Boston 2018, pp. 55–68.

both image stabilizing and distortion correction as well as memory and decentralized distributed reception.

Winfried Gerling has called the latter an outsourcing of functions of the "GoPro camera to other smart mobile technologies as a direct environment," which corresponds to the "entire communication of the company, aimed "mainly at the distribution of photos and videos" through social networks.[40] With regard to sure image he speaks of the "stabilization of the image" by GoPro as a "shift from an 'objective' outside-perspective to the 'subjective' first-person perspective," during which "the camera becomes the actual center of the image," so that "the 'subjective perspective' tends to refer to the acting camera."[41]

The camera becomes the new center of the image. And this also becomes so paradoxically because the camera precisely does not "act". In most GoPro *videts* the camera seems less like an actor than like a reliable, sure basis. It is the foundation of the action, a secure (held or mounted) and reliable dimension of the appearance – the justification of a wide-angle world of stable mobility.

If it is an actor, then it is so in a radically different way than the protagonists of those actions that bring it into the world. This status is clearly demonstrated by one of the most popular GoPro *videts*: "Pelican Learns to Fly" from 2014, in which the camera is fixed to the beak of a flying pelican (and aimed back at it), so that not only does it itself seem to fly, but also everything around it.[42] The *Wikipedia* entry on "action camera" aptly describes this status as "a digital camera designed for recording action while being immersed in it."[43]

It is not the (observing) human being that is involved, but the *digital camera*. It is meant to be trustworthy here precisely by producing sure images (no matter what turbulence they are involved in), almost neutral (the image quality is not supposed to be affected by any action), and yet participating, observing, and thus reliable. In this gesture of the GoPro Roland Barthes and Steve Jobs meet, the "ça-a-été"[44] fuses with "it just works." *Prove you did, what they said you couldn't.*

40 Winfried Gerling and Fabian Goppelsröder: *Was der Fall ist… Prekäre Choreographien*, Berlin 2017, p. 64.

41 Ibid., pp. 72–73.

42 See: GoPro: https://www.youtube.com/user/GoProCamera/videos?sort=p&view=0&flow=grid (last seen: 04.1.2019).

43 https://en.wikipedia.org/wiki/Action_camera (last seen: 04.1.2019).

44 Roland Barthes: *La Chambre Claire: Note sur la Photographie* (Œuvres complètes, Vol. 5), Paris 2002, p. 851.

Fig. 3: Stable Mobility: Still from “GoPro: Pelican Learns To Fly”

Trusting and interpreting (beyond the visual)

The decisive role in the production, aesthetics, and also distribution of these images and sounds is thus played by a technological something, which has to be trusted – “you can’t see what you are filming.”[45] The exposed delegation of viewing and hearing (as well as further treatments of it in the form of saving, distributing, exhibiting, etc.) thus leads not to a third person, not to a “third-person arrangement” or “third-person image.”[46] It leads much more to a third party as programmatic technology: “it,” “IT.” The emerging and suggested relation (exhibited and suggested, for instance, through advertising and GoPro clips published on YouTube, seen over 1,900,000,000 times) can therefore hardly be separated from the myth of the digital, from digitalicity, which is still strongly marked by promise of a quasi-magical immateriality.

Perhaps, and this would be the conclusion of my speculations, one can easily get used to this confidence in technology (I do not need a viewfinder anymore), because it is a confidence in a form of technology that has long been less reliant on understanding or comprehension and more on justifiable belief.

[45] Hetrick: *GoPro HERO*, op. cit., p. 19.
[46] Bédard: “Disembodied perspective: third-person images in GoPro videos”, op. cit., p. 10.

Few examples have so clearly and paradigmatically showed this situation than Steve Jobs's last appearance and his last promise on the iCloud in 2011:

> We think this solution is our next big insight. Which is we're going to demote the PC and the Mac to just be a device. Just like an iPhone, an iPad or an iPod Touch. And we're going to move the digital hub, the center of your digital life, into the cloud. Because all these new devices have communications built into them. They can all talk to the cloud whenever they want. And so now, if I get something on my iPhone it's sent up to the cloud immediately. [...] And now everything's in sync with me not even having to think about it. I don't even have to take the devices out of my pocket. I don't have to be near my Mac or PC. [...] So it automatically uploads it, stores it and automatically pushes it to all your other devices. But also, it's completely integrated with your apps and so everything happens automatically and there's nothing new to learn. It just all works. It just works.[47]

This positioning of programmatic technology, which asks for trust and not for understanding, *with me not even having to think about it*, links the outsourcing of the so-called *center of my digital life* with the being-seen of a digital camera of which I do not even have to know what it sees.

Perhaps, therefore, the renunciation of the viewfinder thus stands for the ostentatious outsourcing of a gaze that could be cast by a *first* or *third person* (or a person at all) to a gaze of programmatic technology, which we are obviously supposed to have confidence in. I confidently delegate the gaze that sees me so that many people see me. Similarly, programmatic technology also takes care that this gaze of the third person will be shared in the same way. Needless to say, this sharing is not human in the sense that it would be a splitting and distributing of material that therefore become scarcer. It is instead the sharing of programmatic technology, in which sharing is mediating and forwarding: a question of traffic.

If the view of something is shared in this sense – *Prove you did, what they said you couldn't.* – it is precisely not as "my" or "your" view. *They'll never see exactly what <u>you</u> saw.* The gaze at question here is much more the view of a technology that accompanies me, including and excluding, that I let see me in order to be able to get myself seen/noticed. Fundamentally here it is no longer a question of the visual at all.

For whether we can still even speak of a "view", a "gaze" or of "seeing" at all with regard to programmatic technology is only a question of interpretation. In a doubled sense: Programs can treat and issue the captured data of the sensors as images, as sounds, or as something else.

[47] "Apple WWDC 2011 – iCloud Introduction", YouTube: https://www.youtube.com/watch?v=KTrO2wUxh0Q (last seen: 7.3.2020).

And I can then interpret these technical acts of capturing and processing in such a way that I call them acts of "seeing" and production of "images" and "perspectives."

Here, once again, the fundamental and challenging complexity of the presence of computers (in all their forms) becomes apparent. Their effectiveness is based on a programmability that we encounter only as a flexible interconnection of observable and unobservable processes. The question remains how to analytically approach the relationships between the hidden and the present.

GoPro Culture: On the Relationship between Apparatus, Manufacturer, and Aesthetics

Florian Krautkrämer

The differentiation within the cinematic *dispositif* due to the emergence of digitality has, contrary to what was perhaps initially feared, not brought film studies back around its object, but on the contrary expanded it around a series of questions. On the one hand this is a matter of analyzing the various forms of presentation and circulation, which are usually treated under the term post-cinematic,[1] but also of new "configurations of film,"[2] which examine the spheres of influence of film forms and their increasing presence. This has also strongly shifted the focus to economic conditions and changes, which are part of Production Studies and are also fundamentally associated with the changed media landscape.[3] Amateur formats are also becoming increasingly significant, since simpler operation and lower entry thresholds in certain areas has not only significantly altered access, but also the range of application.[4] At the same time there has been a pluralization of tools that is at least as varied as the new locations of cinema. Alongside studies on the various platforms (cinema, YouTube,[5] Netflix, etc.) there is a steadily growing area that could be collected under the term *Camera Studies*. This includes publications on drones[6] as

1 See for example Barbara Klinger: *Beyond the Multiplex: Cinema, New Technologies, and the Home*, Berkeley 2006; Malte Hagener: "Where Is Cinema (Today)? The Cinema in the Age of Media Immanence," in: *Cinéma & Cie* 11 (2008), pp. 15–22; Francesco Casetti: *The Lumière Galaxy: 7 Key Words for the Cinema to Come*, New York 2015.

2 "Configurations of film" is the name of the research collective at the Goethe University, Frankfurt, addressing questions of post-cinematic film culture (https://konfigurationen-des-films.de/en/about/ (last seen: 3.1.2019).

3 See for example John T. Caldwell: *Production Culture: Industrial Reflexivity and Critical Practice in Film and Television*, Durham 2008; Peter Szczepanik and Patrick Vonderau (eds.): *Behind the Screen: Inside European Production Cultures*, New York 2013.

4 See for example Patricia R. Zimmermann: *Reel Families: A Social History of Amateur Film*, Bloomington 1995; James M. Moran: *There's No Place Like Home Video*, Minnesota 2002.

5 See for example Geert Lovink and Sabine Niederer (eds.): *Video Vortex Reader: Responses to YouTube*, Amsterdam 2008.

6 See for example Maximilian Jablonowski: "Dronies. Zur vertikalen Ästhetik des Selbst", in: Ute Holfelder and Klaus Schönberger (ed.): *Bewegtbilder und Alltagskultur(en). Von Super 8 über Video zum Handyfilm. Praktiken von Amateuren im Prozess der gesellschaftlichen Ästhetisierung*, Cologne 2017, pp. 222–233. See also the contribution to this volume by Tobias Conradi (pp. 105–120).

well as those on mobile phone films[7] or webcams.[8] But investigating the specific gestures associated with this would also belong to the field of Camera Studies, like that of selfies.[9] And of course, such a context is also where one would analyze action cameras, in particular the most popular of them, the GoPro. The advantage of such a grouping would lie in the ability to compare and the mutual orientation. Investigations on amateur film from the perspective of Camera Studies would concentrate more on the changes that go along with the different camera formats. Technical developments do not simply intrude into a field and change it, but bring particular constellations along, since they have often not been specially developed for this area of application. Through such an opening then, one could also examine the influences that implementing these cameras in amateur film has on related areas, such as journalistic formats for example.

In the following I would like to outline three different fields for the action-cam that could be investigated from the perspective of such a Camera Studies: a technical one (mounts), an aesthetic one (perspective), and a structural one (marketing). The area of application will be that of amateur film, since this is the most commercially lucrative for the camera manufacturer. Other areas of application would be, for instance, research, professional film productions, or pro sports. Under the aspect of Camera Studies other points of connection could be found for future questions, which then, I hope, would also find resonance in other areas and fields.

Mounts

One of the great advantages of the handheld action-cam is not only the way it can be extended almost at will, but the essential possibility of attaching it with the appropriate devices to nearly any stationary or moving object, animals, and people. A camera like the GoPro, taken on its own, is a relatively limited tool that is not particularly simple to deploy: it does not have many functions, and even those are cumbersome and not particularly intuitive. The wide-angle lenses and comparably low resolution, as well as the lack of display in the first models are not

[7] Sarah Atkinson: *Beyond the Screen: Emerging Cinema and Engaging Audiences*, London 2014.

[8] See for example Paula Albuquerque: *The Webcam as an Emerging Cinematic Medium*, Amsterdam 2018.

[9] See for example Julia Eckel et al (eds.): *Exploring the Selfie: Historical, Theoretical, and Analytical Approaches to Digital Self-Photography*, Cham 2018.

particularly inviting. Borrowing from Georges Simondon's *On the Mode of Existence of Technical Objects* GoPro could be described as an abstract technical object, since it can only be used to a limited degree without supplementary devices such as a case, selfie stick, or mounts, but it can be adapted for a variety of uses through modifications. Simondon makes a case for analyzing a technological object not from its final application area, but from its genesis.[10] In his sense, the action-cam would of course already itself be a concrete object, which developed from the simple miniature camera, but we could also transfer his concept to this camera itself. The main attraction of a camera like the GoPro was that it is was like buying a building kit that could be used to form a variety of concrete technological objects. The concreteness here is achieved through the mounts, which were often proposed for special applications. Since the GoPro is not needed to carry out these activities, but in fact to document them, it is significant that the goal of using the GoPro is clearly communicated in connection with the special mount. For this reason GoPro has listed categories in its online shop for years that can be purchased for activities such as "Surf," "Snorkel," "Family," or "Motor Sports."[11] As Simondon states: "[N]eeds mold themselves onto the industrial technical object, which in turn acquires the power to shape a civilization. It is utilization that becomes an ensemble chiseled to the measures of the technical object."[12] In view of the GoPro then, we must add that this modeling is above all dependent on control through suggestions, which come from the company or are based on the relevant videos on YouTube. If we maintain that the GoPro or a comparable action-cam only becomes versatile through the addition of a wide variety of possible extensions on offer to make it an abstract camera body, then we have to specify that this variety is only activated by the relevant videos and tutorials. Following Simondon, what can be asserted on closer inspection of the GoPro and the mounts, is that they do not necessarily only target the needs of a particular milieu, but that the very need is formed by what makes the camera more concrete, that is, the specific mount.[13] Since this is a matter of images, this observation can not only be made with regard to the technical apparatus, but also with respect to the communication

[10] Cf. Gilbert Simondon: *On the Mode of Existence of Technical Objects*, Minneapolis 2017, p. 26.

[11] See the GoPro online shop from Dec. 23, 2018: https://shop.gopro.com/mounts-accessories. A few years ago the activities were further subdivided and one could order, for instance, the "Halloween Packet" or the "Military Packet" in the shop.

[12] Simondon: *On the Mode of Existence of Technical Objects*, op. cit., pp. 29f.

[13] Ibid., p. 56.

of this milieu, the images that this group makes of itself and circulates as images of their group. Due to the popularity that GoPro videos have achieved for some time now on YouTube and other platforms, the visual style of how one now films surfing, for instance, or couples on an exotic holiday, has been heavily influenced.

That fact that the mount, or the camera's position, is a very dominant visual element becomes clear above all in the editing, such as with the "Million Dollar Challenge", which GoPro announced in 2018 and which was targeted at all users of a new GoPro camera. The clip contains 66 different extracts in a little more than two minutes, all of them sent in by participants of the challenge. Alongside impressive footage of animals, landscapes, and diving, there are also numerous other shots for which the camera was attached to a vehicle or another body or where the person filming framed him or herself during an action with the camera mounted on a stick. The visual link between the camera and the person filming or a moving object such as a surfboard, airplane, or motorcycle is perhaps the element that most of the short clips have in common. They can be distinguished from other clips not only by the unusual perspective, above all it is they themselves that produce the variety of the camera in the first place. In contrast to this the clips that do not show the act that they are generating[14] seem significantly more arbitrary and might come from a variety of journalistic contexts instead of being linked to the camera that this clip is advertising. In the GoPro advertisement – and this also explicitly includes all those videos online that emphasize having been shot with such a camera – the variety demonstrated is not a promise delivered by the camera, but always only by the camera with the appropriate mounts. The particular ability that people demonstrate in the videos while jumping, driving, and diving can be filmed more individually by means of the particular perspective that is suited just for this purpose. An individuality that, in the case of the GoPro, the manufacturer claims just as much for itself.

[14] Cf. Philippe Dubois: *L'acte photographique*, Paris, 1993, p. 9: "With photography it is no longer possible for us to think the image outside of the act that generates it." ["*Avec la photographie, il ne nous est plus possible de penser l'image en dehors de l'acte qui la fait être.*"]

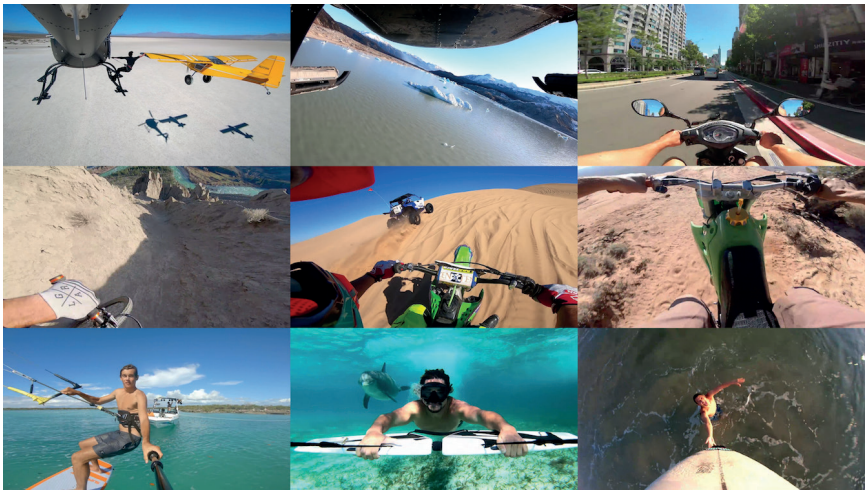


Fig. 1: Stills from the clip "Million Dollar Challenge", for which the GoPro was attached to an object.

Perspective

It is not always easy to determine the type of camera or even the manufacturer by means of any particular image that was used in production. What is most formative in the image is normally the choice of the lens: extreme distortions as with fisheye lenses, particularly prominent sharpness or a certain flatness in the image with wide focal lengths – these qualities come from the lens as well as from the connection that associates this element with the environment, from the properties of the film materials or sensors, or the light situation.[15] The camera thus plays a role in that it determines what lens can be used with it. Whether, for instance, it can simply be ground plastic parts, the mistakes of which can then be corrected afterwards by an algorithm, as is the case with the camera in a mobile phone,[16] or whether it is a professional digital camera, whose lens mount allows for using old lenses to create a look that is more similar to a film from the '70s than to a video image.

[15] In contrast to the film format, which is equally visible in the image, the lens has so far only rarely been the object of extensive analysis in film studies, cf. Florian Krautkrämer: "'Als blickten wir durch eine Glasscheibe in den realen Raum'. Objektive und die Analyse audiovisueller Medien," in: Dennis Göttel et al. (eds.): *Scheiben. Medien der Durchsicht und Reflexion*, Bielefeld 2017, pp. 41–54.

[16] Cf. Hito Steyerl: *Duty Free Art: Art in the Age of Planetary Civil War*, London, New York 2017, pp. 31ff.

In turn, the perspective of an image is dependent on what the camera allows in relation to the lenses, how heavy or manageable it is, and what possibilities for attaching are available. Aside from the handheld camera, the crane shot is certainly the most familiar form of use. For the last 40 years the fluid movement of the Steadicam has been seen often, which in the amateur realm can be achieved by a gimbal.[17] Real-time digital image stabilization, which the current iPhones automatically do for video recording, is also very close to the effect of a Steadicam. What has sometimes become a kind of fad in recent years, is drone footage, which has led, above all in the amateur realm and in clips that do not use any other footage than that taken by the drones, to very particular visual elements, which can be identified in many different examples. Aside from the extreme viewpoints, these are the movements of the camera drones, which, above all in their up and down movements, can clearly be distinguished from a crane shot or from footage taken from a helicopter.[18]

A comparable, equally recognizable perspective with the action-cam is dependent on the mount. The signature shot of the GoPro, which allows this camera to stand out from the abundance of video material of impressive athletic achievements, is that the shot can still show elements of the body on which the camera is mounted. The shots in the "Million Dollar Challenge" mentioned above not only show the subsurface on which the camera is mounted, they also exhibit a particular physicality in doing so, one that is clearly more dynamic than if the camera were mounted on the front of a vehicle during a rapid motorcycle or downhill ride, which, much like the Phantom Ride in silent films, would only convey the ride itself. The energy drink company and sports sponsor Red Bull maintains its own POV channel on its website that it dedicated to recording rapid sports events (mainly motocross, downhill, ski, and snowboard) in such a way that the audience at the computer monitor has the feeling of being there themselves.[19] The dominant visual element in the videos are the handle bar as well as the front wheel, which are both visible in the lower quarter of the image.

[17] The gimbal is a suspension on the camera, for instance on a drone of a handle, which balances and stabilizes the camera so that the image always appears straight and smooth. The balance, however, does not work like with the Steadicam or Cardan suspension, that is, by corrective mechanical counter-movements, but by calculating in real time and a suitably intervening electric motor.

[18] Cf. Jablonowski: "Dronies. Zur vertikalen Ästhetik des Selbst," op. cit., pp. 222–233.

[19] "I want the viewer to feel like they're coming with me, so I decide to do it all in POV." (Scott Hart: "Learn how to get the best POV footage using these top tips from pro rider Aaron Chase," 15.7.2016, https://www.redbull.com/se-en/pov-tips-for-mountain-biking (last seen: 2.7.2019).

Even if the camera and the mount are not visible themselves, it is clear to the participants that this footage was only possible because of the novel camera system of the action-cam. A less vehicle-based, but more body-focused counterpart to this footage is mounting the camera on the chest of the person filming, which means that the hands protrude into the image left and right if they are extended or the legs if one looks down. The physicality of these videos is triple: on the one hand the body parts of the person filming, such as the legs and arms, enter into the image and thus contextualize the camera. Furthermore, this positioning ties the camera back to a real body. The camera does not merge with this body, but it emphasizes that there is a real body behind it, and that its images can only be seen because this body is at just this spot. And third, a fascination for or rejection of these images is transferred to the spectators, which on the one hand is increased due to knowledge about the real camera/body,[20] but is also strengthened by the wide-angle lens of the camera, which can induce dizziness in the spectators. Much like the "body genres" that Linda Williams describes,[21] these clips show a strong physical action, thus evoking a physical reaction in the spectator. But unlike in the genres of horror, porn, and melodrama that Williams analyzed, the body is not treated (maltreated), but acted on, and the camera does not remain an observer, but becomes linked to the bodies that it is filming. This means that in the examples from Williams it is women's bodies as a rule that are acted on, while in the running clips it is usually men's bodies that, in contrast to the common way of reading body genres, precisely do not show "spectacles of feminine victimization,"[22] but the heroic elevation of the male.[23]

A camera that is positioned in the action in this way, participating in it, I call an "involved camera." The body behind this involved camera, which only partly protrudes into the image, is a body that both provides the image and at the same time is exposed to the image. The wide visibility of this camera/body on platforms such as YouTube or Facebook might lead us to forget that this is not at all about the use of the camera by private persons, but also by the police and the military. The development of so-called "body worn cameras" (BWC), that is, cameras that

[20] To distinguish from the camera body, that is, the camera as a physical object, I am using camera/body to describe the constellation of a camera attached to a body.

[21] Cf. Linda Williams: "Film Bodies: Gender, Genre, and Excess," in: *Film Quarterly* 4/44 (1991), pp. 2–13.

[22] Ibid., p. 6.

[23] The spectacle of feminine victimization appears even more strongly in another YouTube genre: the fail video, which often feature the mishaps of women.

autonomously record and therefore can be attached to police officers and soldiers so that they do not restrict or impede their actions, slightly preceded the GoPro.[24] It is nonetheless obvious that the advances in the GoPro with regard to manageability, versatility, and resolution reflects those of the BWCs or dashcams. The reason that the aesthetic element of the involved camera is primarily linked with entertainment is that the video material from police or military usage significantly less often published on the internet. The primary purpose of the images from these cameras is not to exhibit them, but to produce documents for use by the courts and/or the military. In evaluating them, it can later be determined from the material whether police officers or soldiers in a particular situation behaved correctly, or whether there was a breach of the law. At the same time, the cameras are meant to protect those wearing them from unjust accusations, just as they are also meant to give them a sense of security that any misconduct could be documented and tracked. Unlike in situations such as those of armed conflicts, the footage does not serve as self-representation or public documentation[25] and in most cases cannot be published online due to the right over one's own image. The influence that the camera has on the behavior of both police officers as well as those in contact with them is that of disciplining through surveillance, since it is not a question of anything else. The images do not primarily serve the purpose of entertainment, but have long become a component of the war over images. For images of police violence, which garner media attention in spectacular cases, are not those taken by the BWC, but from the opposite side, usually filmed with a mobile phone, documenting fatal shots and sometimes posted live online.[26] There is an important distinction to be made, whether the person filming is involved in the conflict or whether there is a third position in the form of an embedded journalist.

[24] "Britain straps video cameras to police helmets," *Associated Press*, 13.7.2007, http://www.nbcnews.com/id/19750278/ns/world_news-europe/t/britain-straps-video-cameras-police-helmets/#.VN-wl_nF8y4 (last seen: 7.1.2019). On the current development see Peter Hermann: "Police officers with body cameras are as likely to use force as those who don't have them," in: *The Washington Post*, 20.8.2017, https://www.washingtonpost.com/local/public-safety/police-body-camera-study-finds-complaints-against-officers-did-not-drop/2017/10/20/4ff35838-b42f-11e7-9e58-e6288544af98_story.html?noredirect=on&utm_term=.ad63aff18cb1 (last seen: 7.1.2019)

[25] Cf. for instance Mette Mortensen: "The Camera at War: When Soldiers Become War Photographers," in: Rikke Schubart et al. (eds.): *War Isn't Hell, It's Entertainment: Essays on Visual Media and the Representation of Conflict*, Jefferson 2009, pp. 44–60.

[26] On the conflict between civil use of the handheld camera and the military deployment of firearms in the Syrian Civil War, see Rabih Mroué's video-lecture "The Pixelated Revolution." The text for this was published here: "The Pixelated Revolution," in: *The drama review* 3/56 (2012), pp. 25–35.

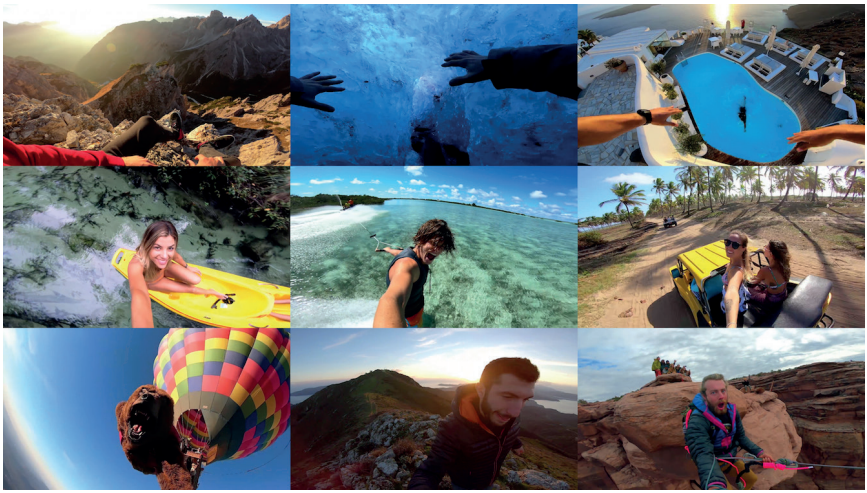


Fig. 2: Stills from the clip "Million Dollar Challenge", for which the GoPro was held or attached to the body.

This kind of reporting is indeed not objective – Judith Butler describes it as the perspective of the Department of Defense[27] – but it is also less directly part of the conflict.

In the conflict over sovereignty, the BWC also turns the mobile phone into a weapon. The president of the Baden-Württemberg police union has summarized the demands for introducing so-called body cams exactly in this sense: "The reason is simple. In the age of video phones our colleagues have had enough of always only being filmed when they act. No one is interested in what led to the action, what activities, insults, etc. have occurred."[28]

Marketing

Thanks to the GoPro and the development of action-cams, BWC are no longer only reserved to just the police and the military.[29] The degree to

[27] Cf. Judith Butler: "Torture and the Ethics of Photography," in: *Frames of War: When Is Life Grievable*, London 2009, pp. 63–100, here p. 66. See also Martin Bell: *War and the Death of News: Reflections of a Grade B Reporter*, London 2017, p. 127: "We had traded freedom for access."

[28] Police Union Baden-Württemberg: "Und wer schützt die Polizei?" *GdP-Digit@I* Nr. 17/2014, online: https://www.gdp.de/gdp/gdpbw.nsf/id/DE_GdP-Digital-Nr-17-2014 (last seen: 4.8.2018).

[29] On the use of the GoPro by terrorist groups, see also the contribution to this volume by Simon Menner (pp. 135–152).

which the image of surveillance technology has made gains due to related consumer electronics would be an interesting question to examine further. Alongside self-documentation and promotion by athletes, the pictures are also becoming visible in armed struggles in which one side does not belong to any official organization and the conflict is thus also continued on various platforms in the internet. For a few years now we have been able to watch footage from the Syrian Civil War, made by the opponents of the Assad regime, in which the fighters usually attached the cameras to their helmets, thus filming and uploading videos from street fighting. If you type the words "Syria GoPro" into the YouTube search bar, you get a long list of a wide variety of videos that all have one thing in common: the word GoPro is either in the title or the description, or it has been tagged with this video. Even if civil wars are not among the applications suggested by the company GoPro as possible uses for your camera, this uncommon example does make it clear that the name of the company as well as its camera has long become a synonym for a certain type of images. GoPro stands for an involved camera, closely linked with the body of the person filming and thus able to deliver video material directly from the action. This goes for practically any filmable scenario. If you only search the word "GoPro" on YouTube, you usually end up with video material that was shot with a GoPro, whereas the search for other camera manufacturers tends to lead to the camera being searched for, that is, reviews, comparisons, and unboxing videos. This deep identification of the user with the camera brand, which is so strong that it is even mentioned in the title, is the actual innovation that GoPro signifies for the field of amateur film.

The linking of amateur image production with a camera manufacturer is not the invention of GoPro. As early as 1987, Richard Chalfen speaks of "Kodak culture" in his examination of amateur photography and film.[30] At any rate, Chalfen is referring less to a concrete manufacturer and its specific products. For him, Kodak – borrowing from the Kodak Moment[31] – stands for the need to capture certain moments in one's

[30] Richard Chalfen: *Snapshot Versions of Life*, Bowling Green 1987, p. 4.

[31] Cf. Oxford Dictionary: "Kodak moment (noun): An occasion suitable for memorializing with a photograph. […] Origin: 1980s: from Kodak, the proprietary name of a photography company, + moment." (https://en.oxforddictionaries.com/definition/kodak_moment, last seen: 30.12.2018). But the Kodak moment also describes the situation in which a company misses important changes in its field and is pushed out of a leading position to the point of closing down. (Ironically the use of the term "GoPro moment" would cover both definitions.) In the meantime there is an app under the name Kodak Moments, with which one can order prints of one's digital photos and share them on the associated website.

own life in photographs. Nonetheless, discussions about technology in the amateur realm are nothing new. The variety of production and differences between equipment were already being discussed in the field of American amateur film during the '50s.[32] This discussion increased with the introduction of video cameras in the '90s.[33] Even before YouTube, amateur films and home movies cannot be seen as isolated entities. In her examination of home movies, Alexandra Schneider has pointed out that the desire to participate in the discussion always already involved producing and circulating.[34] It is one of the achievements of GoPro, not only to stand as a synonym for the camera type action-cam, but to have subsumed this desire for participation as well as the opportunities for circulation made possible by platforms like YouTube into the marketing of their cameras. Instead of elaborate marketing campaigns in various media, the company focuses on its strong presence on YouTube, where the GoPro channel was one of the ten most successful platforms for a long time,[35] as well as its acceptance by surfers, mountain bikers, and other athletes.[36] Not only does this allow GoPro to gain voluntary identification of the users with the brand to monetize amateur productions,[37] it also creates a model of what kind of images and clips should be produced with the camera. Of course family home videos on YouTube are also a product of the videos surrounding them, for as long as they are not automatically uploaded out of the camera, their form is also an attempt to consciously approximate or make distinctions from existing contents. But by identifying the footage as a GoPro clip, one selects a discursive field that is decidedly related to the camera manufacturer.

In order to analyze amateur films that are recorded with a GoPro, not only must the visual material itself be consulted, but also the environment that it uses and thus steers for brand communication and market positioning, as well as the technical environment in which the camera is embedded. If, borrowing from Chalfen, we summarize this focus as

32 Zimmermann: *Reel Families*, op. cit., p. 118.

33 Laurent Creton: "Le Marché du Caméscope. Innovation et logique de développement," in: Roger Odin (ed.): *Le film de famille. Usage privé, usage public*, Paris 1995, pp. 191–205.

34 Cf. Alexandra Schneider: *Die Stars sind wir. Heimkino als filmische Praxis*, Marburg 2004, p. 50.

35 Cf. Andrea Chang and Chris O'Brien: "GoPro is gearing up to share more of its users' videos," *LA Times*, 30.9.2014, http://www.latimes.com/business/la-fi-gopro-20140930-story.html (last seen: 7.1.2019).

36 Cf. James Trew: "Extreme exposure: Inside GoPro's burgeoning media empire," in: *engadget*, 29.5.2014 https://www.engadget.com/2014/05/29/gopro-media-business/ (last seen: 7.1.2019), as well as his contribution to this volume pp. 167–175.

37 Cf. Martin Lister: "Introduction," in: Martin Lister (ed.): *The Photographic Image in Digital Culture*, London and New York 2013, p. 2.

"GoPro Culture," then the brand name should not merely be understood as a place marker and synonym in the sense of the still unfounded camera studies, but also as the commitment to look at the influence and aesthetics of this concrete technical apparatus.

USING VERSATILIY

Footage Redux: Revisiting Cartographic Captures of Time

Nanna Verhoeff, Iris van der Tuin

Footage:

1. In motion pictures, a measure of film taken in feet. There are 16 frames to every foot of 35mm film and the film travels through the projector at a rate of 1.5 feet per second.
2. A generic term for an amount of uncut film, or video rushes: see also archive.[1]

Redux:

Definition of redux: brought back used postpositively.
In Latin, redux (from the verb reducere, meaning "to lead back") can mean "brought back" or "bringing back".[2]

This article is an extension of an earlier published article with a very similar title: "Footage: Action Cam Shorts as Cartographic Captures of Time" authored by one of us.[3] *In our collaborative revisiting of this short essay on short films shot by action cameras, we not only want to extend on what was tentatively argued there, but we also want to take the practice of dialogic revisiting seriously. This, here, refers not only to our object – footage as the "raw" moving images of captured earlier movements that allow for (repetitious) replay – but also to our method of revisiting as a rewriting of thought. This latter form of intellectual replay incorporates a diffractive perspective.*[4] *Diffraction as the Harawayian-Baradian reading of oeuvres through one another in order for new conceptualizations to come to the fore presents itself when, while revisiting our object, the philosophy of Bergson turns out to be (have been) a film-philosophy of video footage and a philosophy of the technology of action cameras. Thus, although the prefix "re" suggests a going back, a "retrograde movement" much despised by Bergson,*[5] *it is intrinsically a moving forward for change, creativity, novelty.*

In this article we return to a focus on short videos of footage shot with action cameras, i.e. action-cams, body cams, GoPros, drones. Typically, these action shorts consist of unedited footage, often single takes,

1 Daniel Chandler and Rod Munday: *A Dictionary of Media and Communication*, in: Oxford Reference: [2011] 2014. http://www.oxfordreference.com/view/10.1093/acref/9780199568758.001.0001/acref-9780199568758 (last seen: 7.2.2020), DOI:10.1093/acref/9780199568758.001.0001.

2 Merriam Webster: https://www.merriam-webster.com/dictionary/redux (last seen: 7.2.2020)

3 Nanna Verhoeff: "Footage: Action Cam Shorts as Cartographic Captures of Time," in: *Empedocles: European Journal for the Philosophy of Communication* 1&2/5 (2015), pp. 103–109.

4 Iris van der Tuin: "'A Different Starting Point, A Different Metaphysics:' Reading Bergson and Barad Diffractively," *Hypatia: A Journal of Feminist Philosophy* 1/26 (2011): pp. 22–42.

5 Henri Bergson: *The Creative Mind: An Introduction to Metaphysics*, Mineola/NY [1934] 2007, p. 11.

captured by small digital cameras *in action*, often strapped to helmets, skateboards, pets, remote-controlled flying drones, or other vehicles for transportation. The shorts are widely disseminated on online platforms for video sharing, such as YouTube, Instagram, or Vimeo, or other social networking sites as part of *vlogs* – video diaries in serial form that subscribers can follow – or separate, independent videos. While perhaps not intrinsically "short" in terms of duration – any footage can be of any length before being edited, shared, or shown in order to perform on the platforms just mentioned – the aesthetics of primarily single-shot "action" imagery we take as paradigmatic for not only their format, but also their onto-experiential essence as it emerges processually and relationally with the camera and the filming and/or viewing body.

The film form of action cam footage – between making and viewing – asks, if not demands, shortness for viewing on the micro screens of mobile devices, a visually compelling yet narratively straightforward editing, and small file size for easy uploading and sharing on online platforms. More importantly, the aesthetic of these shorts is not only bound up with their length but is characterized by speed, instantaneousness, improvisation, and a highly personal mode of address. This navigational address, as both visual and cultural form, has a longer tradition going back to painted panoramas and other pre-cinematic visual technologies, as well as early cinema's emblematic first-person images shot from speeding trains, so-called phantom rides. Widely disseminated and embedded within the social networking sphere, today's action-cam footage takes part in this visual regime of navigation – a persistent and pervasive trope in modern visual culture – by providing moving-image cartographies of time. Action-cam footage as more than a historico-cultural object of analysis, it is also an object to think with, inviting a revisiting of the interlinked concepts of materiality, spatiality, and temporality.

Recapture

Footage, here, both refers to raw, unedited moving images and a length measure (foot) for film stock, an etymology that implies an intrinsic relation between the materiality (film stock), space (length), and time (duration) of moving images. From its etymology, *footage* is perhaps an emphatically analogue term. This intersection of meanings, however, opens up the possibility to think beyond a separation of the registers of materiality, spatiality, and temporality. In its use, footage denotes not the substitution of one by the other that we know so well from our linear

understanding of time in terms of space – a spatialization of time as a rationalist move[6] – but rather the *intersection* of time and space in the temporalization of space that is inherent in the mobility of the moving-moving image. This is the mobility that can also be read in the word "footage" as it refers to the feet that make the walk, so to speak. As a mode of visualization for space *via* mobility, these shorts constitute a *performative cartography*: a visual mapping of space in the duration of the emergent process of navigation through that space. Thus, space cannot be used as paradigmatic for linearity here, as Bergson does, because space is precisely what is experienced *in* time, i.e., intuitively and durationally, and not used as a container for rationalistically understanding time.

In this reflection, we want to raise the question of how the personal tour – communicated by first-person perspective images – can be considered a moving and visual inscription or capture of navigation into a performative cartography that is, in its processual nature, both spatial and temporal. We use quotation marks here because the personal that is emphasized in this type of (shared) footage is constructed by capture, sharing, and re-capture. This is, we would contend, the paradox of the re-embodied image of action-cam footage.

At the same time, this paradox can be looked at differently with Bergson, especially when read through the oeuvre of Karen Barad. The *constructedness* of the personal can be overcome (or undone) when the process of *experiencing* the captured is considered "intuitive" in the sense of Bergson and perceived as happening, just like the sharing, in an "apparatus" (Barad). The phenomenon of finding oneself captivated in and by what was shot with an action-cam is an experience on the border of past and future. The "watching" technobody is at the center of the footage just like the networked-camera-strapped-to-a-body is, as conductor, at the center of *sharing*. Viewer and conductor are defined by experiencing movement; it is not just the original body being in movement nor only the reception of movement, first on the side of camera and subsequently by the viewing body. What we are proposing here is that the Bergsonian debunking of film as an intellectual (not intuitive) affair of mechanistic spatialization (not experiential duration) is no longer necessary when read through Barad's agential realism and with action-cam footage. What we see here is not *film* as a unidirectional spatialization of time, but rather *footage* as a "temporalization of space."[7] Movement is not only cut up

6 Bergson: *The Creative Mind*, op. cit.

7 Cf. Donato Totaro: "Time, Bergson, and the Cinematographical Mechanism: Henri Bergson on The Philosophical Properties of Cinema," *Offscreen* 1/5 (2001), n.p. https://offscreen.com/view/bergson1 (last seen: 21.2.2020).

in static frames rendered in linear fashion but it is also and at the same time performed in the conductor and "in" the body of the captivated viewer. Agential realism precisely bridges conductor and viewer, ascribing a posthumanist performativity to both.[8]

Sugar Rush

The quintessential Bergsonian example of durational experience of time pertains to the watching of a sugar cube melt in a glass of water.

> If I want to mix a glass of sugar and water, I must, willy-nilly, wait until the sugar melts. This little fact is big with meaning. For here the time I have to wait is not that mathematical time which would apply equally well to the entire material history of the material world, even if that history were spread out instantaneously in space. It coincides with my impatience, that is to say, with a certain portion of my own duration, which I cannot protract or contract as I like. It is no longer something *thought*, it is something *lived*. It is no longer a relation, it is an absolute. What else can this mean than that the glass of water, the sugar, and the process of the sugar's melting in the water are abstractions, and that the Whole within which they have been cut out by my senses and understanding progresses, it may be in the manner of a consciousness?[9]

We suggest that this fragment is both helpful and dated. Bergson's famous reflection distinguishes between "mathematical" time, the time of linear spatialization through intellectual rationalization, and lived time, the time of one's own duration coinciding with duration in an apparatus. The latter temporality is, we argue, what is experienced by the viewer of action-cam footage, albeit perhaps not through impatience. Being "carried away" by an enthralling skateboard ride, experienced through mediation, one experiences a rush, the burst of energy of adrenaline and excitement – a metaphorical drinking of the sugar water rather than the witnessing of its making and the anticipation of, perhaps, its taste. Notably, this viewer might as well be the person that originally had the camera attached to her body – or extension thereof – or anyone else. Thinking-with a different technology (i.e. the action camera) and thus positioning "the viewer" in a different apparatus (networked-camera-strapped-to-a-body and/or body-watching-footage-online) further complicates Bergson's famous fragment and its potential role in theory.[10] In our case, the experience is

[8] Karen Barad: *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*, Durham, NC 2007.

[9] Henri Bergson: *Creative Evolution*, London 1911, p. 10 (emphasis in original).

[10] It has been argued elsewhere that Bergson's take on early film needs complication. See Totaro: "Time, Bergson, and the Cinematographical Mechanism," op. cit. and see also Nanna Verhoeff: *The West in Early Cinema: After the Beginning*, Amsterdam 2006.

always already both first and second-hand as the revisiting affordances of action-cam footage, and of film as such,[11] dissolve the distinctions between the "original" rider and the media consumer, and between mathematical and lived time. Viewer and consumer *can* in fact "protract or contract" "a certain portion of [one's] own duration" as one likes, and this rationalist procedure adds to both our understanding of video footage and to a philosophy of the technology of action cameras. It is *as if* a non-protracted or non-contracted viewing is lived, whereas the camera footage showing a ride from the perspective of the camera eye, the lens, has no human reference point but from a posthuman perspective is embodied, nonetheless.

Unboxing

Let us (figureatively) unbox the action-cam and continue with the *specs* of the device and the characteristics of the visual style that the small camera affords. Micro-sized to fit in the palm of a hand but not to be held in one, the camera is specifically designed to be mounted on, or strapped to, a harness, helmet, dashboard, or action-cam pole – a stick popular for its ability to include yourself in the shot "in action," while shooting the video: a moving-image selfie. On one of many websites that offer tips on making action-cam footage, specifically for practitioners of so-called "extreme sports" or free running, the pole cam is particularly useful for versatility:

> All the riders we spoke to are big fans of the pole cam. The key is its versatility. Strapping a bit of rubber for grip lets you do a lot. Put your hand out in front of you, and you've got your mug, a good chunk of your body and the slope you just blasted down. Stick it off to the side, so you can watch your blades carve into the snow. Throw your arm back behind you, and you get a really cool follow shot of your approach and surroundings. Put it on an extendable pole and those angles are even more exaggerated, including much more of yourself and whatever terrain you're traversing. Stuff the pole in a backpack and have it shoot straight down at you for a very unique angle.[12]

Without the small flip-out LCD screen that camcorders have, the wearable action camera is very versatile indeed. When shooting the image, however, one cannot simultaneously see the footage, making it different from the

[11] See William Uricchio: "Cinema as Detour? Towards a Reconsideration of Moving Image Technology in the Late 19th Century," in: K. Hickethier, E. Muller and R. Rother (eds.): *Der Film in der Geschichte*, Berlin 1997, pp. 19–25.

[12] Brent Rose: "How to Get Better Action Cam Footage," in: *Gizmodo*, 14.02.2003, http://gizmodo.com/5983584/getting-better-action-camera-footage (last seen: 1.4.2019).

"making-the-ride-while-taking-the-ride" type of image that one of us has analyzed elsewhere as a literally self-reflexive doubling of viewpoint characteristic of footage shot by camcorders – in a way the predecessors of action-cams.[13] With the action-cam, the viewer becomes a posthuman subject, the camera-subject, which indeed draws a connection between early-cinema and digital filming in that the camera-eye-in-motion is doing the looking rather than the witnessing. The traveling camera-eye marks the perspective and thereby anchors, and thereby situates, the attraction vis-à-vis the spectator.[14] It must be noted, however, that the specificity of the action-camera-subject cannot be translated one-to-one to the cyborgian subject in that the camera is not only an extension of the human eye but also, and perhaps more emphatically so, offers a non-human perspective to be grasped by any human in a (non)chronologically second instance of re-embodiment.[15]

Typical for action-cam footage is the fish-eye image of the point-of-view shots, the (sometimes exaggerated) emphasis on movement, unexpected camera angles, and rapid succession of viewpoints. The effect is much like a visual roller coaster – a ride that in some cases seems to defy the rules of gravity. While the camera has a built-in microphone, the sound is not the best, but typical for most short videos uploaded on YouTube, Instagram, or Vimeo is the emphasis on extreme images rather than (diegetic) sound, and while the image often lacks extensive editing, a soundtrack is sometimes added later to enhance the spectacle.[16]

Like most gadgets today, the camera is a hybrid device that encompasses different technologies for shooting, quick editing, and sharing. While being a digital device, action cameras bring an "analogue" and "digital" logics of navigation together by simultaneously shooting footage and tagging this footage with tracked GPS data. The tracking of GPS data allows for the stitching together of camera image and location data, and with software micro maps can be included in the image. GPS tracking

13 Nanna Verhoeff: *Mobile Screens: The Visual Regime of Navigation*, Amsterdam 2012.

14 Tom Gunning: "The Cinema of Attractions: Early Film, Its Spectator and the Avant-Garde," in Thomas Elsaesser and Adam Barker (eds.): *Early Cinema: Space, Frame, Narrative*, London, pp. 56–62; Frank Kessler: "The Cinema of Attractions as Dispositif," in: Wanda Strauven (ed.): *The Cinema of Attractions Reloaded*, Amsterdam, pp. 57–69; Frank Kessler: *Notes on Dispositif*, 2007, unpublished.

15 Cf. Donna Haraway: "A Cyborg Manifesto: Science, Technology and Socialist-Feminism in the Late Twentieth Century," in: David Bell and Barbara M. Kennedy (eds.): *The Cybercultures Reader*, London, New York, [1985] 2001, pp. 291–324, here pp. 294; Sheenagh Pietrobruno: "Medianatures," in: Iris van der Tuin (ed.): *Gender: Nature*, Farmington Hills, MI, 2016, pp. 103–116, here p. 107.

16 We are indebted to Lena Verhoeff and August Voskuil for alerting us to the aspect of sound in action cam footage.

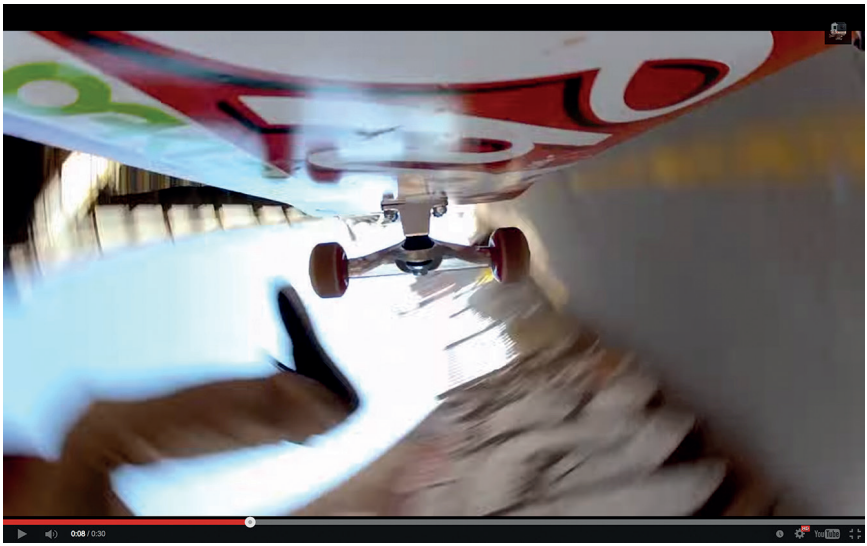


Fig. 1: Screenshot of a commercial for the GoPro camera with skateboarder Ryan Sheckler, imitating the style of popular amateur action videos.

brings about the issue of surveillance. Especially the use of consumer drones such as quadcopters or ar.drones with strapped-on cameras is currently sparking discussion about new regulations for safety, privacy, pervasive and invasive technologies of surveillance, and principles of tracking and tracing by ubiquitous location-based technologies. The aesthetic of the *personal* ride, indeed, relies on that otherwise controversial and socially and politically charged aspect. A meeting of social controversy over new visual technologies and the popularity of spectacular aesthetics is, indeed, a recurring media-historical tradition that we also know from the years when cinema was a new medium. Let us now zoom in on the spatio-temporal dynamics that this aesthetic entails.

From a media-archaeological perspective we can trace a fascination with first-person perspective short films to early cinema's phantom ride in the use of point-of-view and the dizzying effect of heightened mobility and versatility. The distinction of and relation between *making* and *taking* the ride, traversing from early cinema to contemporary handheld cameras and video game simulations is one between the experience of virtual travel as provided by phantom rides of early cinema and beyond – the staple cinematographic effect of a moving perspective, thrusting the spectator into the depth of field, created by mounting a camera on a moving vehicle, such as a train – and that of experiencing this mobility first-hand, while handling a camera or joystick and shooting the footage

oneself. The action-cam seems to be a variation and, as we argue, perhaps also an extension of the same fascination, emphasizing the vitality of the image and the agency of using the technology to make the image. This vitality combines the suggested *liveness* of the image-in-motion with the vicarious and delayed experience of first-person perspective – a term that is inherently misleading, as every camera image is the first-person perspective of the dis-embodied and now re-embodied camera-eye, the extending technology, but in the case of a mobile camera simulates an embodied perspective. Interpreted as live and first-hand, the footage suggests we can re-embody the action. This entails a paradox of, on the one hand, witnessing the action as if one were in the action, as the one holding the camera, yet, on the other, experiencing the action via the unreflected perspective of the camera – a re-embodied *possible impossible.* Moreover, the availability of digital technologies – the cheap miniature cameras, editing tools, and platforms to share the images with others – emphasizes a personal closeness of shooting, sharing, and viewing the short videos, multiplying the action of the networked camera as apparatus.

Pepita Hesselberth has effectively demonstrated that in feature film similar techniques contribute to an authenticity effect of this, what she has called, "handheld aesthetics" – the use of images of "ostensibly handheld equipment" that both "feeds on the viewer's spatio-temporal disorientation within the film's diegesis, as well on his or her impulse to anticipate what is yet to come."[17] Indeed, whether simulated with the shaky shots of handheld cameras, or shot with action cameras strapped on a helmet, a moving vehicle, or a flying drone, the point-of-view image both orients and disorients. The viewer follows the point-of-view shot from an emphatically embodied position, yet is offered dazzling perspectives never before witnessed. Like early cinema's phantom ride, these shots show *possible impossibilities*. However, these contemporary action cameras more emphatically enable a repetition – or rather, revisiting – of one's own personal endeavors – movements – in the aesthetic of a second-hand, cinematic disembodied perspective. Moreover, like the earliest phantom rides, the shorts are not embedded in larger narratives but in concentrated form present in this aesthetic of "action shorts," a specific overlap of shortness in form, in content, and in duration.

[17] Pepita Hesselberth: *Cinematic Chronotopes: Here, Now, Me*, New York, London 2014, p. 52.

Detours

In his essay "Spatial Stories," Michel de Certeau makes a distinction between (abstract) maps and (personalized) tours.[18] While these two forms of spatial representations – map-like, disembodied overviews versus first-person perspective tours – seem fundamentally different, if not opposing, the action-cam forges a connection between the two by using real-time inscription of navigation into captured moving images that can be re-embodied upon (re-)viewing. Moreover, the GPS coding of the video enables a later insertion of micro maps or other data overlays within the frame of the video.[19] This combination – well-known from computer games and related to layered frames of Augmented Reality[20] – enables a path-like interpretation of the potentially disorienting effect of the images' hyper-perspective: a point of view of disembodied camera angles that is re-embodied in the construction of a first-person perspective.

Fig. 2: Footage with data overlay – an image we know well from computer games.

[18] Michel de Certeau: *The Practice of Everyday Life*, Berkeley, [1974] 1984, pp. 18–22.

[19] For a discussion of de Certeau's distinction between maps and tours and the use of maps in games, see Mary Fuller and Henry Jenkins: "Nintendo® and New World Travel Writing: A Dialogue," in: S. Jones (ed.): *Cybersociety: Computer-Mediated Communication and Community*, Thousand Oaks, CA, 1995, pp. 57–72 and Henry Jenkins: "Game Design as Narrative Architecture," in: N. Wardrip-Fruin and P. Harrigan (eds.): *First Person: New Media as Story, Performance, Game*, Cambridge 2004, pp. 118–130.

[20] Nanna Verhoeff: "A Logic of Layers: Indexicality of iPhone Navigation in Augmented Reality," in: L. Hjorth, J. Burgess and I. Richardson (eds.): *Studying Mobile Media Cultural Technologies, Mobile Communication, and the iPhone*, London, New York, 2012b, pp. 118–132.

The spectacle of possible-impossible viewpoints, combined with the means to track and trace the movements by GPS data, provides a double cartography of map and tour. Besides the obvious inclusion of maps in the image, the footage itself, as a recording of movement, can be understood as a performative cartography in motion – a tracing of paths taken, in the process of going. Here another theoretical movement of making the film-philosophy of Bergson precise must also be made. Because whereas Bergson suggests that film is spatialized time *par excellence*, which we have adjusted above to footage as a temporalization of space, action cam footage shows prototypically that "certainly film is only an illusion of movement, but for film to exist there can be no immobility."[21]

The tracing of a path in the process of going is all about undecidability, hence, durational, creative time. The footage is nothing but *one* actualization of *all* paths possible, of the virtual. Nowhere does this allow for a retrograde movement, as the footage does not afford (the suggestion of) "a reverse projection of the real."[22] Re-embodying this actualization through watching, the viewer of action-cam footage finds herself in motion which also affects our thinking of the moving image itself: "If the indicator of duration and change rests on the individual consciousness perceiving the art work then film can not be neglected because, regardless of its mechanical process, the film will still 'grow' and 'gnaw' into a person's consciousness."[23] The following lengthy quote from *Duration and Simultaneity* unravels the apparatus of re-embodiment when a body watches footage online:

> [...] it is of the very essence of our attention to be able to be divided without being split up. When we are seated on the bank of a river, the flowing of the water, the gliding of a boat or the flight of a bird, the ceaseless murmur in our life's deeps are for us three separate things or only one, as we choose. We can interiorize the whole, dealing with a single perception that carries along the three flows, mingled, in its course; or we can leave the first two outside and then divide our attention between the inner and the outer; or, better yet, we can do both at one and the same time, our attention uniting and yet differentiating the three flows, thanks to its singular privilege of being one and several. Such is our primary idea of simultaneity. We therefore call two external flows that occupy the same duration "simultaneous" because they both depend upon the duration of a like third, our own; this duration is ours only when our

[21] Totaro: "Time, Bergson, and the Cinematographical Mechanism," op. cit. Obviously, for a spectator to experience this movement, she needs to be immobile. About this paradox of mobility and immobility in cinematic spectatorship, see Anne Friedberg: *The Virtual Window: From Alberti to Microsoft*, Cambridge, MA, 2006.

[22] Elizabeth Grosz: *Time Travels: Feminism, Nature, Power*, Durham, NC, London, 2005, p. 107.

[23] Totaro: "Time, Bergson, and the Cinematographical Mechanism," op. cit.

> consciousness is concerned with us alone, but it becomes equally theirs when our attention embraces the three flows in a single indivisible act.[24]

Here it is made explicit that the "apparatus" of watching either something in nature or something on-screen involves the coming together of, or experienced disjunction between, at least two durations. This is precisely where and how we understand *liveness* or the impact of the first-person, if not first-hand perspective. The fact that we easily bring "something in nature and something on-screen" together reminds us of the apparatusness of all human situations, on the one hand, and, on the other, of the foundational re-embodiment of every experience beyond the projection of a human consciousness closed up in her own experience (a so-called brain-in-a-vat),[25] hence even of the "original" navigating subject (in our example above, a skateboarder).

While hardly maps in the strictest sense, as cartographic captures of time and temporality, action-cam footage provides a fundamentally experiential construction of space by means of a visual inscription of navigation that is at once abstract and personal, dis-embodied and re-embodied. Taken as exemplary for today's preoccupation with navigation and the mobile screens and other gadgets that allow for personal tracking, image-making, and sharing, the short videos of action cams signify a convergence of trends. Versatile, playful, and shareable, they are both ephemeral and significant. Indeed, they are footage, taken in the double meaning of raw, unedited, and short moving-images, and analogue measure of distance travelled, yet signifying in this conjunction the duration in both. The gripping shorts of the action-cam thus produce fundamentally, doubly-personalized cartographic captures – the snapshots of our time.

[24] Henri Bergson: *Duration and Simultaneity: Bergson and the Einsteinian Universe*, Manchester, [1922] 1999, p. 36.

[25] Bruno Latour: *Pandora's Hope: Essays on the Reality of Science Studies*, Cambridge 1999.

Pure, Clinical, Shiny Surfaces
Recreational Drones and Images of Construction and Destruction

Tobias Conradi

In cultural theory, 'Unmanned Aerial Vehicles' (UAV) or 'drones' are most prominently discussed with regard to their military employment or in the context of surveillance. The approaches range from philosophical examinations[1] and sociological conversations[2] to media theoretical argumentations of 'drone logics'[3] and artistic revisions.[4] These articles usually focus on the ethical questions of remote killings, on the ubiquity of sensors as a prerequisite of drones,[5] on the strict verticality of the operational images,[6] on the collection of data that is made possible by drones, and on the databases behind the human-machine assemblage, which builds the background for the military deployment of UAVs. This may lead to a perspective in which (recreational) drone images and their dissemination in social and editorial media are merely – if at all – regarded anecdotally as an "abuse of army equipment."[7] At the same time, as Julia M. Hildebrand writes in her ethnographic study on recreational drone usage, there has been a

> [...] drastic increase in civilian drone use and the respective image production has resulted in the creation and growth of multiple online archives thematically or geographically organizing thousands of drone-generated photos and videos.[8]

And it is these "insightful and often breathtaking"[9] images that I will analyze in the context of their localization in free-time, commercial, and

1 Grégoire Chamayou: *A Theory of the Drone*, New York 2015.
2 Zygmunt Baumann and David Lyon: *Liquid Surveillance: A Conversation,* Cambridge/Mass. 2013.
3 Mark Andrejevic: "Theorizing Drones and Droning Theory," in: Aleš Završnik (ed.): *Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance*, New York 2016, pp. 21–43.
4 Hito Steyerl: How Not to Be Seen: A Fucking Didactic Educational.MOV File, 2013, video (color, sound) 14 min.
5 Andrejevic: "Theorizing Drones and Droning Theory," in: Završnik (ed.): *Drones and Unmanned Aerial Systems*, op. cit.
6 Volker Pantenburg: "Working images: Harun Farocki and the operational image," in: Jens Eder and Charlotte Klonk (eds.): *Image Operations: Visual Media and Political Conflict*, Manchester 2016, pp. 49–62.
7 Friedrich A. Kittler: *Gramophone, Film, Typewriter*, Stanford 1999, p. 97.
8 Julia M. Hildebrand: "Situating Hobby Drone Practices," *Digital Culture & Society* 3, no. 2 (December 20, 2017), pp. 207–218, here p. 213.
9 Ibid., p. 214.

(citizen-)journalistic usage. Mainly I want to examine distributed images that are recorded by private individuals and uploaded online. Even the early approaches to military drones show that there are uses for drones in leisure time that are worth examining:

> Following in the footsteps of the model enthusiasts of the 1960s, there today exists a whole little community of amateurs who buy or construct drones at the cost of a few hundred dollars. With their microcameras on board, these machines make it possible to produce unofficial little films, some of which are strikingly beautiful. I am thinking in particular of a flight over New York in which, once over the Brooklyn Bridge, the camera scans the facades of the skyline, ending up by gliding past the flame on the Statue of Liberty. Proof enough of the validity of Walter Benjamin's thesis that technology, today used for death-dealing purposes, may eventually recover its emancipating potential and readopt the playful and aesthetic aspirations that secretly inspire it.[10]

The starting point for my observations is the affinity/kinship between drones and action-cams, mainly based on the following aspects:

- The light weight, small size, and thereby easy mountability of the action cameras make them the perfect companion for drones.
- Drone images can help to ground and situate the often vertiginous first-person GoPro images, for example of practitioners of parkour.
- Drones can balance the jolting movements of cameras that are small and mobile. However, it is not the drone itself stabilizing the image, but the matched combination of the drone, its camera gimbal, its inertial measurement unit (IMU), and the gimbal control unit (GCU). This algorithmically controlled assemblage enables seamless movements on the X, Y, and Z axes of the drone.[11]
- Action-cams usually have a fixed focal length with no zoom. In combination with a drone, the movement of the camera eye is facilitated.
- Action-cams are especially useful for images with a large depth of field. Drones, enabling the elevated capturing of images, hence benefit from the deep focus of action cameras.
- Action cameras usually come with a fixed wide-angle lens, equivalent to a 16-33mm field of view. Hence, the drone operator can make the most of the already elevated point of view of the drone.[12]

[10] Chamayou: *A Theory of the Drone*, op. cit., p. 78.

[11] Cf. Fintan Corrigan: "Drone Gimbal Design, Parts and Top Gimbals for Aerial Filming", in: *DroneZon*, 16.9.2019, https://www.dronezon.com/learn-about-drones-quadcopters/drone-gimbal-design-components-parts-technology-overview/ (last seen: 15.4.2019).

[12] E.g. the Go-Pro 6: https://gopro.com/help/articles/question_answer/hero6-black-field-of-view-fov-information (last seen: 15.4.2019).

Two classes of images form the main focus of this paper. Both hold a special relationship to the hypermobile, small, and high-resolution cameras that are mounted on drones:

a) Drone images of the construction of Apple Park. These short clips, mainly distributed via YouTube, can be regarded as private or semi-professionally produced image-films, which enable a viral marketing for the company Apple.

b) Drone videos produced in the face of natural disasters. These clips contain sometimes privately and rarely editorially produced bird's-eye perspectives on devastated landscapes. Many of these clips are produced by private individuals and disseminated via YouTube. Afterwards they often get licensed, branded, and used by editorial mass media.

My analysis sheds light on the uses and aesthetics of drones and action cameras apart from military usage. I also claim that the aesthetics of these videos maintains a close relationship to their mode of circulation.

1. Construction: Immaterial Aesthetics

Apple Park

The plan for the new Apple campus – 'Apple Park' – was introduced at a meeting of the Cupertino City Council by Steve Jobs on June 7, 2011. Jobs was still involved in designing the new campus during his lifetime, but the overall architecture was planned by the famous architectural office Foster & Partners. A suburban landscape of 175 acres[13] is now filled with an annular building of 260,000 square meters. Only extending on four floors above the ground, the building can host up to 12,000 employees.

The ring, also called 'Spaceship,' is mainly built of glass on its inside and outside – a fact that lead to reports at the beginning of 2018 that, already on its very first day of use, seven employees were injured when they walked into the glass doors.[14]

What sounds like a simple anecdote at first hearing becomes more meaningful in the context of a building that tries not to be regarded as one. The supposed invisibility of the building – Jobs planned for it to resemble a nature refuge more than a skyscraper[15] – collides painfully and undeniably materially with the heads of Apple employees.

[13] Steven Levy: "One More Thing. Inside Apple's Insanely Great (Or Just Insane) New Mothership", in: *Wired*, 16.5.17, https://www.wired.com/2017/05/apple-park-new-silicon-valley-campus/ (last seen: 11.3.2019).

[14] Ibid.

[15] Ibid.

Wired editor Steven Levy has got a point when he writes: "It turns out that when you turn a skyscraper on its side, all of its bullying power dissipates into a humble serenity."[16] This is because it is quite obvious that Apple Park is not a skyscraper, and it is trying hard not to be mistaken for a "visible symbol of economic power," as the German architectural theorist Niklas Maak defines the key characteristic for skyscrapers in the twentieth century.[17] Maak, writing on Apple Park, states that "what Apple is building can be grasped in urbanistic terms rather than architectural ones."[18] Apple Park has to be regarded as a "closed sphere"; a work-paradise that one doesn't need to leave, or – and even worse – one that cannot be left.[19] Apple, just like Facebook with its new campus in Menlo Park, does not "build towers anymore, but landscapes for work; the strong shape of the tower is succeeded by *weakform buildings*: Buildings that are intentionally informal."[20]

> If you see Apple and Facebook as commercial consciousness machines that control, analyze, and steer our thoughts and actions, then you can also see a nice ideological punch line in the concealment of their corporate headquarters. Facebook meets us as a friendly force of nature, as Roland Barthes once wrote, the transformation of 'history into nature.' The social network becomes a natural part of our ecosystem, power and its operating systems disappear under the earth; just as in early James Bond films the villain's center is under a rock, power disguises itself as nature, work as play.[21]

Maak does not explicate that the arrangement of an office building as a parkland aims for the ambivalence between spatial opening and closure, which has been characteristic for think tanks since the 1950s and which has been applied before, for example by the RAND Corporation.[22] However, a building that gives the impression of permeability from the

16 Ibid.

17 Niklas Maak: *Wohnkomplex. Warum wir andere Häuser brauchen*, Munich 2014, p. 83, my translation.

18 Maak: *Wohnkomplex*, op. cit., p. 84, my translation.

19 Cf. Ibid, p. 84.

20 "[…] produzieren keine Türme mehr, sondern Arbeitslandschaften, dem starken Form-Statement des Turms folgen *weakform buildings*: Gebäude, die bewusst formlos sind." (Maak: *Wohnkomplex*, op. cit., p. 84, my translation) – It remains a question how the German "formlos," which Maak uses, is to be translated into English. Possible candidates are: 'shapeless,' 'formless,' or 'amorphous' – all of which don't correspond particularly well with an annular building. That is why I decided to use 'informal.' This seems to be the translation that matches best the combination of an ideological statement of openness.

21 Maak: *Wohnkomplex*, op. cit., p. 85, my translation.

22 Thomas Brandstetter, Claus Pias and Sebastian Vehlken: "Think-Tank-Denken. Zur Epistemologie der Beratung," in: idem (eds.): Think Tanks. *Die Beratung der Gesellschaft*, Zürich, Berlin 2010, pp. 17–58.

outside (and even more from *above*), can evoke impressions of closure from the inside:

> One can also find the new Facebook headquarters claustrophobic as well as Apple's glass spaceship with its enclosed paradise garden. Both create worlds in which there is no outside anymore: They set immersion [...] against the pathos of vision into the world offered by the high-rise building on the executive floor. [...] The corporations consciously go green with their headquarters, they invent a second nature, a working landscape in lieu of the city. What does the aesthetics of disappearance mean, the culture of weak form, which distinguishes the new Facebook headquarters above all, but also the Apple building whose form and dimensions cannot be seen from street level?[23]

Maak sees the urbanism of the new worlds of work in accordance with Apple's storage principle iCloud,[24] which was launched almost simultaneously with the announcement of the planning of Apple Park. Both projects – the annular spaceship and the cloud that substitutes for hard drives – play on a symbolic field that connotes zero gravity, placelessness, and immateriality. The analogous character between them both becomes especially clear when Maak's architectural reading of Apple Park is paralleled with Jan Distelmeyer's media-theoretical analysis of the iCloud:

> The hardware, here, loses its hardness. It is not supposed to be the body and its outer limits, to which the software as soul is inhabited. Instead, it too has turned into something intangible, into something elastic, which eludes the gaze from the outside and, like the brain (as important as it is incomprehensible), remains hidden. The hardware [...] vanishes [...] in favor of unobservable operations.[25]

Another characteristic of Apple Park is that you cannot actually see the shape of the building when you're standing right in front of it. And this is exactly the point where the architecture of the building complex becomes of interest for a paper on drones and action cameras. Contrary to a high-rise building like the Empire State Building or the World Trade Center, the architectural peculiarity of Apple Park only reveals itself from an angle that no human can gain on their own. Apple Park, it seems, was constructed to be seen from above – for example by a drone – and hence it is no wonder that the progress of its construction was continuously documented by drone pilots.

23 Maak: *Wohnkomplex*, op. cit., p. 85, my translation.

24 Ibid., p. 87: "With the 'iCloud,' the company provided the signet for dematerializing the perceptible: What the skyscraper was, symbol of an epoch and at the same time seat of real power, is now the cloud."

25 Jan Distelmeyer: "Freiheit als Auswahl. Zur Dialektik der Verfügung computerbasierter Medien," in: Jan-Henrik Möller, Jörg Sternagel and Leonore Hipper (eds.): *Zur Paradoxalität des Medialen*, Munich 2013, pp. 69–90, here p. 70, my translation.

It is worth emphasizing the clips produced by Duncan Sinfield, who started his (almost) monthly drone documentation of the construction of Apple Park in August 2015,[26] and Matthew Roberts, who started filming in March 2016.[27] According to his YouTube page Sinfield started his flights using a DJI Inspire 1 Pro and later switched to the DJI Inspire 2. These drones are also used for professional purposes (e.g. cinema) and both drone operators are professionals – although they give the impression that they produce the videos of the Apple Park (AP) construction site in their free time. Sinfield works as a TV Assignment Editor for KTVU and – according to his Twitter page – as an "aerial cinematographer documenting history w/drones."[28] Roberts works as a freelancer with his company *Maverick Imagery*.[29]

Marketing Clips from Nowhere

One example, "APPLE PARK June 2018 Aerial Perspective 4K,"[30] shows the nearly finished construction of Apple Park. The clip consists of a montage of several angles. It opens with the drone flying sideways, from left to right, with the Apple Park building slowly emerging on the right cadre of the picture. In the background of the shot the mountains surrounding Silicon Valley are visible and form a natural contrast to the flat 'spaceship'. The angles show images from the drone moving slowly forwards and backwards; occasionally tilting up and down. Just once, about a minute after the clip starts, there is a shot with the drone slowly ascending vertically, allowing a short glimpse of the drone mirrored in the glass panels of the roof of the building (fig. 3). Sometimes the movement of the drone/camera seems to follow the geometrical patterns being portrayed, flying along the lines of planted trees or concrete pathways; sometimes it seems to fly tangentially to the curves of the

[26] The oldest video depicting the Apple Park construction site on Sinfields YouTube-Page is from August 1, 2015. See: Duncan Sinfield: "Live: Apple Campus 2 Construction Update – August 1", YouTube 2015, https://www.youtube.com/watch?v=QTs_Zxb3Bws (last seen: 11.3.2019); cf. also: https://www.duncansinfield.com/videos-apple-park/ (last seen: 11.3.2019).

[27] The oldest video depicting the Apple Park construction site on Roberts YouTube-Page is from March 2016. See Roberts YouTube-Channel: https://www.youtube.com/user/SuperTechAssistant/videos; cf. also: Matthew Roberts: "APPLE CAMPUS2: March 2016 Construction Update 2K", YouTube, 9.3.2016, https://www.youtube.com/watch?v=2bwoJJIyB_4 (last seen: 11.3.2019).

[28] Twitter bio of Duncan Sinfield: https://twitter.com/DuncanSinfield (last seen: 11.3.2019).

[29] 'Maverick Imagery'-Internet-Presence: https://www.mvrkimagery.com/ (last seen: 11.03.2019).

[30] Matthew Roberts: "APPLE PARK June 2018 Aerial Perspective 4K", YouTube, 4.6.2018, https://www.youtube.com/watch?v=dnC_dxKc6bk (last seen: 11.3.2019).

annular building. A combination of shots that underlines the depth of the picture and the expansion of the architecture. Many shots focus on small sectors of the 'ring,' only to move slowly backwards releasing the view to an endless and edgeless building. Other shots put surrounding buildings in the center of attention – for example the lobby of the Steve Jobs Theater, a 20-foot-tall glass cylinder, that forms the entrance to the 1000-seat underground auditorium.[31] The 3-minute clip is accompanied by simple, monotonous production music, combining repetitious, reverberating guitar arpeggios, four bass and piano chords, a piano melody and a drum machine programmed for a simple quadruple meter. The steady repetition with small variations underlines the impression that it is an image or marketing clip.

The placelessness of the 'spaceship' is mirrored in the zero gravity of the drone-flight. The glossy aesthetics of the high-definition clips perfectly

Fig. 1: The "Spaceship" Apple Park in June 2018, screenshots YouTube-Clip (Matthew Roberts)

correspond with the self-proclaimed harmony of nature and architecture. The music – which helps to build a standardized corporate identity for the following video clips – seamlessly integrates into this arrangement. Along with the edgeless camera flights this music furthermore supports an analogy to the design-image films Apple regularly presents during its quarterly keynote events, when revealing new products.[32]

[31] Apple Press Release, "Apple Park opens to employees in April", 22.2.2017, https://www.apple.com/newsroom/2017/02/apple-park-opens-to-employees-in-april.html (last seen: 11.3.2019). cf. also: Ben Lovejoy: "Apple granted design patent for the exterior of the Steve Jobs Theater [Update]", in: *9to5mac*, 28.8.2018, https://9to5mac.com/2018/08/28/steve-jobs-theater-design-patent/ (last seen: 11.3.2019).

[32] "The new MacBook Pro – Design, Performance and Features," YouTube, 17.10.2016, https://www.youtube.com/watch?v=WVPRkcczXCY (last seen: 11.3.2019).

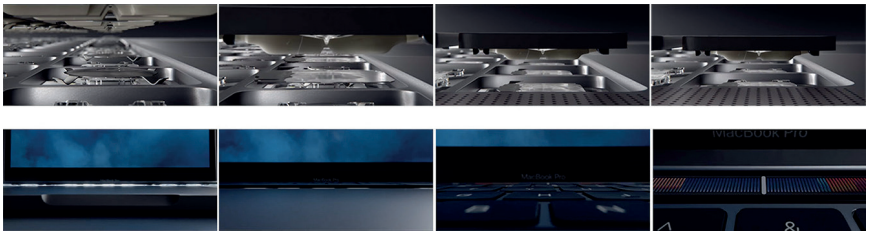


Fig. 2: Virtual floating around the MacBook Pro 2016, screenshots YouTube clip (Apple)

It becomes clear that the documentation of the AP construction site forms a viral marketing film, on the one hand for Apple as a brand and on the other hand for the drone pilots/camera operators. Drones here create the condition of possibility not just to represent, but also to manifest a 'product' that hides its monumentality behind its size and expansion. The floating drone flight and the smooth movements of the images produce the impression of a weightless monumentality – while representing a building whose restaurant doors of glass weigh 6,500 pounds each.[33]

Fig. 3: 'Drone-Dronie' and geometrical patterns, screenshots YouTube clip (Matthew Roberts)

But isn't it obvious that these drone clips – made possible by the use of a floating versatile camcorder – construct the exact opposite of what is usually regarded as a key function of the GoPro and action-cam? They do not connote radical subjectivity, individuality, third-person perspective[34] or the impression of immersive participation. Rather, they produce a perspective without a vantage point; a non-place and *no-topia*. The aesthetics of the images also do not connote a military perspective – not least because pure vertical top views are used only very infrequently. Instead the images seem to veil their technical background; these are not 'operative images' – a reference often made towards drone images in media studies. Their main

33 Levy: "One More Thing," op. cit.

34 Philippe Bédard: "Disembodied Perspective: Third-Person Images in GoPro Videos," in: *Alphaville: Journal of Film And Screen Media*, 9 (2015).

goal is to show off their depth of field and to produce an impression of floating three dimensionality. Up to this point it seems as if the drone flights over the AP construction site mirror the intended semiology of their architectural object of observation. The drone movement and aesthetics argue in a rhetoric of immateriality, which also builds the ground for the building itself and the logic it is intended to embody.

2. Destruction: Immaterial Aesthetics on Material Disaster

In the following, I want to shift my attention to drone videos, which to a certain extent can be regarded as the evil twin of the AP construction clips. In the last few years recreational, semi-professional drones have found a use case in documenting multiple 'natural'[35] disasters. Especially in the US people – oftentimes themselves impacted by a catastrophe – use their high-tech gadgets to give an overview of the destruction in the face of disasters like flooding, hurricanes, or wildfires. Many of these videos are later uploaded to YouTube, often supported by sad or solemn ambient background music, showing flooded areas in Texas or Ohio and scorched grounds in California.

One prime example can be seen in the YouTube clip "Ohio River Flooding Drone Video,"[36] uploaded by YouTube user Ben Childers in February 2018. The video, accompanied by sad background music from violins and synthesizers, gives an overview of different cities along the Ohio River that were impacted by flooding in early 2018. The drone flies – or rather floats – in slow motion over houses surrounded by water. The floating movement of the drone is supported by hardly noticeable tilting movements – sometimes to the left or right, sometimes up and down. The gaze of the camera is never completely fixed and rarely focused on a single object. The continuous movements reinforce the impression of an endlessly flooded landscape. Font inserts – along with the depiction of signature skylines like the one from Cincinnati, for example – clearly localize the documented cities and countryside; however, the vantage point of the gaze itself again remains unfixed. The montage of the different shots – moving and tilting left and right; ascending and descending up and down – still might refer to a centre of observation, but nevertheless connote an all-encompassing vision.

[35] What is commonly called a 'natural disaster' is often based on a hybrid of natural, social, and technological causes.

[36] Ben Childers: "Ohio River Flooding Drone Video", YouTube, 25.2.2018, https://www.youtube.com/watch?v=bB_nBYPiRto, (last seen: 2.3.2019).

Fig. 4: 'Moving straight, tilting left', screenshots after 0, 3, 6, 9 sec. of the YouTube clip: "Ohio River Flooding Drone Video", Ben Childers.

The aesthetics of these videos is strikingly analogous to the Apple Park construction videos. The images mostly display top views without a clear vantage point, but instead of showing the construction of something new, they document the remains of devastated homes and landscapes, signifying an untouched grasp of sublime destruction – supplemented by tragic sounds, cut to the beat.

Fig. 5: Cincinnati flooding 2018, screenshots YouTube clip "Ohio River Flooding Drone Video", Ben Childers.

A significant number of these videos simply show unaltered footage, that is only post-processed, cut and set to music, after they get licensed by an editorial mass medium. In opposition to the AP construction videos, these image types represent an amalgamation of unaltered, raw footage of citizen journalism with the professional editorial practices of journalistic mass media.

Coffey Park

One example of this practice can be found in a clip from the 'Tubbs Fire,' up to 2017 the most destructive in the history of Californian wildfires. Drone pilot and YouTube user Thomas Rennie[37] used his drone to show the destruction of multiple streets and single-family homes in the Coffey Park neighborhood.[38] The video fades in from a black screen and gives an overview of houses that are still intact – it also shows a man in a yellow vest, obviously looking at a screen; possibly the drone pilot. The view

[37] See Rennies YouTube-Channel: https://www.youtube.com/channel/UCveOzOAeG-07081FZEpfgs7Q (last seen: 11.3.2019).

[38] Thomas Rennie: "Coffey Park Fire 10/9/2017", YouTube, 10.10.2017, https://www.youtube.com/watch?v=9y87FhUQWUM (last seen: 11.3.2019).

of the camera then tilts right. A text insert locates the street as "Banyan Street" and the continuing tilt finally shows the complete destruction of the houses on the opposite side of the road. The drone ascends and flies forwards, giving view to a field of destructed houses and burned trees. Again, text inserts locate a street crossing, while the drone flies on and gives the impression of endless destruction – with dusty air on the horizon. In the middle of the short clip the footage is cut and shows another ascending flight over the neighborhood. In this shot, while the drone is ascending, its rotor-blades shortly become visible in the upper edge of the picture – a disturbance that on the one hand may diminish the quality of the recording, while on the other hand supporting the authenticity of the flight.

The special economy of such a video is demonstrated by the fact that Fox News licensed the clip from Rennie and uploaded it to its own YouTube channel.[39] The editorial work by Fox News consists of the insertion of text plates with additional information on the aftermath of the fire, and, even more prominently, the addition of dramatic, orchestral music, which could just as well accompany a Hollywood action movie.

Fig. 6: Editorial preparation. Upper row: screenshots YouTube clip "Coffey Park Fire 10/09/2017", Tom R; Lower row: screenshots YouTube clip "Cal wildfires: Drone footage captures Santa Rosa decimation", Fox News.

This video clip, which is a lot less sensational in its qualitative aspects, provides a few indications of the effects of cutting and editing drone videos. In contrast to the AP-construction-clips, where it seemed almost impossible to determine a vantage point for a producer or subject controlling the production of the images, the Coffey Park destruction clip

[39] "Cal wildfires: Drone footage captures Santa Rosa decimation," *Fox News,* 16.10.2017, https://www.youtube.com/watch?v=iQ2lISnO-nY (last seen: 11.3.2019)

gives a different impression. At least after watching the video multiple times, the localization of the drone pilot – i.e. the camera operator – seems possible both at the beginning as well as at the end of the video. Furthermore, the continuous tilting left and right of the drone/camera, just like the repeatedly jolting movements of the camera, not only diminishes the beauty and glossy aesthetics of the images; it makes the video seem more like the representation of a not strictly coordinated search movement. However, for the purpose of documenting the destruction in the face of a disaster, these qualitative constraints may even serve an additional purpose: Accidentally filmed rotor blades, water drops on the camera lens, or seagulls attacking the drone support the authenticity of the images.

Interestingly one of the producers of the AP construction clips also documented the destruction of Coffey Park. Duncan Sinfield used his drone to fly over Coffey Park 14 weeks after the fire. His two-minute short video – the length of which seems to be determined by the length of the accompanying sad piano music – shows the abandoned, ground zero-like landscape of the (former) neighborhood.[40] The debris, which was visible in the clip from Thomas Rennie, has been moved and the drone flight shows empty streets along the burnt soil of abandoned plots of land. The montage of the clip gives the impression of sheer endless destruction – and again, every indication of the vantage point or trace of a personal perspective is erased from the hyper aestheticized images. The images signify 'placelessness': An anonymous, stray gaze that is lacking a personal, subjective point of view.

Fig. 7: Abandoned plots of land, YouTube clip: "WILDFIRE AFTERMATH: Coffey Park Neighborhood of Santa Rosa, California", Duncan Sinfield (Screenshots).

In the contrast between Rennie's non-altered clip and the edited clip by Sinfield it becomes clear that it is not only the drone perspective per se that gives the impression of anonymity and 'placelessness'. Rather,

[40] Duncan Sinfield: "WILDFIRE AFTERMATH: Coffey Park Neighborhood of Santa Rosa, California", YouTube, 24.1.2018, https://www.youtube.com/watch?v=EAAlaub0DfE (last seen: 11.3.2019).

it is the arrangement of floating, of the multiple angles, the tilting and up and down movements, and their combination in a post-processed montage of a YouTube clip that fulfils the utopia of an all-encompassing and hence non-subjective gaze. The image economy of recreational drone clips represented in the examples I have discussed so far seems to fulfil the wish constellation of drone surveillance: Seeing everything from an unlocatable point of view:

> The fantasy of the drone is to cover all spaces all of the time; hence, the drive towards more high resolution cameras with broader ranges of field carried by devices that can stay in the air as long as possible.[41]

The short clips – no matter if showing construction or destruction – seem to erase the negative connotations of such a gaze that may arise with respect to questions of surveillance. Quite to the contrary – and most of the comments in the commentary section under the YouTube clips attest to this – they trigger enthusiastic or sympathetic reactions towards the spectacularity of the images and the tragedy of the destruction portrayed.

The 'placelessness' of the images and the impression of the camera's pervasiveness – in contrast to the perspective of surveillance – seem to be produced by the assemblage of not clearly motivated movements and by the fact that there is no clear focus of the image production. The pictures seem to portray the paradox of an interested lack of interest. There is no clear vantage point that can be attributed to a producer of the image and also – at least in the examples discussed here – no clear focal point of interest that the images portray.

TV-News: No Place for 'Placeless' Images?

Considering the beauty and attraction of drone images, their moderate price and relative simplicity in relation to helicopter flights, it is surprising that the main news programs – apart from their online versions, and at least in Germany – use such pictures only very rarely. Technological explanations may be found in the short battery life of about half an hour in recreational drones and in the lower ceiling – the maximum flying altitude – of the drone compared to a helicopter.[42] Another explanation

[41] Andrejevic: "Theorizing Drones and Droning Theory," in: Aleš Završnik (ed.): *Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance*, op. cit., p. 28. Cf. also: Chamayou: *A Theory of the Drone*, op. cit., p. 38f.: "The second major principle makes the watch total as well as persistent. This is the notion of 'wide area surveillance': see everything, all the time."

[42] While helicopters can reach heights of up to 12,000 meters, recreational drones can theoretically reach about 5,000 meters. The Federal Aviation Administration (FAA) and the European Union Aviation Safety Agency (EASA), however, limit the maximum altitude

could be that the perspective from the helicopter, which in the face of a hurricane, fire, or earthquake always signifies the hegemonic perspective of the rescuers, perhaps is simply better suited to represent newsworthy events.[43] But if one considers that drones – especially in the face of disasters – are the near perfect tool to produce high-angle shots and the sort of 'hypervisibility'[44] that is characteristic for television's news coverage of catastrophic events, it is astonishing that far more often the actually more expensive helicopter is used to produce disaster news coverage. In addition to legal constraints[45] concerning the use of drones, one could speculate here that visual aesthetics are also responsible for this: camera movements – from a camera dolly, over gimbal to Steadicam and cable cam systems – are above all visual cues for aestheticization and highly characteristic for fictional formats, high-end narrative-documentary formats from the BBC or Discovery Channel, or as initially seen for promotional films. They connote a clinical look signifying post-processing and high production value. Hence they are usually associated with categories that run counter to the direct, unaltered perspective expected from television news. According to this explanation, the use of drones (up to now?)[46]

to 400 ft. or 120 meters, respectively, in the US or the EU. (FAA, "Recreational Flyers & Modeler Community-Based Organizations", 18.02.2020, https://www.faa.gov/uas/recreational_fliers/ last seen: 09.03.2020; EASA, "Proposed consumer information – 2018: Flying a Drone: Do's and Don'ts. Vers. 01", Feb. 2018, https://www.easa.europa.eu/easa-and-you/civil-drones-rpas last seen: 15.04.2019.)

43 This last explanation can be supported by the fact that one of the few examples that I was able to find in the daily news segment of German public television was from an earthquake in central Italy in August 2016. It shows a top down view on a village after the quake and the drone is only ascending, but not moving left or right, thus lacking the typical drone-movement. The drone-camera is utilized by the Italian fire brigade, Vigili del Fuoco, as can be seen on the font insert. Cf. *ARD Tagesthemen*, 25.8.2016, https://www.tagesschau.de/multimedia/sendung/tt-4681.html (last seen: 11.3.2019).

44 Matthias Thiele: "Ereignis und Normalität. Zur normalistischen Logik medialer und diskursiver Ereignisproduktion im Fernsehen," in: Oliver Fahle and Lorenz Engell (eds.): *Philosophie des Fernsehens*, Munich 2006, pp. 121–136, here p. 129.

45 Especially in context of the California wildfires the (private) drone pilots seem to pose a security threat – and subsequently a legal issue – and there are already posters made by the US Department of the Interior and the US Department of Agriculture that read "If you fly, we can't" or "If you fly, someone could die," warning drone pilots not to get in the way of rescue operations. Contrary to the helicopters of TV stations, private drones obviously pose a threat for fire-fighting planes and choppers. Another poster warns that in 2017 36 public drone incursions occurred, shutting down firefighting operations at least 25 times.

46 There are a few signs that drone journalism is on the rise: In 2017 the Poynter Institute, in collaboration with Google News Lab, the Drone Journalism Lab at the University of Nebraska, the National Press Photographers Association, and the drone manufacturer DJI, announced a "drone journalism school". See: Vicki Krueger: "Announcing Poynter's 2017 drone journalism school", in: *Poynter.*, 30.1.2017, https://www.poynter.org/newsletters/2017/announcing-poynters-2017-drone-journalism-school/ (last seen: 15.4.2019). Also in 2017 CNN received a waiver from the FAA to fly small UAVs over people, clear-

implies a breach in the routinized habits of news consumption. The drone's inherent mobility, pervasiveness, and 'placelessness' – the lack of a clearly situated location for a reporter – may be regarded as harmful in the context of news reporting. Does it raise suspicion towards news segments with their claim for authenticity, objectivity, and unaltered truth? Is journalism as situated objectivity in need of an identifiable perspective from a journalistic subject? Are the clean, clinical drone pictures only acceptable when this perspective is established with reference to a citizen journalist as eye-witness? Even if this changes in the future, it remains to be noted that the central place for the circulation of drone images has so far been the internet.

3. Conclusion

There are certain takeaways summing up the montage of different uses and fields of drone images and the analysis of their particular aesthetics.

The clips of the AP construction site portray a combination of shots that live by the depth of field and let spectators grasp the materiality of a building that hides itself behind its expansion. The documentation of the progress of construction seems to fulfil the actual planning of the building. The images produce a fetishizing gaze: The 'weakform building' regains the power of a visible symbol of economic success and sovereignty through pictures of a weightless monumentality. In the images of the drone flights Apple Park itself becomes an untouchable Apple gadget: The slogan "What you see is what you get" has rarely been more appropriate.

The clips of natural disasters share the same aesthetics as the construction videos: However, instead of showing the lightness of monumentality, they give the impression of endless catastrophe. The montage of multiple angles and floating movements produces the paradox of pictures without a clear vantage point, an anonymous all-encompassing view. It seems as if the drone – while itself relying on a complex "mobile assemblage of physical and virtual movements and human and non-human actors"[47] – decouples the gaze from the subject. At least as long as the filming subject

ing the (legal) way for increased drone operation in their reporting, see: "CNN Receives Breakthrough Part 107 Waiver for Operations Over People", *CNN*, 18.10.2017, http://cnnpressroom.blogs.cnn.com/2017/10/18/cnn-receives-breakthrough-part-107-waiver-for-operations-over-people/; last seen: 15.4.2019).

47 Hildebrand: "Situating Hobby Drone Practices," *Digital Culture & Society* 3, op. cit., p. 208.

does not itself become visible in the shot.[48] The drone and the action camera are not only perfect companions. In their combination they also show another layer of the versatility of the microcamera. While the GoPro 'flips the vertical and the horizontal', puts the filming subjects and the filmmaker's body in the center of the action, and thereby seems to focus on subjective agency,[49] the drone-mounted action camera seems to erase the subject and its central location altogether. It produces a perspective that I have called 'placeless': the anonymity of a stray gaze. And while this perspective may still share certain aspects with surveillance views, it does not foster suspicion. Just as the searching movements of the floating drones lack a fixed vantage point, the disaster clips do not situate an identifiable object in the center of attention. The images portray an interested lack-of-interest: A pure, clinical, shiny surface.

[48] This point was made clear in the example of the Coffey Park clip by Thomas Rennie. It could be further examined with respect to the 'Dronie.' Cf. also: Maximilian Jablonowski: "Dronies. Zur vertikalen Ästhetik des Selbst." in: Klaus Schönberger and Ute Holfelder (eds.): *Bewegtbilder und Alltagskultur(en): Von Super 8 über Video zum Handyfilm. Praktiken von Amateuren im Prozess der gesellschaftlichen Ästhetisierung*. Cologne 2017, pp. 222–233.

[49] Winfried Gerling, Florian Krautkrämer: "Versatile Camcorders: Looking at the GoPro-Movement," 07.5.2018, https://versatilecam.de/ (last seen: 11.3.2019).

Visions of Outer Space

Anne Quirynen

In my video installations *Venus Mission* (2012) and *mars analog* (2014) I researched the disused copper mine Rio Tinto, an analog Mars site near Sevilla, Spain. In 2003, Minas de Rio Tinto caught the attention of the US space agency NASA. The consistency of the soil, due (partially) to the surface mining, is similar to that on Mars. The scarred landscape of Rio Tinto became an outdoor laboratory for the MARTE project (Mars Analog Research and Technology Experiment), for the Austrian Space Forum, and the aerospace company Boeing.[1] Using landscape images as a starting point for *Venus Mission* (2012), I worked my way through

Fig. 1: Venus Mission 1 Fig. 2: Venus Mission 2 View from the video installation Venus Mission by Anne Quirynen

the inflections of visual cultural technologies. The camera mimics visual aesthetics that are closely associated with a cultural history of media between industrialization and information society. Images of a trip across the terrain of the Rio Tinto (re-)stage the link between railway, cinema, and radically transformed perception in modernity. Slow pans and isolated zooms test out the structures of the area like surveillance cameras and scanners. It seems as if the (human) body has completely vanished until the end of the loop in which moving close-ups of the ground with its red stones suddenly become clearly accompanied by the crunching sound of steps, traces of a body. The camera on a monopod is held away from

[1] Anne Quirynen and Lena von Geyso (eds.): *Reflections into a Thousand Pieces: Videos und Installationen Anne Quirynen*, Berlin 2015.

the body with an outstretched arm. But one never sees a human body. And with an image of the red stones Venus Mission ends and this article starts with the very typical first-person point of view and third-person variants of outer space selfies. During my research I was astonished by the many selfies and Twitter accounts of the Mars rovers and astronauts of the International Space Station. Therefore I want to focus on three different film sequences of current devices and practices in planetary research to understand the shift between human bodily perception and medial intervention in contemporary media technologies and practices.

1) Film sequences of extra-vehicular activity (EVA) or spacewalk, which is any activity carried out by an astronaut outside a spacecraft beyond the Earth's appreciable atmosphere
2) Space selfies by the Mars rovers
3) Ride film by the Mars rover Curiosity

My argument, in brief, is that these image sequences act as mechanisms of a united world, albeit complexly mediated and distributed among very different institutional agents. The images represent outer space as seemingly democratic, accessible to humanity. We can now download images, maps and even walk on Mars.[2] They tend to give us viewers a sense of control and they tend to confirm the techno-utopian position that humanity masters Space.

Let's go back to 1968…

In 1968, the Apollo 8 spacecraft became the first crewed mission to orbit the Moon. Astronauts Frank Borman, Bill Anders, and Jim Lovell entered lunar orbit on December 24. The crew conducted extensive photography of the lunar surface. At a certain moment, as they were about to round the backside of the Moon, the astronauts caught sight of the Earth appearing above the lunar limb. It was then that Bill Anders snapped some of the most iconic photos of the Apollo program, first in black and white and then the more famous color Earthrise images.[3]

Anders was the first to see the earth rise:

> Anders: Oh my God look at that picture over there.
> There's the Earth comin' up. Wow, is that pretty!

[2] Google: "Mars", https://www.google.com/mars/ and https://accessmars.withgoogle.com/ (last seen: 6.2.2019).

[3] Kelli Mars: "50 Years Ago: Apollo 8 in Lunar Orbit", in: *NASA History*, 24.12.2018, https://www.nasa.gov/feature/50-years-ago-apollo-8-in-lunar-orbit/ (last seen: 6.2.2019).

Borman: Hey don't take that it's not scheduled.
Anders: Do you have a color film Jim? Hand me a roll of color, quick.
Lovell: Oh man, that's great! Where is it?
Anders: Hurry. Quick. Just grab me a color. A color exterior. Hurry up. Got one?
Lovell, Yeah, I am looking for one. C368
Anders: Anything. Quick
Lovell: Here
Anders: I think we missed it.[4]

Then the planet appeared again in a different window, and Anders went over to capture the *Earthrise*, talking with Lovell about exposure settings and framing. The *Earthrise* became one of the most iconic pictures of the twentieth century. It was proof of winning the space race and conquering a new frontier. The photo *Blue Marble* taken by Apollo 17 became even more iconic. Steward Brand's *Whole Earth Catalog*, a manual for a Californian counterculture, published some of these iconic pictures.[5] The Apollo images appealed for a unifying world perspective that would bring humankind together. They are produced by technologies of vision,

Fig. 3: Apollo 11 Astronaut Neil Armstrong.

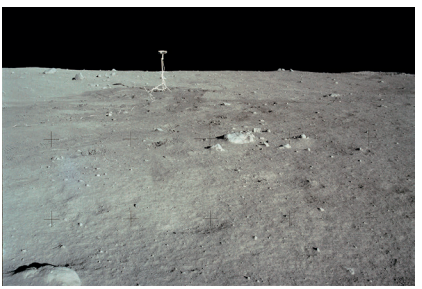


Fig. 4: TV camera on lunar surface

which are deeply embedded in discourses of the cold war, cybernetics, and space frontier.[6] An estimated 600 million people – one-fifth of the

4 NASA: "Transcripts of Earthrise: The 45th Anniversary", https://svs.gsfc.nasa.gov/vis/a000000/a004100/a004129/G2013-102_Earthrise_MASTER_youtube_hqTranscripts.html (last seen: 6.2.2019).

5 The photograph Earthrise by Anders, 1968, was the cover photo of the second and third editions of the *Whole Earth Catalog*, Spring and Fall, 1969.

6 The report by the National Commission on Space, *Pioneering the Space Frontier* (1986) opened with the following statement: "Five centuries after Columbus opened access to 'The New World' we can initiate the settlement of worlds beyond our planet of birth. The promise of virgin lands and the opportunity to live in freedom brought our ancestors to the shores of North America. Now space technology has freed humankind to move outward from Earth as a species destined to expand to other worlds." The reference to Columbus recalls the violent history of white Western colonialization.

world's population – witnessed Neil Armstrong and Buzz Aldrin's first moonwalk in history on 20 July 1969. "Seen live, unedited, and everywhere, it became a genuine experience of global intimacy,"[7] although the TV signal and quality were very poor. Since then the quality of TV pictures of the astronauts' has improved; the last three Apollo landings carried a higher-quality color TV camera, which could be controlled from earth, and the astronauts were professionally trained as cameramen.[8] Visually, NASA was unique "in being a government agency with its own television stream (NASA television), which provides live and prerecorded programs on missions and projects."[9] Today we can follow the International Space Station (ISS) by the ISS tracker, and since April 30, 2014 the High Definition Earth Viewing (HDEV) experiment aboard the ISS, which includes several commercial HD video cameras, allows us to observe the Earth almost 24 hours a day.[10]

Decades of optical development make it possible to photograph and film first Earth, the Moon, and Mars, to create high resolution maps and make us 'Earthtlings' experience outer space. In her book *Placing Outer Space* Lisa Messeri, an anthropologist of science and technology, observed how planetary scientists "rely on narrating, mapping visualizing and inhabiting to imagine themselves on other worlds."[11] She observed the researchers at the Mars Desert Research Station in Utah, an analogue Mars site, and different NASA research centers in California, tracing how the place-making practices of planetary scientists transform the void of space into a cosmos filled with worlds that can be known and explored. "The planetary imagination includes scientific understandings of the planet and conceptions of planetary past and futures, as well as notions of what it would be like to be on and live on other planets. A planetary imagination is enacted as Earth becomes another Planet, mostly the

7 David Meerman Scott and Richard Jurek: *Marketing the Moon: The Selling of the Apollo Lunar Program,* Cambridge 2014, p. 14.

8 "The Apollo astronauts underwent intensive training in preparation for their Moon explorations. Over the several years prior to the Moon missions, scientific and photographic training was provided. Astronauts were encouraged to take training cameras on trips to become more familiar with the camera operation and to enhance their photographic technique. Tutorials were provided to the crews on the equipment, its operation, as well as the scientific purposes." Gary H. Kitmacher: "Astronaut Still Photography During Apollo", in: NASA, https://www.history.nasa.gov/apollo_photo.html (last seen: 6.2.2019).

9 J. Stuart: "Unbundling, sovereignty, territory and the state in outer space: Two approaches," in: Natalie Bormann and Michael Shehan (eds.): *Securing Outer Space*, New York 2009, pp. 8–24, here p. 18.

10 NASA: "High Definition Earth-Viewing System", https://eol.jsc.nasa.gov/ESRS/HDEV/ (last seen: 6.2.2019).

11 Lisa Messeri: *Placing Outer Space: An earthly Ethnography of Other Worlds,* Duke University Press, Durham, NC, 2016, p. 19.

Moon or Mars."[12] The planetary becomes something to be navigated, whose dynamics can be observed but also experienced. It is presented to us in fragmented images, visions, narratives, and stories produced and told in a particular time in place.

Extra-vehicular activity (EVA)

On February 21, February 25, and March 1, 2015, NASA strapped a GoPro camera onto astronauts Terry Virts and Barry Wilmore to capture spacewalks outside the International Space Station from their perspective. One of the films begins with a grinning 'selfie' of Terry Virts before the camera turns, peering out into space.[13] In the later streamed videos, Earth slowly rotates below the space station while astronauts fiddle with cables, install antennae, and reconfigure parts of the station so future crewed spacecraft can dock.[14]

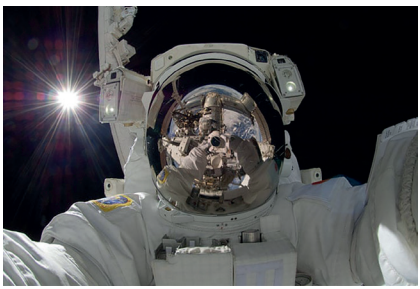


Fig. 5: Japan Aerospace Exploration Agency astronaut Aki Hoshide. Fig. 6: Johnson Space Center's Mission Control Center station flight control room known as FCR-1

> As spectacular as the view from inside a spacecraft is, it is magnified during a spacewalk. An invisible, thin polycarbonate faceplate is all that separates our eyes from the void. Lightly holding onto a handrail with one hand, we look down at Earth, 400 kilometers below, passing beneath us at eight kilometers per second. ...Unfortunately, there is precious little time to enjoy the views

[12] Ibid., p. 33.

[13] Eva #29 Spacewalk: "EVA #29 Spacewalk – Barry "Butch" Wilmore & Terry Virts [part 2 of 2]", YouTube, 21.2.2015, https://www.youtube.com/watch?v=_6YrNzI_RYE (last seen: 6.2.2019). EVA#30 spacewalk: "NASA GoPro Spacewalk with Terry Virts [720p HD]", YouTube, 13.4.2015, https://www.youtube.com/watch?v=--ysPOJepOw (last seen: 6.2.2019).

[14] In 2019 NASA's Commercial Crew Program and private industry partners, Boeing and SpaceX, starts with the return of human spaceflight launches to the International Space Station from U.S. soil.

> while performing a spacewalk. Each EVA is choreographed to the minute, with two spacewalkers as part of a team of three astronauts. All this is done under the care and guidance of the Mission Control team, with whom we have constant communication and who are able to observe our work thanks to cameras mounted in our helmets. It is incredibly satisfying to be part of a complex operation that uses such sophisticated tools and technology that allows us to perform what amounts to basic construction in an environment as beautiful as it is deadly.[15]

The films we see of the spacewalk – actually it is not a walk in the literal sense but a work session – is no longer necessarily bound to an eye and a body. The spacesuits of the astronauts are small space ships. The GoPro camera is mounted to the mini-workstation, which is mounted to the suit. The whole operation is also followed by images coming from the SD and HD cameras installed outside. All of this is done through the guidance of the Mission Control team, with whom the astronauts have constant communication and who are able to observe their doings thanks to the cameras mounted in the helmets.[16] Other stations in the world are monitoring the space suits and other biometric data from the astronauts. The long duration spacewalks sequences (mostly 6.5 hours) remind the viewers of operational approaches that allow them to understand the images in terms of work – the spacewalkers maintain and install new material – and in terms of distributed agency. The spacewalkers are choreographed and led step-by-step through their spacewalk over the radio. The preparation for a spacewalk takes a whole team and starts anywhere from six months to a year in advance. The full spacewalk training for the ISS is traditionally done at NASA's Neutral Buoyancy Laboratory (NBL) at the Johnson Space Center, Houston, Texas, and at the Gagarin Cosmonaut Training Center in Russia. During the live TV transmissions, we are informed of every step, but also long moments of silence and stillness are transmitted. We watch how the astronauts are learning to work/live in a low or no gravity space: an operation that will be important to explore outer space but that also refers to the work assemblies of hu-

[15] Michael Lopez-Alegria: "The Inflexion Point of Human Space Flight" in: Lukas Feireiss and Michael Najjar (eds.): Planetary Echoes: Exploring the Implications of Human Settlement in Outer Space, Leipzig 2018, pp. 86-94, here p. 92.

[16] The US EVA #49 spacewalk starts to introduce the two astronauts Drew Feustel and Ricky Arnold and he announces further that "as is always the case both spacewalkers will be equipped with helmet cameras to provide flight controllers and You! the most personal views of the work they are conducting outside the station. Today the spacewalk is seen on Facebook live – questions will be answered on Facebook live. Also on the twitter account @ astro_wheels , #askNASA.

man and robots.[17] The online film sequences raise awareness of human activities and demonstrate the achievements of technology and human mastery. The most popular and distributed images on social media are those where the Earth appears in the background to remind the viewers that 'humankind' is in Space.[18] "According to the Overview Effect, it is images of the Earth, devoid of obvious political borders, which is pushing an imagination of space projects for the benefit of all humankind."[19] Space projects such as the ISS are concerned both with the exploration of collective international projects and with the visual intensification of ideas of a seemingly united Earth community.

Selfies by the Mars rovers

The most famous selfie on another planet was taken by the Curiosity rover on NASA's Curiosity Mars rover September 7, 2012 based on the

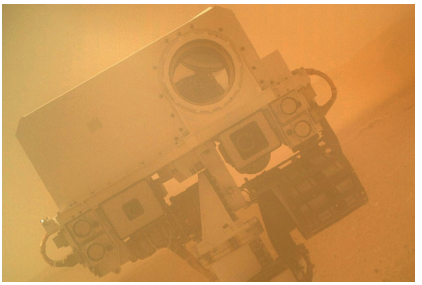


Fig. 7: These images were taken by ESA astronaut Luca Parmitano during his spacewalk, together with NASA's Chris Cassidy, 9 July 2013. Fig. 8: NASA's Curiosity Mars self-portrait. Sept. 7, 2012.

17 Future space operations are tending toward close collaboration with robots. Intuitive user interfaces are to be utilized to command these robots. Daniel Leidner, Peter Birkenkampf and Neal Y. Lii, (2017): "Context-aware Mission Control for Astronaut-Robot Collaboration", in: *14th Symposium on Advanced Space Technologies in Robotics and Automation (ASTRA)*, 19-22 Jun 2017, Leiden, The Netherlands. https://elib.dlr.de/112953/ (last seen: 6.2.2019).

18 From now on new virtual reality apps from NASA "let users take space selfies and visit a cool star system that has seven Earth-size exoplanets." Elizabeth Howell: "New NASA VR Apps Let You Take Space Selfies and Visit Strange New Worlds", in: space.com, 24.8.2018, https://www.space.com/41616-nasa-new-vr-apps-space-selfie.html/ (last seen 6.2.2019).

19 Jill Stuart: "Unbundling, sovereignty, territory and the state in outer space," in: Bormann and Shehan (eds.): *Securing Outer Space*, op. cit., p. 18.

local time at Jet Propulsion Laboratory, the base of the operations in California. The image was modified and posted on NASA's Curiosity Mars rover Facebook account with the message:

> Hello, Gorgeous! Snapped this self portrait while inspecting my MAHLI camera with its dust cover intentionally left on. This was a test to make sure the cover, its hinge the area it sweeps when it opens are clear of debris.[20]

Discovery news described the maneuver as the way to take a truly authentic selfie and gave it the title King of Selfies in 2013. Most of the self-shots taken by Curiosity and Opportunity (the older Mars rover launched in 2003) are made up of dozens of individual images taken by this camera, which is attached to the end of the rover's robotic arm. The photos are taken over the course of several Martian days. The Mars Hand Lens Imager (MAHLI) camera has a range of capabilities and presents considerable flexibility for use. Some ways the camera will be used include amongst others:

> From Drill hole imaging to acquiring scientific video sequences (e.g., documenting grain movement on the surface) and acquiring public outreach or documentary video sequences (e.g., opening of a sample inlet cover; viewing landscape go by as rover drives…The long list of tasks ends with the Rover self-portraits (for education/public outreach) by holding camera head up above the rover or out at some distance from the rover.[21]

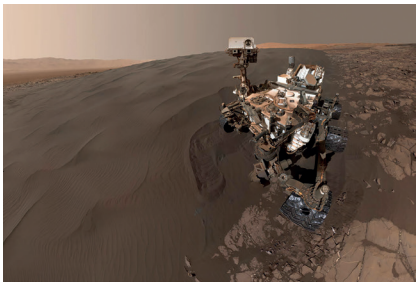
Years before the landing of Curiosity, scientist and engineers were involved in improving software and cameras to capture high resolution images to see Mars in the way scientists imagine Mars. Filmmaker James Cameron was a member of the camera team for the mission of Mars rover Curiosity, which was originally supposed to carry a three-dimensional zoom camera on its mast.[22] They realized that the MAHLI camera has a wider-angle view than the Mastcams and that it could be pointed back at the rover so that it would be possible to take a picture of it on Mars from a third-person point of view. The pictures are composed by the scientific knowledge and experience of skilled rover planners, who have to position the robotic arm with the MAHLI camera for taking multiple images that are later stitched into a mosaic that becomes the self-portrait of the

[20] NASA's Curiosity Mars Rover: facebook, 07.9.2012, www.facebook.com/MarsCuriosity/photos/hello-gorgeous-snapped-this-self-portrait-while-inspecting-my-mahli-camera-with-/407444432638871/ (last seen: 6.2.2019).

[21] Mars Exploration Program, Mars Curiosity Rover: "Mahli", https://mars.nasa.gov/msl/mission/instruments/cameras/mahli/ (last seen: 6.2.2019).

[22] Guy Webster: "Work Stopped on Alternative Cameras for Mars Rover", in: NASA, 25.3.2011, https://www.nasa.gov/mission_pages/msl/news/msl20110325.html (last seen: 6.2.2019).

rover. The robot arm of the rover seems to dance as it takes photos for the mosaic, which is plotted by scientists using 3-D visualization software that maps the terrain near the rover, based on pairs of cameras on Curiosity.[23] All the rovers also have Twitter feeds to serve as travelogues and to describe their biographies. Through the combination of language and the photographs the scientists produce Mars as a world to explore and they also refer to an embodied experience through the feeds. I want to include the Mars rovers as agents in an ambiguous utopian technological environment where the difference between visual perception and medial intervention is becoming uncertain. Distributed on social media networks such as Facebook and Twitter, these high-resolution digital selfies of the Mars rover in a Martian desert landscape simulate an individual observation and channel a sense of immediacy and ever-presence; Mars is made accessible. The extended (robotic) arm that normally holds out the smartphone and thereby underscores the performativity of the selfie taker is not visible here. Who is performing where?



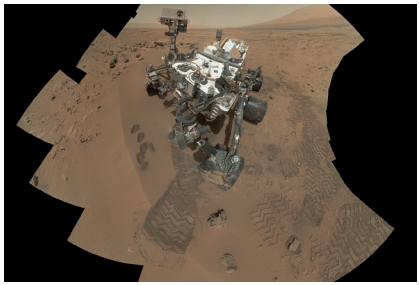


Fig. 9: NASA's Curiosity Mars rover self-portait shows the vehicle at "Namib Dune." Fig. 10: NASA's Curiosity Mars rover documented itself in the context of its work site, "Rocknest Wind Drift," (Oct. 31, 2012).

> Curiosity Rover @MarsCuriosity 28 Jan 2018
> Hola, amigos! How's it going? Been a while since I rapped at ya. I took this selfie (here's how: https://youtu.be/b2rwWECbEHg?t=166 ...) before heading toward an area of clay rocks that may hold more clues about the ancient lakes that helped form this part of #Mars.[24]

[23] Nasa Jet Propulsion Laboratory: "Animation of Curiosity Rover's Arm Movements for Taking a Self-Portrait", 11.12.2012, https://www.jpl.nasa.gov/video/details.php?id=1171#fragment-1 (last seen: 6.2.2019).

[24] Nasa Jet Propulsion Laboratory: "Curiosity Says Farewell to Mars' Vera Rubin Ridge", 28.1.2019, https://go.nasa.gov/2B89YbX

The ride film by Curiosity[25]

The Mars rover Curiosity navigated five years in various sections of Mars. Images recorded with the Hazard Avoidance Camera (Hazcam) throughout this timespan were used to create the ride film, which lasts 5 minutes and 48 seconds.[26] The smaller right frame of the animation of five years of Curiosity shows the rover's location in Mars's Gale Crater. The left frame shows us a first-person view of the ride. Each image is labeled with the date it was taken and its corresponding sol (Martian day), along with information about the rover's location at the time. The clip is underscored with music. There is a shift in perspective from a bird's eye – seen in the right frame – to one of immersion in the left frame. "This immersed perspective mimics how scientists have come to understand Mars. Though the experience of exploring Mars feels personal, it is structured by this particular, expert way of seeing."[27] NASA announces that: "The future Rover 2020 'eyes' and other 'senses' will carry new instruments that help us land on Mars, while others serve as our 'eyes' on the surface to drive around. They give *us a first-person view of landing on Mars*. ...They are likely to give us a good and dramatic sense of the ride down to the surface!"[28] Or as the sales pitch of GoPro cameras says: "capture life as you live it, share the experience and pass on the stoke," which rests on the physical experience provided by – or coming with – its use. The GoPro wearable camera promises users they will experience and record the moment without having to bother with choices around the point of view such as focusing, framing, and shot scale. Remember the 1968 Apollo 8 shooting of the Earthrise. The GoPro can be attached anywhere to record unconventional and spectacular images and sounds of bodily experiences and perception of the world. It is designed to record the complete experience and to upload it without the need for editing. Through Wi-Fi it creates an immediate relation between the person in action, technology, and the user/viewer. Such a 'real time' operation for capturing the rides of the Mars rovers is not possible. First, they don't have movie cameras and second, because of the distance between Earth and Mars, it takes approximately 7 to

[25] "Ride films attempt to dematerialize the subject's body through its visual extension into the cinematic field while they emphasize the spectator's body itself as the center of an environment of action and excitement." Lauren Rabinovitz and Abraham Geil (eds.): *Memory Bytes: History, Technology, and Digital Culture*, Durham, NC, 2004, p. 106.

[26] "Rover POV Five Years of Curiosity Driving on Mars," https://www.youtube.com/watch?v=4QdWOW7KPtw (last seen: 6.2.2019).

[27] Messeri, Placing Outer Space: An earthly Ethnography of Other Worlds, op. cit., p. 103.

[28] Mars 2020 Mission: "Designing A Mars Rover To Launch In 2020", https://mars.nasa.gov/mars2020/mission/rover/ (last seen: 6.2.2019).

20 minutes for a signal to travel between the two planets. The Hazcam camera of Curiosity is a fish-eye lens camera, used to plan rover drives. Rover planners actively process images to gain a sense of the terrain. They learn what it is to be a rover on Mars. Coupled to the rover's sensing and moving, the scientists report the rover's motions as that of an entity with intention. Sometimes scientists request sequential frames of the same observation that present the broadest possible field of view to assemble them into a movie. The ride we see is in fact an embodied view of scientists who take "on their robot's instrumentally-mediated vision as their own, making it the lens through which they experience Mars and formulate questions for continued observation."[29] Watching Curiosity's five-year ride on social media networks, the user imagines him/herself as the embodied viewer. Caught up in the animation of an unfolding world in its continuous openness, the users' attention moves forward as they project themselves through space along with the rover robot and the embodied movements of the rover planners. The users play

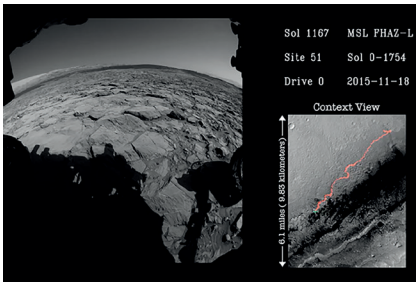


Fig. 11: Fotomontage of NASA's Curiosity Mars rover ride and a third person view of a mountain biker. Fig. 12: Five years of images from NASA's Curiosity Mars rover were used to create this time-lapse movie

and operate within these movies. Mars becomes a world to be explored and shared beyond a scientific community.

In my video installation *Venus Mission (2012)* and *mars analog* (2014) the camera movements and sounds call up the physical work of the miners of the nineteenth and twentieth centuries while the earthly and astronomical digital worlds seem to be incorporeal products of electronic and computerized data production. In contrast here, the three different image sequences seem to be human corporeal products of electronic and computerized data so that the user can navigate in space or on Mars. The images circulating on social media are embedded in an instrumental

[29] Janet Vertesi: Seeing Like a Rover, Chicago/Mass. 2015, p. 186.

complex visualization in which they gain a very ambiguous status. As the rover planners interact with a robot, they assign varying types of embodied agency to it. "On the one hand, the machines are an expression of the team's actions and interactions; on the other hand, they have personalities and agency all their own."[30] The difference between direct embodied experience and medial intervention becomes invisible – the technical visualization and the immediately tangible converge. Scientists spend a lot of time and energy producing such spectacular image sequences that play an important role in getting public support. The spacewalkers and robots such as the rovers become a medium for staging and experiencing the human phantasma of exploring and conquering outer space. While producing, distributing, and consuming these images, the scientists and the users inevitably immerse themselves in the logic of the neocolonial discourse. The human teams are entangled in power-

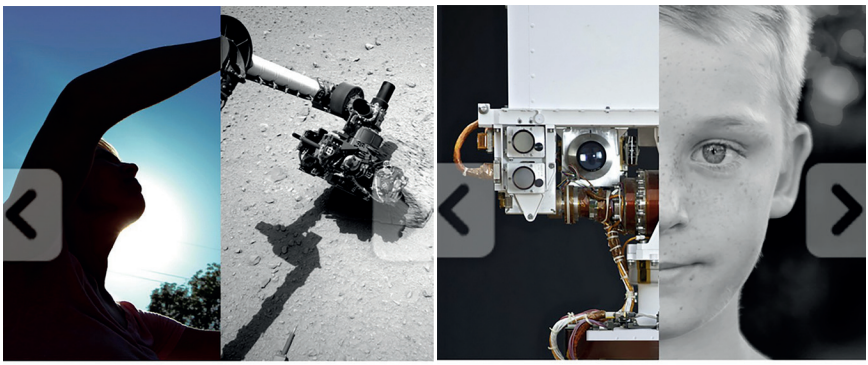


Fig. 13 and 14

ful institutions, influenced by the political agendas of a select minority: well-resourced nations, large industry, and industrial co-operations.[31] As some of us remember the televised images of the moon landing and the

[30] Ibid., p. 189.

[31] Although the Outer Space Treaty of 1967 defines that Outer Space is for the benefit of all Humankind, a lot of commercial gain already depends on the exploitation of outer space. Papers such as the US Space Command's Vision for 2020 refer to space systems, commercial and military, which are proliferating throughout the world. The U.S. Commercial Space Launch Competitiveness Act protects the rights of private spaceflight ventures. President Obama signed the legislation into law on 25 November 2015 *(congress.gov. 25 November 2015*). Companies such as Bradford Workspaces and Planetary Resources have already detailed plans to send miniature scout probes into space. Billionaire Elon Musk (CEO of Space X) wants to send manned flights to the ISS and Mars.

famous words of Neil Armstrong: "*That's one small step for [a] man, one giant leap for mankind*," some of us will recognize the images from Mars and the Twitter feeds of the Mars rovers and the lander Insight: "*First #Selfie I'm feeling healthy, energized and whole. This is me on # Mars.*"[32] The representation in words and images of 'we,' 'mankind,' and 'I' perform an important role for an ideological image production of outer space as readily available, inhabitable, and potentially exploitable territory.

[32] NASA Mars, 10.12.2018, https://twitter.com/nasainsight/status/1072614369350074370, (last seen: 6.2.2019).

Media Brothers – Fighting Jihad with GoPro cameras

Simon Menner

The Islamic State video Resolve of the Brave 2 (or "2 عزم الكماة") was released mid to late December 2015.[1] It contains a remarkable scene: Two Jihadi fighters can be seen, running head-on towards an invisible enemy. The narrative of the video is that one of the fighters kills himself during the attack, by exploding a suicide vest. What makes this video stand out from other propaganda videos of that time is not so much that an attack is shown, nor that this is a suicide attack, but rather the fact that the two attackers (cameraman and suicide bomber) are both wearing action cameras.

Fig. 1: "Resolve of the Brave 2", ca. December 2015

[1] Dating Islamist propaganda material accurately is extremely challenging. In an attempt to circumvent online censorship, material of this nature is constantly re-posted to different websites, often under different titles and with altered metadata. Since most platforms quickly delete Islamist propaganda, it is unclear where and when this material appeared first. That said, there are some good indications that this video was in fact first published in December, 2015. At the time there were some blogs and websites discussing the release of this video and its content. But the video was also mentioned as a top new release in "Dabiq #13." "Dabiq" had been a quasi-official ISIS online publication. "Dabiq #13" was published on January 19, 2016.

While carrying a weapon himself and seen shooting, the second guy is described as a "Media Brother" in the subtitles.[2] His role seems to be defined as someone who produces propaganda material and not through his actions as a fighter. This indicates the central role that is given to propaganda by groups like the Islamic State.

The footage from the vantage point of the suicide attacker is not being used in this video. The reason for this could be that his action camera was destroyed when he blew himself up. To my knowledge, no GoPro footage has so far been published that shows a suicide attack with explosives from the point of view of the attacker. These cameras might be tough but being at the center of an explosion seems to destroy them.

This 25-minute-long video Resolve of the Brave 2 is one of the first to emerge from the civil war in Syria that show fighting filmed with GoPro cameras. But as a whole, GoPro cameras entered the propaganda scene in Syria much earlier.

Tanks with GoPros

Right from the start of the conflict in Syria in 2011, social media played an important role for people trying to tell their side of the story. Like in other regional conflicts of the so-called Arab Spring, people in Syria were using their phones to document demonstrations and the harsh reaction from the government. When violence kept spiraling out of control and civil unrest became a full-scale civil war, people kept filming. What had begun as sharing current events within your social network morphed into a propaganda war, fought online, with ever more elaborate productions and more sophisticated technical means.

Early 2013 was an important time in the conflict. ISIS entered the scene in Syria and they quickly developed a highly appealing propaganda machinery. This probably helped them to recruit many foreign fighters. Amongst them were people like German rapper turned jihadi propaganda operative Dennis Cuspert (aka Deso Dogg, aka Abu Talha al-Almani), who brought with them a modern visual language and broad knowledge with regard to video production. At the same time – early 2013 – other parties in the conflict also put in money and effort to produce more professional-looking propaganda. This has to be understood as a response to the propaganda pressure from groups like ISIS. When talking about GoPro

[2] The term "Inghimasi" is frequently used for suicide attacks, kamikaze-style, the literal translation would be: "become immersed."

Fig. 2: "HD Tank with GoPro™ gets multiple Hits in Jobar Syria", October 25th, 2014

cameras, we have to look to the Syrian government for its first usage. There exists a somewhat obscure organization "ANNA." ANNA stands for Abkhazian Network News Agency. Abkhazia, part of Georgia, separated with Russian support in 2008, but lacks international recognition. ANNA has close ties to the Syrian government and to Russian aligned separatist fractions in the civil war in eastern Ukraine. In both conflicts, it operates cameramen that are deeply embedded within armed groups. Many of the produced videos end up on YouTube.

In early 2013, a YouTube channel called "Tanks in Space" started posting ANNA videos that show tanks of the Syrian Arab Army fighting in mostly residential areas. The tanks are shown in very close combat, shooting and sometimes even being hit themselves. All these videos are shot with GoPro cameras, attached to the guns or turrets of the tanks. They are all named similarly, like: "HD Tank with GoPro™ gets multiple Hits in Jobar Syria" [sic].[3]

3 "HD Tank with GoPro™ gets multiple Hits in Jobar Syria", YouTube, 25.10.2014, https://youtu.be/KVgHRlRqxTo (last seen: 22.2.2020). Please note the TM symbol behind the brand name GoPro.

The first video of this kind that is still available was posted on March 11, 2013, the last video so far was released on June 10, 2018.[4]

Here, the GoPro camera is used in a situation that would be far too dangerous for someone holding the camera. Sitting on top of a tank, in the midst of battle, is out of question, especially for a non-combatant cameraman. Using a GoPro therefore seems quite practical. There is another aspect that makes a GoPro intriguing in this situation. The gun of a tank always points at the thing it is shooting at. By aligning the camera with the gun, it seems as if we are seeing what the tank sees. Of course, this is not true, the tank itself is not able to "see" and the crew inside the tank has a much more limited field of view. This point of view is entirely artificial, yet by moving with the turret and looking at the things the tank is shooting at, one can get the impression of being there.

Even though there are a lot of noises, dust, and rubble in these videos and some explosions can be seen, they remain somewhat sterile. Very few people can be seen and those always appear to be fighters associated with the government. The shots fired by the tanks cause walls to topple and dust to billow. But the enemy – alive or killed – remains invisible. On one hand we get the impression of being right there, yet this "there" that is shown hides human suffering.

It is interesting that almost all the videos have the brand name GoPro in their titles. This seems to signal quality and maybe even authenticity. Plus, people searching for action packed-GoPro videos might stumble upon this channel.

A new tool for the cameraman

It might be a mere coincidence, but one of the earliest uses of GoPro cameras on the side of groups opposing the Assad regime also has a Russian connection. The 43-minute video "попытки штурма центральной тюрьмы Алеппо" (a rough translation would be "The failure of the assault on the central prison of Aleppo") shows Russian-speaking Chechen fighters during battle in Aleppo.[5] Shot mostly with regular cameras, there is

4 "HD Tanks with GoPros Attack Encircled Rebels in Jobar", YouTube, 10.6.2018, https://youtu.be/rJu1ySZy9XU (last seen: 22.2.2020).

5 There is evidence that this video was released on February 16, 2014. On February 7, Islamist groups under the leadership of al-Nusra Front had taken control of the central prison after long and bloody fighting. The British Daily Mail reported on one attack, shown in this video, on February 7, 2014. Sophie Jane Evans: "The last moment of the British jihadist who blew himself up to free Syrian rebels: UK fighter drove truck full of explosives in prison suicide attack", in: *The British Daily,* 7.2.2014, https://www.dailymail.co.uk/

Fig. 3: "попытки штурма центральной тюрьмы Алеппо", February 16th, 2014

also some action camera footage. We see a cameraman running with a group of fighters through rubble and debris, while they are being shot at. He is taking pictures and filming with a regular camera. For some time, fighters are running through a ruined landscape, ducking and taking cover behind walls, dodging bullets. Then there is a calm moment. In the last scene of the video, a larger group of men is standing around a couple of cars, apparently shielded from enemy view by a building. A prisoner is shoved into one of the vehicles, when suddenly a mortar round explodes some meters away. Even though the explosion seems small and distant, the leader of the group, identified as Saifullah al-Shishani, falls to the ground, instantly killed.[6]

The action camera here does not seem to play the central role in the attention of the cameraman, it rather seems as if this camera were a mere fallback device. A handy tool one could use to film, while simultaneously focusing on more important things. This approach proved to be right in this case. At the moment of the explosion, the cameraman was standing around, just like everyone else, waiting and observing. The situation seemed to be relatively tranquil and only the action camera captured the death of the senior fighter.

news/article-2553864/British-fighter-Syria-blows-suicide-attack-Aleppo-prison.html (last seen: 22.2.2020).

6 "Video Shows Raid on Aleppo Central Prison, Moment of Death of Chechen Commander", 17.2.2014, https://news.siteintelgroup.com/Jihadist-News/video-shows-raid-on-aleppo-central-prison-moment-of-death-of-chechen-commander.html (last seen: Dec. 2018)

Maybe the footage from the GoPro camera, in this case, was never meant to be published, and only the recorded death of the leader made the footage appear valuable. This is guesswork, but the GoPro footage seems slightly out of place from the rest of the video.

In more recent videos, much more attention is given to the presence of the GoPro camera and the way it depicts action. Part of this is done in post-production, by using cuts in between different types of footage (first-person, third-person, and material shot with drones) to create a sense of speed and urgency. More important seems the fact that GoPro cameras are worn by the fighters themselves, rather than some observer in the rear. By showing the fight through the perspective of the fighter, rather than the perspective of a spectator, it feels more intimate and therefore easier to connect to.

Since action cameras are easy to use and robust, they can also be used to film what is out of reach for a regular cameraman – like when cameras are placed on tank turrets in battle. This seems handy but can also be misused to document brutal atrocities. In the case of the still seen here, an action camera (in this case not a GoPro) is worn by a recruit of the Iraqi Army, captured by ISIS fighters. He is forced to climb a communication tower to raise the national flag, at which point he is shot by fighters on the ground. Hit by multiple bullets, he topples off the tower and hits the ground. The fact that he is forced to film his own torture and death (even though the footage from the action camera is not used in the video) is an additional form of mockery.

Fig. 4: “Fight the Guardians of Satan”, ca. March 2016

Given the mercilessness shown by ISIS towards captured enemies, this young recruit would have certainly been killed after his surrender – at least that is what the propaganda wants us to believe. Without an action camera available, would he have been forced to climb a tower? Maybe – maybe not. He would certainly not have been given a regular camera with the instructions to film his own demise. Somehow with action cameras available, a scene like this just seems to be more likely. Every new image-making technology tempts its early adopters to come up with creative ways to utilize the newly available aesthetics, this example is just extremely perverted.

Artificial action

Fighters in training have always been a tempting subject for cameramen and propagandists, long before social media or GoPros. The setting itself is staged and therefore extremely suitable for cameras. Actions and movements are constantly being repeated and that makes it easy to film. Movies like Full Metal Jacket (Stanley Kubrick, UK/USA 1987) or Starship Troopers (Paul Verhoeven, USA 1997) and many documentaries or propaganda films tell the story of the brutal and often repetitive training soldiers seemingly have to undergo. The ballet-like movements of military drill have long been adopted by paramilitary groups all over the world to depict strength. Even the otherwise not so image friendly Taliban have released a multitude of videos depicting fighters undergoing this form of training. If you want to appear powerful, you'd best try to look like the toughest guy around. The fact that this can easily look ridiculous does not seem to matter.

In recent years, jihadi propaganda moved away from just depicting fighters doing jumping jacks, pushups, or running through obstacle courses and more towards staging combat scenes. Very often, when doing so, the insurgent fighters try their best to emulate fighters in regular armies, by wearing modern looking uniforms and equipment and interacting in ways that seem familiar from Western military propaganda. Gestures, movements, the way fighting is depicted, it all seems as if it comes directly from Hollywood movie sets. And that might in fact be the case. Hollywood and Western media clearly influence the way these groups depict themselves as fighters. And this is interesting. The way fighters are depicted in these staged settings is vastly different from the way they are presented in real fighting in Syria and Iraq. Very few fighters on the real battlefield are seen wearing these SWAT-team like uniforms. There, the jihadis look far more informal.

Fig. 5: "Terrify the Enemy of God and Your Enemy", ca. December 2015

An example of propaganda of this kind could be the Islamic State video "Terrify the Enemy of God and Your Enemy."[7] Released in late December 2015 or early January 2016, this 21-minute video is all about training and staged fighting. In one scene five fighters wearing all black are seen entering a building, shooting and throwing grenades. All five fighters are wearing GoPro cameras and the footage from these cameras is mixed with footage from static cameras that provide a third-person view on their staged attack. The scene does not pretend to show real fighting. The building is clearly empty.

The use of the GoPro aesthetics in a staged setting is interesting. These videos show an idealized version of what fighting ought to look like. While there might be good excuses for utilizing GoPro cameras in actual battle – robustness, ease of use, free hands – staged scenes could easily be documented with a more static or more professional setup and they would basically contain the same amount of information. It is not just about the information they are containing, but also about the image they are projecting. Since the early 1990s, when computer games like *Doom* or *Wolfenstein 3D* entered our visual culture, the first-person view has come to resemble our idea of what fighting should look like. This

[7] Aaron Y. Zelin: "New video message from The Islamic State: 'Terrify the Enemy of God and Your Enemy'", *Jihadology*, 3.1.2016, https://jihadology.net/2016/01/03/new-video-message-from-the-islamic-state-terrify-the-enemy-of-god-and-your-enemy-wilayat-%E1%B8%A5im%E1%B9%A3/ (last seen: Dec. 2018)

had a lasting impact on movies and computer games – and apparently even Islamist propaganda.

Another much more recent video (May 2018) is represented by the still below.[8] Not from Syria or Iraq, but shot by Hamas in the Gaza Strip, it shows a group of kindergarten kids in military fatigue reenacting a military attack. The scene shows a hostage taking operation – not hostage liberation. Five children are seen as attackers. The way they move and interact with one another is very similar to the way it is presented in the earlier Islamic State video. It clearly resembles scenes from a whole genre of contemporary action movies. Two of the children can be seen wearing GoPro cameras. These cameras are filming the play and that footage is used together with footage from other cameras.

Fig. 6: Video still

When Hamas was staging this event and creating this video, they were reacting to the conflict with Israel. Many Israeli soldiers wear cameras as part of their high-tech equipment. In the video, one of the Palestinian children is wearing both gas mask and GoPro camera as part of its special forces costume. Maybe, like gas masks, ghillie suits, flak jackets, or helmets, action cameras are seen as part of the accessories of a fully equipped soldier. They themselves have become a status symbol that

8 "Gaza Kindergarten Graduation Ceremony: Kids Stage Mock Military Attack and Hostage-Taking", *Memri TV*, 13.5.2018, https://www.memri.org/tv/gaza-kindergarten-ceremony-stage-military-attack-hostagetaking (last seen: Dec. 2018)

represents professionalism and audacity. This goes beyond them being mere image-making devices.

The authentic GoPro footage

Everyone seems to be using GoPro cameras on today's battlefield. And many of the actors seem to associate this footage with a special level of authenticity. This becomes clear when action cameras fall into the hands of the enemy. Since both sides use the same cameras in battle, the victorious side can sometimes use the footage found on captured enemy devices. Maybe here the advertised toughness of these cameras has some strange side effects. While some of the fighters carrying these cameras are killed, the devices themselves survive. And once the button is pressed, the cameras record even the death of their owners.

That leaves us with difficulties of attribution. GoPro-like cameras leave extremely little room to create a personal style. There are almost no manual settings and there are just so many ways to fix a camera to the body of a fighter. Added to this is the way the civil war in Syria is fought on the ground. All groups use pretty much the same weapons, uniforms, and recruits. If you are the lucky winner of a battle and you stumble upon a GoPro camera on a dead enemy, the footage you find is almost indistinguishable from your own.

Maybe it is just too tempting not to show your enemy being defeated. To avoid confusion, the appropriated material is often marked with phrases like "Apostate Camera" and is frequently mixed with similar footage from the same battle, shot by one's own fighters. Doing so is not limited to jihadi groups. While the Philippine Armed Forces were fighting ISIS-linked jihadists in the city of Marawi in late 2017, the Philippine Army produced propaganda videos of their own – very similar to the ones produced by the insurgents. Video drones were used on both sides and so were GoPro cameras.

One of the government videos, titled "Battle of Marawi,"[9] contains footage captured from killed jihadi fighters. In this case, the material is marked "captured enemy footage" and is intermingled with footage of what appears to be the same firefight, shot from the opposing point of view. It is striking to see one side of an attack, while the other side is desperately trying to defend themselves.

[9] "Battle of Marawi", YouTube, 28.11.2017, https://youtu.be/_4zXI0X8Brc (last seen: Dec. 2018).

Fig. 7: "Battle of Marawi", November 28th, 2017

Under normal circumstances, propaganda material taken by your opponent might not be used in this way. But with GoPro footage, things seem slightly different. It seems that as long as the material is still in the camera, one can easily trust its authenticity. If you trust your own GoPro to accurately record events, why not trust the camera someone else was using?

The use of footage taken with more traditional cameras seems to be far more limited. Maybe in the heat of battle, especially if one finds himself on the losing side, few cameramen keep on actively filming. Or the material that can be found lacks the authenticity provided by a strap-on surveillance camera that just keeps filming, even if its owner is killed.

Media Brothers

With the release of videos like the one mentioned at the beginning of this article, GoPro footage quickly became something that was to be expected in videos from the battlefield. At this time in 2016, ISIS had established itself as the jihadi group that was running the most professional video production. Abu Bakr al-Baghdadi, the leader of ISIS, had proclaimed the caliphate in late June 2014. The area controlled by the group had peaked in June 2015. And from then on, things went steadily downhill. Maybe without fully realizing it, in early 2016 ISIS found itself already on the defensive.

Even though the full scale of this development can only be seen in hindsight, the propaganda changed. It became bloodier and the fighting became ever more important. For some time, a significant part of the propaganda tried to tell tales of a wonderful caliphate, the goal might have been to attract families to occupy the land, now under the control of the Islamic State. This was short-lived though, and ISIS quickly needed fighters. Young fighters. And to attract them, it seemed like a good idea to show battles in all their glory. Fewer videos were released that showed things like street cleaning in the capital of the caliphate or the inner workings of government offices.

Major releases like "Resolves of the Brave 2" or "Flames of War 2" were announced with overwhelming trailers that were trying to create social media hype. And once released, these videos could be shared in a number of different languages, either dubbed or subtitled. They were clearly targeted at an overwhelmingly young and overwhelmingly male international audience who might be willing to join the jihad in Syria and Iraq. And fighting was a key element of these major productions.

The GoPro camera seems to be the perfect camera for the battlefield. Easy to use, quick to set up. Rugged. Plus, it leaves both hands free to fight. When you are a free-climber or surfer, it is best for you to have both hands available and not to hold a camera. The same is true for someone shooting while running into battle.

The added bonus is that the footage created is easily recognizable as action camera footage. As footage taken by someone who had been really in the midst of things – and this gives it a glorious appearance.

Fig. 8: ملحمة الثبات3 (Epic Stability 3), ca. September 2016

Amongst earlier ISIS video productions, there were quite a few attempts in creating scripted stories and complex narratives. Stereotypically, it went like this: A fighter uses social media to connect with ISIS, he then travels to Syria, makes friends, gets trained, enjoys his life, and in the end, finally, he sees battle and becomes a hero amongst heroes.

Now, under the mounting pressure and growing desperation these groups are facing, such productions seem to be too difficult to realize. Videos merely showing battles and executions have become the norm. Given the current situation, they are just much easier to produce. Rarely do these videos now follow a single fighter, whose personality or motives are established to the audience. Most of the videos just show a collection of fighting. Fast paced, yes, but actions and personnel often interchangeable. When recruits are getting fewer and fighting is getting more intense, the GoPro camera becomes the ideal tool. No need to extensively train fighters in how to use a camera, or how to capture great images. Just point the camera forward and hit record.

This should not be confused with the "genre" of best-of videos, where special edits are created that combine a selection of already published fighting scenes from different videos. Those are indeed extremely abundant, but are very often created by outside opportunists who create their own videos from appropriated footage. The videos I am talking about here are new creations that seem more and more reduced to merely depicting violence and fighting, instead of focusing on more elaborate narratives, as earlier videos were clearly trying to do.

There is a long-standing avoidance of depicting people being killed. In war this is mostly true if it comes to civilians or enemy combatants, but is only relatively strict when dealing with one's own fighters who are the victims. This is one of many things that is shocking when first encountering jihadi propaganda by groups like ISIS. Not only are executions and corpses shown in every gruesome detail, but also the death of their own fighters is far from being taboo. In their logic, killed enemies are infidels and their deaths should be celebrated. Killed comrades on the other hand are seen as martyrs, their deaths are a sign of a just and god-fearing struggle. Showing them killed seems to be the right thing.

Western propaganda is almost devoid of depictions of violence. People know that the bombing campaigns of the US military, for instance, kill scores of civilians, yet US propaganda makes these conflicts appear almost sterile. Drone strikes are depicted as grainy blasts in black and white – if any footage is released at all.

By overwhelming the viewer with brutality and depictions of violence, jihadi propaganda almost seems straightforward and open. Naturally this

is a deception and only certain forms of violence are shown, while many atrocities remain hidden – especially in regards to violence perpetrated by ISIS and Co. against women.

And what could seem more open and authentic than if the person wearing the camera films his own death? There are dozens of scenes like this in Islamist propaganda.

Most of the time the fighters are filming themselves shooting and running before suddenly falling to the ground, hit by a projectile. Sometimes we can hear the fighter dying, or we see him struggling. Of course, we have to trust the propaganda as to whether or not any of these videos really depicts the death of a fighter, but this is not the point. These scenes feel authentic, and that has a lot to do with the visuals created by the action camera. There are plenty of other videos in which a cameraman captures the death of another fighter, yet these third-person views feel far less personal. In these cases, we look at the scene from a spectator's view and not from the perspective of the killed fighter himself. That is different.

Even though the recordings of these deaths seem accidental, they are not. It might be impossible to plan whether or not a fighter survives a battle. But by providing many fighters with action cameras and given the high casualty rates amongst jihadi fighters, chances are quite high that this kind of material is going to be generated. And it seems as if this kind of footage is precisely what propagandists are hoping for. This

Fig. 9: Unnamed Islamic State video, ca. April 2017

might explain why GoPro cameras often seem to be used in the craziest of attacks, the most desperate or the most daunting ones. The attempt is to show heroism and the unquestioned willingness to become a martyr. This now might sound distasteful but following the GoPro PR claim "be a hero," this is precisely what these cameras are meant to record.

And as with the scene described at the beginning of this text, there are numerous attempts to document suicide attacks with GoPro cameras – especially with car bombs. Take this still here. It shows another suicide attacker, wearing a camera, while already inside the vehicle for his final attack. Here again, the footage seems not to have survived, or it would certainly have become part of the propaganda narrative. But this shows us that these documented deaths are not accidental, but part of a perverted propaganda machinery.

Outlook

On the battlefield ISIS seems to have been defeated. The huge amount of professional looking propaganda created by the different media outlets under the banner of the Islamic State is a thing of the past. New ISIS branded videos do appear, but many of them are mere animations or recycling of old video clips. Many of these videos seem desperate. A few mostly old men fighting with outdated weapons. The glory-days of ISIS propaganda – for now – seem to be over.

Lately there are also very few scenes in these videos filmed with GoPro cameras. I am not assuming this is a voluntary shift in the media strategy, but rather a sign of desperation and lack of resources.

Other jihadi groups in Syria have never been as productive as ISIS when it comes to propaganda. They do produce new videos, but their resources are also dwindling. Plus, at the moment of writing, in early December 2018, there is a half-hearted ceasefire in place in and around the last remaining rebel strongholds in northern Syria.

Interestingly, the other big international jihadist fraction, under the flag of al-Qaeda and the Taliban in Afghanistan and Pakistan, never widely adopted GoPro cameras for their propaganda. In comparison to the Islamic State, these groups were always slow when it came to adopting new technologies and methods for propaganda purposes. While remote controlled video drones were already being widely used in Syria, it took these groups in the Hindukush more than a year to make this technological leap. Judging by this pace, they should, by now, have long adopted action cameras, if so desired.

The reason for not implementing this technology might have to do with a very different approach to the depiction of violence. Limited use of action cameras is made to document training sessions, but not during battle. While being similarly ruthless in their attacks, the propaganda produced by these al Qaeda linked groups shows very few executions or close-up shots of killing. Most of the fighting is filmed from remote vantage points. Maybe these groups share a general distaste for the gory brutality in ISIS propaganda.

In the future, there will be other groups that adopt GoPro-like cameras for their propaganda. The blueprint ISIS has provided might just be too tempting. ISIS might have failed in their power grab, but for some time, their propaganda proved to be extremely successful. Maybe the extent to which violence is depicted might be different, but the immersive feel of battle that can be created with GoPro cameras has deeply influenced what the audience expects of propaganda from the battlefield.

Postscript – After Christchurch

The main text of this article was written in late 2018, and while it is clear that there is never going to be an endpoint to the development of propaganda, some things need to be addressed. This postscript is written shortly after the horrendous attacks on two mosques in Christchurch, New Zealand. While in describing the development on the use of GoPro cameras in conflicts and propaganda my focus was mainly on the conflict in Syria and Iraq, we must realize that these conflicts exist in a much broader media context.

The attacker did film part of his attack with a GoPro camera and live-streamed the footage to Facebook.[10] *To many, this added another layer of horror. But in a way, this seems to be the next logical step in the development of this form of propaganda. Every tool available will be used at some point. There have been earlier examples of murders being streamed live and at least one example of Islamist terror in which the footage was directly shared via Facebook. The scope was different though.*[11]

[10] The watermark "Live4," visible in the video of his attack, indicates that an app of that name had been used to link his GoPro camera to his Facebook account.

[11] There were also some reports, at the time of the Charlie Hebdo attacks, that GoPro cameras had been used by the attackers. It seems as if they had not been used to document the attacks themselves but were merely in the possession of the attackers. One way or the other, no footage of that kind was ever made public. Still, even back then, in January 2015, this little snippet of information led some commentators to question when we might see the first attacks streamed live to the Internet.

While this was a fascist attack, nothing is going to prevent other groups from using the same tools in the future. What might have prevented ISIS and Co. from streaming more of their attacks might just come down to technical limitations. Almost all the attacks mentioned in the article above took place in areas ravaged by brutal conflicts. It has always been astonishing to me that, for instance, while ISIS was besieged in the Iraqi city of Mosul, their media output did not seem to be affected by the bloody battle. Even when jihadist forces were limited to some few streets and city blocks, they still managed to release high-resolution footage to the world. Smuggling a USB stick with a full HD video is one thing, live-streaming to Facebook is a different challenge. These were not the technical limitations encountered by the attacker in Christchurch. He could easily rely on a functioning phone network to stream his terrible attack.

We are shocked by this senseless act of violence and while we are grieving for the dozens of people killed, we might have to face a new reality, one in which this is the new norm for how these attacks leave their mark in our visual memory. The role images play has changed drastically since the events of September 11th. Back then, all images were shot from a victim's perspective – surveillance cameras already filming, tourists with cameras in hand, camera crews responding to the breaking news. To our knowledge, none of the attackers recorded the attacks himself. They were certainly hoping that these attacks were going to be covered by a multitude of cameras – which was precisely what happened. But things are different now. Snipers set up cameras to record their kills. Suicide attackers decide beforehand where best to detonate, so that the cameras, already rolling, capture the best shot. Images have lost their innocence. They've stopped being neutral devices that record certain events. Today, people are killed to produce images. And very often these images seem far more important than the details of who is it that is being killed. And as brutal as this sounds, the GoPro might be the perfect device for that. For all the reasons mentioned above, these cameras seem to be the right tools to film action and violence. At the same time, their distinct visual style has come to define what we expect action and violence to look like. So, this is certainly not going to be the last mass murder that is recorded with these cameras.

It is crucially important to me to stress that while in this research I might have focused on Islamist propaganda and the use of action cameras in this context, it is clear to me that these cameras will be used by other groups in the future as well. With an app that lets you stream your footage directly to the Internet, these cameras might indeed be the perfect weapons for the visual propaganda war that is being fought online. ISIS and Co. have merely been at the forefront of bringing down moral norms regarding the

depiction of death and murder. Others will certainly follow. And strange as this might sound, at their sadistic and dehumanizing core radical Jihadists and right-wing anti-Muslim Fascists are very close and should normally get along just fine.

The Cardboard Camera
The Highs and Lows in Immersive Filmmaking with GoPro Cameras

Christophe Merkle

On Christmas 2014 the postman or Santa Claus gave me my first Kickstarter-backed product. It was a piece of cardboard that was going to change the trajectory of my career. The project's name was Dodocase VR Viewer. With this I could integrate my iPhone 5c into a cardboard construction fitted with lenses and see VR for the first time. My first experience was a 360 film from Arte called PolarSea360. I was fascinated by the new technology and showed it to anyone I could. My dean asked me: "How do you make these kinds of movies?" I didn't know. After some research I found a company called Freedom360, which makes rigs with several GoPros. After telling her that, the school bought 6 GoPros with the Freedom360 Explorer rig. This was the start of my professional relationship with GoPro & cinematic VR.

I immediately started experimenting. The GoPros had to have similar exposure in order to stitch the videos together successfully. Stitching is when you take the files from your camera and stitch them by joining the overlapping pixel structures together into one 360° film. If one camera was not on or did not have the right settings, you were in trouble.

I did several short films where I wrote all my settings down into a small booklet with the information as to whether the capturing was a success or failure. Kind of a fail blog. Whether or not the stitching quality was good was another topic. After 10+ films I created some sort of workflow. Every camera captured 1440p 30FPS with ProTune on. Then there were some settings like ISO or EV that depended on the amount of light available in the shooting direction. I took one GoPro, connected it with my smartphone, and used it as a viewfinder to get the right settings. Then I changed the settings on the other GoPros. I switched off WLAN because of the high battery use. For recording I inserted every GoPro into the bulky rig, rolled the rig into the tripod and pressed record. I verified that every camera was counting the recording seconds and clapped several times for synchronization. Now I either had to start acting or hiding somewhere. After the planned action was over, I ran back to the rig and pressed the record button on all the GoPros. Then I imported the footage. To do this you have to take every GoPro out of the rig. Slide the MiniSD out. Insert the card into the PC slot. Import footage

and do that again for the remaining five GoPros. After organizing the footage into scenes or takes you can import it into a stitching program like Autopano Giga Video.

This software created by the French company Kolor was later bought up by GoPro. I didn't like that software from day one. The learning process was steep – my background is IT – and there were plenty of crashes. These time-consuming bugs made me a coffee drinker. The software was adapted from a photo panorama stitching software and needed a lot of updates for the video stitching function to work reliably. When adjusting the stitching in Kolor you could only open one frame into a different photo stitch software called Autopano Giga Pro, readjust the stitching, save it, and then hope that it looked good for the rest of the video. You could create keyframes in a later update. The interface design was like an early version of Windows XP. A bunch of windows with a lot of options you didn't need and complicated procedures to follow. They released this software halfway through and did not care much about the user experience.

Since this was the only software available to me at the time I chose not to complain and follow the 80/20% rule in stitching. I stitched it until it was 80% good, because to get the other 20% you would need to invest the same amount of time or even more than you did for the first 80%. In my experience, only the experts that stitch themselves were complaining about the last 20%. For the normal viewer, they did not care and were overwhelmed by the VR experience.

After some weeks of experimentation, I got a request to make 360° videos for a science project called Augmented Learning Experience. The team created an app called Sardona. In this app you could choose a trail in the Tectonic Arena of Sardona. During your hiking experience you could stop at certain points and learn more about your surroundings with AR or VR content. I was excited to take the 360° rig out for the first time in the mountains. The place where GoPros are at their best according to their marketing. We took all six of them, the charging module, Zoom H6, Lavalier Mic, and a heavy mic tripod with us. A graphic designer, an animator, and I took the chairlift up to 2,700 meters on the Cassonsgrat. With us came a drone pilot and a guide, who was our actor at the same time and looked like the humble Swiss version of Indiana Jones. We hiked to the first film location and prepared the material for recording. I took the 360° rig and set up the 6 GoPros. I turned them on and saw that two GoPros had lost half of their battery capacity although I had charged them two hours before. Therefore, we had to pack the things back up and return to a guesthouse to charge the batteries. 40 minutes and

some soups later we tried it again. I installed all 6 GoPros in the mount, adjusted all the settings. This time I brought the GoPro remote with me. I could synchronize all the GoPros with the remote and have them record at the same time. This was very practical but not for the battery, because they all needed WLAN to be activated. Additionally, there was a problem that not all cameras were in sync. Some of them occasionally dropped out of the connection. After a couple of takes I decided to launch them manually and never use the GoPro remote again.

Fig. 1: Indiana Jones, the famous Martinsloch and the GoPro Gang

Maybe there was something peculiar going on in that beautiful arena where you can experience the force of tectonic movements. During this mission we had problems with almost every electronic device. Even the drone crashed.

Some of the takes on this 6+ hour hiking trip went well with some detours to mountain lodges to recharge the batteries. I felt a constant tension because I was nervous that the next technological breakdown could happen at any time. There was a constant danger that one GoPro or another would not record or save the video. From time to time the GoPro just said no, like the computer in the TV series Little Britain. When that happened, you would encounter troubles in the post-production. It was possible to check if the GoPro recorded a video, but not if it had

recorded the whole thing. There were cases of corrupted files or films with weird color patterns. The main problem at that time was that you could not visualize what the finished 360° video would look like. I had to wait until I was at the school or at home, transfer the files, and then stitch it to see if the 360° film was usable or not. Therefore I was very nervous and chose the fastest way to a PC after the recording. I was quite paranoid and hugged the camera all the way home.

Today it is possible thanks to all-in-one cameras to visualize the stitched image on a Head Mounted Display during recording. But back then I could only rely on my experience, because I had to hide myself somewhere in the scenery during recording. The same for directing. This led to much more planning and rehearsing before recording, almost like in the theater. You rehearse and adapt things but when the curtain opens, and the public is waiting to be entertained, you as the director don't have much possibility to influence what is happening on stage.

After the stitching we added some animations on it and we could finish the video. Unfortunately, our 360° films did not make it to the final app of the Tektonikarena Sardona because the movies were too big to download for a 3G network. That was a sad end, but it was a very interesting project and prepared us for future projects.

After some trips to the mountains with the rig I felt the urge not just to create pretty panoramas but to challenge myself to tell a story in 360°. In my master's studies I was mainly focusing on the so-called Röschtigraben. These are the cultural differences between Swiss-German and Swiss-French citizens. I grew up half and half right at the border of this non-violent clash. I wrote a scene about a man that is looking for the owner of a bath brush that he found in his grandmothers' basement.

The persons watching the film should feel like visitors to the space and not like casual bystanders. She or he should feel as if she were involved in the scene and not watching an experience through a window like the framed, flat, classic film. Therefore, I wanted to build a character that had a role in the story, and who the actors would acknowledge as a physical friend. I built a rig out of everything I could find and afford.

The scene in the bar had a lot of persons around a table. Therefore I had to capture a lot of details in the horizontal. The Freedom360 Explorer Rig that I had used before only had 4 in the horizontal. Unfortunately, I did not had access to other rigs that could carry more. I was looking for other solutions and found instructions on the PurplePillVR website for a 3D printed rig. A friend printed this and we combined it with a self-built cardboard body. This was the birth of Carl Karton, the Cardboard Man with Super Spider Vision.

Fig. 2: The Birth of Carl Karton

Fig. 3: Super Spider Vision Recording System gets towed to the filming location

I hired an assistant to handle the camera. The only problem was that the GoPros overheated because they were very close together and hyped each other up, almost like fans in a waiting line before an Apple keynote. Therefore, we integrated an ice pad to keep the brain of Carl Karton cool.

We shot one scene in a bar and one on a boat on the Lake of Schiffenen. Carl Karton was tied to the roving boat with straps.

As the director I could only rely on my sense of hearing. I could not see a preview picture of the result and had to be patient until the next day. So the whole day was kind of a blind shooting with over 20 persons involved. This was my small Fitzcarraldo project.

The rest of the recording went great. I was very fortunate because I had an awesome crew that worked very hard and the gods of technology were on my side. On the next day I began with the stitching of the GoPro footage. The lake footage was very shaky and looked like a mosaic. The videos of the different GoPros were not in sync together and caused problems in the stitching. After several hours of trying to fix the footage I have finally found a solution. Up to that point, I had synchronized the footage with audio by clapping after pressing the record button. This was not so accurate. What worked better in my case was to sync with the help of movement. The software would look for movement patterns in each video and would then sync the video frames accurately together.

While trying to solve problems like that you realize that you are heavily dependent on the current state of technology. It was frustrating back then, but there was hope that maybe the following weeks the next big thing in 360° filmmaking would arrive.

After this project Tourism Schwyz asked me to do an 360° film for a big exhibition in Zug. They wanted to show the best tourist activities that the canton Schwyz has to offer. This is hiking the Mythen, riding with sledge dogs, visiting the monastery of Einsiedeln, and kayaking. The client wished to include more activities like a ceremony in the Carnival or visiting caves named Hölloch, but I didn't know how to stitch low-light scenes with GoPros back then. I did know how to lower the noise by keeping the ISO low, but stitching dark frames together with Kolor Autopano was a mess that I avoided.

The recording of the episodes Kayak, Mythen, and Einsiedeln went well. The one with the sledge dogs however did not go so well. The dogs were in a beautiful, small village in the Muotathal. The owners of the place were very friendly and introduced us to all the dogs. They were friendly and calm too. We planned to attach the camera to a sledge. Since I did not have a lot of experience with grip systems back then I decided to take Carl Karton from my previous movie with me. He fit wonderfully

Fig. 4: The GoSlaves and Me on the Mythen

Fig. 5: The friendly but soon hyperactive dogs and the sledge powered by Ultra Spidervision

on that sledge. Thinking back, I realize how unprofessional that was, coming with a cardboard box with 3D printed plastic to fix the camera on the sledge. That was sort of a rookie mistake, but I learned everything about grip material after that.

We left the camp early the next morning. I did my routine checkup and checked to make sure that every camera was working, had enough battery power, and that the mini-SD cards were okay. I took two replacement GoPros and replacement batteries with me. The dogs and the sledges were in a special wagon, pulled by a pick-up truck. The dogs where barking all the way down the road, so I did not have to see the car to follow it. You could hear them riding through the valley. We drove to a station. There we took a short cabin ride to one of the coldest places of Switzerland, the Glattalp. Up there, they attached the dogs to poles while I was installing my camera rig. The dogs were going crazy because they knew that they were going to be able to run through a beautiful snowy valley.

While the dogs hyped each other up more and more, I was having problems with my camera rig. Four out of the seven cameras kept going out repeatedly. Therefore I was going crazy too. I started running back and forth to chang batteries. Nothing helped. The GoPros kept crashing. Meanwhile, one of the dogs bit through his leash and ran away. The dog leaders were desperate. "We have to go!" they said. Therefore I put the three working GoPros in the forward driving position and the rest facing backwards. The sledge with the dogs disappeared into the white paradise. I was by myself and did not know if the cameras were recording or crashing. After a long 15 minutes they came back and the GoPros were still recording. We were lucky. I went to the only house up there and asked if I could borrow an electricity plug. After 30 minutes of recharging we did some static shots. All the GoPros were working again as if nothing had ever happened. A couple of hours later I drove back home very nervous. Could you stitch a panorama when only 3 out of 7 cameras were working? What if not? Reshooting the scene would have been very expensive. How could I better prepare myself for this? Was the height the problem? Was my career at stake? I decided to put some blues music on to calm myself down and drove home.

The footage has been backed up and I started to stitch the sledge ride immediately. I was very lucky. It was possible to stitch a 360° film from three angles and it didn't look so bad at all. When you watch the film with a head mounted display you mostly look forward in the direction that the sledge is moving. Otherwise you can get dizzy. I was incredibly fortunate that my intuition told me to put the working GoPros in front because neither the client or the over 30,000 visitors to the exhibition

found out that in one scene 60% of the sphere was black because they were watching in the direction of movement. The only thing I wanted to do afterwards was to learn more about how I could get better using GoPros and grip systems. Furthermore, I was desperately hoping that very soon a reliable all in one high-res 360° camera system would come out.

Fig. 6: "Wow, nice dogs!", she said.

After the job with Schwyz Tourism I got a visit from an employee of the SRF. He had ambitious plans about 360° films and how to integrate them into the Swiss Television Network and website. We brainstormed a lot of episodes but decided to create a prototype first. I knew that this was my chance and I shouldn't screw it up. In other words: Better take care to master your GoPros when it counts! The mission was to create a 5-7 minute 360° film about the world record attempt at the longest Slackline walk without falling.

During the planning phase of the episode, the new Samsung Gear360 camera came out. With this camera you could record 360° films by pushing only one button. It saved the footage on one SD Card. That was a good improvement. Unfortunately the image resolution was not that high. Therefore, I decided to shoot the main scenes with the 7 GoPros and the riskier drone and POV shots with the Gear360.

Fig. 7: Filming the SRF360 Slackline movie on the Churfirsten

To record the world record attempt, we had to hike 3 hours on a difficult route. I took my 7+2 GoPros, a new rig, and batteries with me. On the top we had to secure ourselves because it was steep and the grass wet. It was one of the prettiest locations I've worked at, but I was again in a situation,where I was in a remote and very high place without the possibility of loading up my GoPros. Obviously, I was nervous. Additionally, the world record attempt was in a precise time frame so the 7 GoPros had to all work then. Luckily, they all did. We got interesting shots and the drone was not damaged. This time I took my laptop with me to directly back the data up while coming back to the car.

We were able to finish the film after two weeks of editing and in my opinion it was a success. The GoPro and the Samsung footage looked very good. I was fortunate to do several more 360° films for the SRF. The films Inspector Crazy and SRF Pulse täglicher Kampf um Menschenleben (Daily fight for human life) were mostly shot with GoPros and the 360Fly. My relationship with the GoPro in 360 ended right after the Pulse film. It was the moment when the Insta360 Pro came out. This camera was an all-in-one 8K 360-camera. It did not have as good image sensors as the GoPro, but it was easy to use and reliable. I could

Fig. 8: GoPros & Gangsters on set of the SRF360 Inspector Crazy movie

visualize the whole 360° film on the spot, instead of having to do a lot of abstraction with the GoPros. Additionally, I could record stereoscopic 360° and the camera came with a very easy stitching software.

A lot of doctors and GoPros on the set of SRF360° Täglicher Kampf um Menschenleben GoPro had some innovations too. They launched the Omni Rig. This was a synchronized 360° rig containing 6 GoPros. This system had a very nice workflow and synchronized all the GoPros frames accurately together. Furthermore, they launched the GoPro Fusion in 2018. This is an all-in-one 360° camera that is affordable and could shoot 5.2K. I tested it on several occasions and was surprised at how easy it was to use. Unfortunately, I experienced bugs and problems with it as well. To me this camera felt more like two GoPro H5s glued together and wrapped in a case than one system. I lost data from the front or the back camera on several occasions while filming. Therefore, I could not stitch and use it. The GoPro Fusion is one step behind in comparison with the competition. Insta360, Kandao, and ZCam all have interesting all-in-one cameras with easy to use and reliable stitching software. GoPro doesn't have an official solution for stereoscopic 360° films yet, which in my opinion will become more and more important

in the future. There was the Google Jump Rig containing 16 GoPros. This rig is only for selected filmmakers and in my opinion is already outdated.

The GoPros are cameras for rapid prototyping. They helped me to discover new fields of filmmaking like 360°, photogrammetry, and volumetric capturing. Without them, I don't think that I could have done these experiments. Not at such a low budget. GoPros are easy to use, have good recording quality, and are very versatile for all projects. They are perfect for experimenting or for cases when you want to try something new, but it is not very tragic if you lose the data. No wonder Google has used them for their first 360° 3D films and now recently for volumetric capturing. The only case in which I would not use them is when money and hard-to-reach shooting locations are involved. I would use them as backup cameras, but not as a main recording device anymore. Especially today, GoPro has a lot of competition from Yi, Sony, etc. Some of them are cheaper, better, and more reliable. Furthermore, GoPro not only loses the Hardware race, they lose the software race too. The company behind the stitching software Autopano Giga named Kolor was shut down by GoPro. That decision does not surprise me at all if you compare this software with what MistikaVR is capable of. It seems that GoPro is on a downward spiral, and you can see that in the company's market share too. The downward spiral started around 2015. In this year, Facebook bought the VR company Oculus. GoPro, while having problems surviving in the hardware market, also wanted to have a seat on the VR train. They realized that multiple production companies around the world used their GoPros with 3D-printed rigs and Kolor Autopano as stitching software to create immersive content. Therefore, they manufactured the Omni Rig and bought the stitching software company Kolor in the same year. GoPro wanted to professionalize this field and be the go-to company for immersive filmmaking. Then they created the Fusion to target the amateur market but got competition from Chinese manufacturers creating similar hardware and software that was cheaper and more reliable. Additionally, the HMD sales underperformed massively and only a few early adopters around the world are able to enjoy immersive 360° films with a Head Mounted Display. Meanwhile they had a dead-on-arrival drone named the GoPro Karma too. Nowadays GoPro are trying to sell the Fusion and the new Gopro Max as a camera that covers everything, and the idea that you can reframe the 360° film into a "flattie-movie" with awesome pans, also known as the over capture feature. They are completely leaving out the virtual reality component and focusing on conventional, flat films again.

Fig. 9: GoPro's stock price since 2014. You can see a short high when they announce the GoPro Omni and Kolor acquisition.

I compare the GoPro with the material cardboard. It is good for rapid prototyping and creating interesting experiments, but collapses under pressure. Unfortunately for GoPro we have now passed the cardboard age of small cameras and have more reliable and powerful materials on the market. The GoPro cameras must find a new field. I have seen some interesting experiments by Google for volumetric capturing. They built a huge arc of GoPros. However, like the Google Jump rig, I doubt that it will become a solution for the mass market, but for specialists with particular connections to Google.

GoPro seem to target with their new generation of cameras the Vlogger community. The GoPro 8, Max and their accessories have been especially built for the selfie filmmaker. Are these features going to save the legendary GoPro from crashing?

The GoPro has always been a partner in my experiments into new ways of filmmaking. I can't thank them enough for their contribution into making small, powerful, and simple-to-use cameras. I hope that they will exist for many years, although some heavy turbulence seems to be coming up against them. The question is: Will GoPro find a new and innovative way to create and share experiences? Can they reignite the magic of sharing never-before-seen experiences and camera angles?

GoPro's Social Success: Strength in Numbers

James Trew

Today, it's hard to imagine a social media world without GoPro. The versatile, robust camera is designed to be used during life's most exciting moments, after all. Social media is where people share those moments, making the two a natural fit. But other action cameras exist, and have done for some time, so what is it about the humble GoPro that has made it the go-to camera for sharing life's extreme (and increasingly not-so extreme) moments online? A clever strategy, a little bit of luck and some fortuitous timing.

The early days

GoPro has been around, in some form, since the early 2000s. The company's first product was a waterproof 35mm still/photo camera that came to market in 2005 (coincidentally, the same year that YouTube launched). GoPro's first "video" camera – the Digital Hero – came out the following year, but could only shoot very short clips in (by today's standards) very low resolution (320×240).

It would take a few more years until GoPro would make a camera – the HD Hero – that would deliver the video quality needed for it to capture social media users' attention. The HD Hero's arrival at the end of 2009, offering 1080p/30fps (FHD) along with the trademark rugged/waterproof casing helped define a new kind of video capture device: the action-cam. And its timing was almost perfect.

While YouTube had been around for five years at this point, it was starting to grow beyond its early roots as a simple video-sharing platform, to a complete viewing destination. Especially with the introduction of live TV, sports, and a move away from the clunky "Flash" player to the more versatile HTML5 standard. With Instagram launching in late 2010, and Facebook already a household name, along with the rise of smartphones (after the introduction of the iPhone in 2007), it's easy to see, in hindsight, how the new decade was setting the stage for a sharp rise in video and photo sharing.

That doesn't mean GoPro was quite ready for it. Or alone in the market. The company's first post to Instagram wouldn't happen for over another year (in the spring of 2012). The companion mobile app for its cameras wouldn't arrive until the following autumn, and even then it was primarily an extension of the camera's controls, allowing you to turn your phone into a viewfinder or change key settings – although the app did include a social section for "Photo/Video of the day." There was also strong competition from the likes of Contour and Drift (among others).

The next few years, however, would prove to be pivotal for both GoPro and the social media platforms that would become the natural home for their output, and separate the company from its rivals. By 2014, GoPro had established itself as a high-profile name on social media, winning the "Best Brand" on Instagram and "Best Facebook Page" awards at the sixth annual Shorty Awards (a sort of "Oscars" for social media). Later that year, GoPro would announce the Hero 4, which brought full 4K/30fps (or "UHD") to helmets, boards, and beyond for the first time. Meanwhile, its competition was struggling to gain the same following. It was about to be a really good time to be GoPro.

The good years

2014 is the year that I, as a reporter for Engadget, was exposed to the depth and breadth of GoPro's social media strategy. I was invited to Hawaii to cover the company's annual "Athlete Summit." The event brings all the sponsored athletes together in one place, everyone from wingsuit flyers, to Olympic skiers and pro surfers for a long weekend of social media training and, of course, action-related fun.[1]

To open the event, GoPro held a short conference to welcome all the athletes. During this, the speaker showed a video from YouTube titled "Backflip Over 72ft Canyon." In it, pro Mountain Biker, Kelly McGarry, rides over the steep, desert mountains at Red Bull's "Rampage" event. The two-minute clip looked much like any other freeride mountain biking clip, complete with perilous drops and sharp turns, until about 70 seconds in, at which point McGarry's helmet-mounted GoPro captures his incredible backflip over a 72-foot gap.

[1] James Trew: "Extreme exposure: Inside GoPro's burgeoning media empire," in: *engadget*, 29.5.2014, https://www.engadget.com/2014/05/29/gopro-media-business/?guccounter=1&guce_referrer_us=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_cs=chq3K3RDJ3RYnyKbkQI--w (last seen: 2.2.2019).

The company chose this clip as it had proved to be one of the most popular GoPro videos that year, with several million views. (It still is one of the most popular as of 2019, racking up over 50 million views.) After showing the video, the athletes in the room were reminded that GoPro had (once again) been voted "Best on Instagram," and now, YouTube at that year's Shorty Awards.

The rare, behind-the-scenes glimpse at how GoPro was working to focus its social media efforts was, on the one hand, to be expected (the company had quickly become famous for receiving a lot of exposure on social media thanks to customers posting their own clips). On the other hand, it was revealing to see what an organised machine the social strategy was becoming.

Over the weekend, athletes were trained on what type of video or photo – landscapes, action shots, product-related shots, etc. – tend to earn the most engagement (clicks, comments, or other interactions). There was also guidance on what time of day will usually be optimal to post their material and breakout sessions with GoPro staff on hand to offer training on how to use each of the camera's functions; then outdoor sessions to try them out in the real world. The event was capped off with an awards ceremony for the best clips captured over the summit, after which athletes were dispatched back to their day jobs to deliver on whatever contractual obligations they had agreed to (number of social posts per week, etc.).

If it ain't broke, improve it

With GoPro receiving so much free exposure from customers, the use of hashtags (#gopro) and use of the company's name in the title of videos and photos on social media, it would be easy to assume that hiring athletes to add to this collection of media was simply a case of improving an already successful formula. By 2014, the company's social presence was strong, with over 3.8 million Instagram followers (an increase of 162% from the end of 2013 – Sony's action-cam only has 50,000 in 2019). YouTube videos featuring GoPro content were bolstered by the new 4K functionality of the Hero 4 Black.

While the brand had become popular across the social media universe, even the company itself had realised that GoPro's strongest platform was Instagram, especially since the service added the option to share videos (and not just photos) in the summer of 2013. The launch of a GoPro

"channel" on Virgin America airlines (and later Xbox, Roku, and Playstation, among others) followed, and represented the first true indications that the company was trying to expand the success of social media to a broader audience. More importantly, an audience it could completely control (and therefore, monetise).

As GoPro began to sell record amounts of cameras, the number of candid/user-generated clips would rise in tandem. All GoPro had to do was keep asking for submissions, or comb the social networks for the best clips and repackage them for its own social media accounts or streaming channels. With a steady flow of contracted content coming in from pro athletes, for a relatively minimal cost, the company had an organic marketing campaign that, quite literally, money couldn't buy. Other companies tried to replicate this plan – Sony contracted Tony Hawk for example – but with fewer cameras being sold, they were unable to gain the same traction. Not least of all, there was a new opportunity growing, and one that GoPro was quick to embrace: the "influencer."

High-profile users have existed on every platform since the dawn of the internet. Social media just fine-tuned the idea, giving a single destination, a wide-reaching audience to connect with and other tools such as re-tweets, shares, likes, hashtags, and algorithmic "recommendations" to help grow your following. Even though many of these emerging social media "stars" were not athletes, nor did they necessarily have a strong alignment with the GoPro brand, the small, versatile camera was a relatively easy sell to these content creators who often wanted to capture impromptu moments with either their phone or, of course, a GoPro.

Around the time of the launch of the Hero 4 Session – the company's smallest camera yet – in 2015, I noticed these influencers started appearing at GoPro's launch events. I had been at every camera launch since the Hero 3+ and they followed a fairly set formula: Invite a group of journalists to a controlled event, kit them out with a camera and subject them to various activities (kayaking, mountain biking, etc.). The plan was simple, the journalists were able to try the new features in an "active" environment, and would end the excursion with sample footage that would be much more interesting than if they had been sent the cameras to try for themselves at the office.

The influencers, on the other hand, required a different approach. Journalists are used to things like embargoes (a date before which they agree not to publish anything) or signing non-disclosure agreements in exchange for early access to new products. This is especially important for those that work for print media, which needs a longer lead time to meet publishing deadlines. But even the online journalist needs time to

assess, review and then file a story. Not the influencer, though, who often tends to work in real time and share everything immediately.

To adapt to this new challenge, GoPro began holding two sessions: one for the mainstream media (usually a day or so before the official announcement of a new camera), and a second session on the day for influencers, allowing the company to guarantee a steady flow of photos and videos from the new camera to reach the influencers' audience that very same day.

The use of influencers has become a new symbiotic marketing tool for GoPro. Regular users had long been sharing their videos, helping GoPro gain brand recognition in a way that paid-for marketing can rarely achieve. With the rise of the influencer, this same strategy would work in a new, enhanced way. For starters, these social media stars came with much bigger audiences, often in the millions. This is true for the sponsored athletes, too, but the influencers' audiences were often not conventional GoPro users.

The second benefit is that the transaction between the influencer and their audience is more direct. We all know that athletes have support teams, or managers, eager to assist in showing their talent to the world. The influencers usually work for themselves, and often thrive on the "authentic" connection they have with their viewers. This arrangement meant that many brands were quick to capitalise on social media marketing.

Soon, many companies were paying highly-followed accounts to place their products in posts, give reviews, and other sponsored content. The problem was that often there was no indication that these placements were paid for, and advertising standards authorities across America, Europe, and beyond started pressuring platforms, like Instagram, to require users to indicate when a post was paid for or sponsored. GoPro, however, was largely able to avoid this issue by being the camera that enabled the selfie, or the time-lapse, or the short video clip without the product necessarily being shown at all. All it had to do was be there by association.

The next indication that GoPro was taking influencers more seriously was when they started being featured in the company's official promotional videos. Most notably for the launch of the Hero 5 and Hero 6 cameras. Until then, the company had largely relied on pro athletes and its own in-house media team to create the promotional highlight video for its camera launches. With the Hero 5, we see a switch to using non-athletes. This technique was even more prevalent in the launch video for the Hero 6, which features several well-known influencers. But GoPro turned the tables, having the influencers work with their media team in

a semi-scripted capacity, rather than use their own candid content. Now, the influencer was replacing the athlete.

This new strategy has certainly helped GoPro reach a wider audience, piggybacking off of the large following of its chosen influencers, but it's also around this time that other aspects of the business weren't going as well. After the company's share price slumped, and several rounds of layoffs, GoPro's brand image had shifted from aspirational to a company caught on its back foot. A situation that was exacerbated by the troubled launch of the Karma drone, which, thanks to a manufacturing issue, had in some cases been falling out of the sky.

GoPro was ultimately forced to rethink its entire strategy. The most drastic measure (after the layoffs) was to terminate several projects. These included the Karma drone, which was originally planned to continue with a second aerial device. The media division was also stripped down, along with any plans to grow its streaming channels on Xbox and Roku etc. After a year or two of reshuffling, the company changed its vision to focus squarely on the camera, with most other things being secondary. This new strategy included improving the mobile and desktop apps and listening to users to understand what they wanted most.

Fortunately for GoPro, this strategy quickly lead the company back to what had helped it become a success in the first place: a focus on users, social media, and ease of use. After hiring a new CTO, and acquiring companies that made popular mobile video sharing apps, a revised version of its original "let the user do the work" strategy emerged.

One app in particular, Quik, soon became a focus. Quik was a rebrand of an existing app called Replay, which was repurposed after GoPro acquired it to heavily simplify the editing and sharing of videos. While the main GoPro app had offered similar functionality for some time (since at least 2013), Quik put social media front and center, including many templates that were custom made for Instagram (square format, and pre-set to Instagram's optimal video lengths). Now, the company's message wasn't just about how versatile its cameras were, but how easy (and important) it was to share your life with the world. A companion service – GoPro Plus – offered a place to store your videos online, for a fee, meaning that anyone with a phone could store, edit, and share their videos with just a mobile phone.

This new and improved social strategy is directly reflected in the Hero 7 Black. The introduction of "Hypersmooth" (electronic image stabilisation) along with a vertical shooting mode (almost certainly made just for Instagram Stories) along with a new livestreaming feature made the Hero 7 the most social-friendly camera to date. Athletes still benefit

from these new tools, but it was very clear who GoPro was targeting with this camera.

The result is a new wave of user-generated content that looks even better than before. Vertical video is a nuisance to most, but for Instagramers, it's a valuable tool and a big lure. Smooth video simply makes everything look better, and livestreaming opens the camera up to a new range of social networks: Instagram, YouTube, Facebook, and Twitter all support live video, but for emerging platforms like Twitch it's essential. The symbiotic relationship between influencers hungry for more eyes, and GoPro's appetite for user-generated content has since entered a new realm. GoPro can make you viral, or if you go viral, GoPro might well jump on your clip and share it even further. In 2019, GoPro has around 90 athletes on its payroll, and 50 "ambassadors" (their term for "influencer"). So athletes are still the bulk of the paid promoters, but the number of paid influencers is on the rise. This is especially attractive to the budding content creator. To become a pro athlete takes years, but you can make a viral video almost overnight.

One candid video can have extraordinary reach. A clip from 2018 called "Octopus Slap" shows a seal with an octopus in its mouth, "slap" a kayaker in the face. It's a moment of incredible timing and coincidence. The YouTube video garnered about 2 million views in around three months. But according to GoPro, the creator of that video was invited to become part of their team, hosting the GoPro Experience New Zealand. The combined sharing and news coverage of this odd moment has raked in a whopping estimated 4.6 billion views (according to GoPro).

Going forward, GoPro continued to see Instagram as a priority, with YouTube coming in a close second. Facebook appears to be slightly less important, but offers other benefits beyond views and clicks. Perhaps most interesting is the emergence of China on the internet stage, and the networks and apps that come with it. TikTok (formerly Musical.ly) has steadily grown more popular, particularly with younger users. Originally, the app was a way for users to make short videos of themselves lip-synching to music. As is the way with new apps, people have experimented and expanded on the original idea in new and creative ways, and GoPro was quick to identify it as an important destination for creators (and its users).

As much as the social media landscape might twist and change, some things will (and have) remained consistent. But GoPro has learned to adapt and to overlay its basic formula in new, more exciting ways. After the launch of the Hero 7 Black, the company announced a new initiative: The Million Dollar Challenge. The premise is simple, and really an extension of its long-standing "video of the day" program. In short,

GoPro set aside a seven-figure prize pool, and invited users to submit their best clips shot with the new camera. GoPro hand-picked the best, and made a user-generated sizzle reel. Each clip included earned the creator an equal share of the prize fund.

The genius with the Million Dollar Challenge is that it not only engages core users (who can create a clip and potentially win a prize), but demonstrates that the professional look of sizzle reels isn't out of reach for the average user. GoPro's own, in-house promotional videos look so well produced, it's hard to imagine you might create something anywhere near as good. But once you've seen a two-minute video from other regular people of the same caliber? It's a clever, seductive twist on the time-honored "let the user do the work" formula. Not to mention the fact that outsourcing your promotional video to the user might cost about the same (thanks to the prize fund), but requires a lot less work, planning, travel, and shipping of gear.

As of August 2020, GoPro has over at 17 million followers on Instagram, with no signs of slowing down. Red Bull, a thematically similar brand, is slightly behind at 13 million, but creates all of its own content, complete with all the associated production costs. As for Sony and *its* Action Cam? Well, it's languishing at around a mere 50,000 followers on the same platform. The company still faces an uphill challenge to reach the levels of growth from a few years ago. In 2019 the company took another shot at a 360-degree camera (after the seemingly modest launch of Fusion), and CEO Nick Woodman has repeatedly conceded they need to focus on the user more. Either way, a million dollars on one promotional video might very well be money well spent.

ENVIRONMENT

The Swamp film(s): Moving Image and Environmentality in "Swamp"

Julian Jochmaring

About five kilometers west of Manhattan, on both sides of the Hackensack River, which flows into Newark Bay, lay the New Jersey Meadowlands. Since 1976 the marsh has been the home of the stadium for the American football team the New York Giants. Just ten years earlier there was barely anything in the Meadowlands aside from a couple of gas stations and hotels scattered throughout the landscape, over which the dark smoke of the industrial facilities in the port of New Jersey hung heavy in the air. During this time the artist couple Judie Finch and Donald Judd and their friends Nancy Holt and Robert Smithson would regularly pass this rather uninviting area on their excursions to the quarries in neighboring Passaic County. While Judd's fascination for the crystal structures of the minerals found in the quarries can be seen in his red-pink plexiglass boxes, the

Fig. 1: Swamp (USA 1971, 6 minutes, Artists: Nancy Holt and Robert Smithson)

swampy transit station seemed to exert an odd fascination on Smithson as well. In a short travel report from 1966 he referred to the swamp as "a good location for a movie about life on Mars,"[1] also noting, along with the radio transmission towers and landfills, the reeds that lined the banks of the delicate network of pools and creeks. Smithson, who was killed in a plane crash in 1973, would never make a film about life on Mars in the Meadowlands, but the swamp plays the title role two years before in the film sketch Swamp (Nancy Holt, Robert Smithson, 16mm, 1971), which he made together with Nancy Holt. In the six-minute film Holt slowly feels her way through a swamp, her gaze – analogous to the gaze of the viewer – only seeing through the viewer of a Bolex hand-held camera. She is guided on her way by verbal directions from Smithson off camera. The more Holt presses on, the more she loses her orientation. The camera does not serve to expand or deepen her gaze, but proves to be an obstacle. Reeds bump off against the camera lens, the situation becomes increasingly confusing and oppressive.[2]

As a study in "deliberate obstruction and calculated aimlessness"[3] the film provides an occasion to reflect on both the tension between intentional and non-intentional moments in film practice, as well as about the relationship between body and apparatus. Characteristic qualities of Swamp, such as the close interrelation between the camera and the body of the carrier subject, the first-person perspective, and the calculated loss of control, however, also arouse associations with the worlds of current visual culture created under the conditions of digital technology. Mobile end devices equipped with cameras such as smartphones or tablets as well as action-cams like the GoPro are no longer only held in front of our eyes, but can be attached to the human body in a variety of ways that are even closer. Above all pictures by the GoPro, a camera with a digital picture sensor for photos, videos, and series, which was originally developed for self-documenting extreme sports such as surfing, and which can easily be mounted on helmets or even independently of human bodies on sports gear or vehicles, "intensify [...] the coupling of apparatus and subject."[4]

1 Robert Smithson: *The Collected Writings,* ed. Jack Flam, New York 1979, p. 9.
2 "Swamp / Holt Nancy Smithson / Robert / 1971", *Vimeo*, https://vimeo.com/206448357 (last seen: 4.1.2019).
3 Smithson: *Collected Writings,* p. 261.
4 Winfried Gerling, Susanne Holschbach, Petra Löffler: *Bilder verteilen. Fotografische Praktiken in der digitalen Kultur*, Bielefeld 2018, p. 120.

As Florian Krautkrämer has noted from the perspective of media studies, the pictures from action-cams like the GoPro are neither completely anthropomorphic, implying the possibilities of the human gaze, nor technomorphic, being traced back to the apparatus's technological features. They refer on the one hand to a body that no longer exclusively guides the camera directly in front of the eye, while on the other hand the camera itself develops a strong, medial obstinacy, it is much more than simply an instrument for expanding and perfecting the human gaze.

Krautkrämer suggests the term "performative camera" for these forms of moving images. The footage of a performative camera would therefore by characterized by the fact that "the persons behind the camera are included through movement or their voices, while at the same time they clearly emphasize the recording apparatus," and thus it is "not only about reproducing their 'gaze,' but also their positioning in the image itself, in the hand of the one filming."[5]

Beyond the context of current technological conditions, however, the term performative camera can be further elaborated on both from a historical and theoretical perspective. Of particular interest here is the question of further aspects of the performative. If we understand film practice as a particular practice of the performative, which always remains bound to a body in relationship to its surroundings, surroundings that are not congruent with the diegetic space, then our attention is drawn to those moments in which these surroundings do not merely fulfill a passive function as the background to the film events. The performative aspect of the performative camera therefore no longer plays out between the carrier and the camera, but also encompasses the performativity and mediality of the surroundings in their material dimension. Films therefore become a form of aesthetic practice in which moments of non-intentionality emerge from the confrontation with a materiality that is not completely mastered by this practice.

Within the framework of such a performative spectrum, the history of the performative camera does not begin with the GoPro, and in fact its genealogy still remains to be written. The following reflections can be understood as a contribution to such a genealogy. With Swamp the gaze can be guided in particular to the role of the relation to the environment, thus recuperating exactly that dimension of the performative that tends to

[5] Florian Krautkrämer: "GoPro-*Vision* und involvierter Blick: Neue Bilder der Kriegsberichterstattung," in: Marie-Hélène Adam, Szilvia Gellai, Julia Knifka (eds.): *Technisierte Lebenswelt. Über den Prozess der Figuration von Mensch und Technik*, Bielefeld 2016, pp. 209–224, here p. 216.

remain underdetermined between anthropomorphic and technomorphic aspects of the moving image. What should be discussed, then, is how much images of a performative camera are also always – both in the sense of genitivus obiectivus and subiectivus – images *of the* environment. Second, the status of filming as a performative practice, however, also allows for a media philosophical perspective. A conception of film practices as a technique of the body is distinguished from a reading from the viewpoint of media phenomenology, which works with the difference between the lived body (*Leib*) and the inert body (*Körper*), understanding the mediality of film much more from the side of the surrounding materiality, which does not simply remain passive.

We find approaches to reflecting on filming as a performative embodied practice in particular in the history of experimental and avant-garde film. For Maya Deren, for instance, the human body serves as a multi-faceted tripod. By using the body in the (amateur) film practice, Deren linked the hope for new forms of the moving image outside the standardized aesthetics of professional film studios and their purportedly superior technical material: "Don't forget that no tripod has yet been built which is as miraculously versatile in movement as the complex system of supports, joints, muscles, and nerves which is the human body, which, with a bit of practice, makes possible the enormous variety of camera angles and visual action."[6]

Today, with the GoPro, the entire body becomes a potential tripod. Using it, however, above all serves to stage an aesthetically formal, quite uniform, male-oriented heroism, which finds its place in extreme sports and war. On video platforms such as YouTube we find countless high-definition images, usually recorded with a GoPro attached to a helmet, of daredevil maneuvers on motorbikes, snowboards, mountain bikes, parachutes, or surf boards, always right at the edge and occasionally well beyond it. Titles like "Near Death Captured by GoPro" or "The Most Shocking GoPro Crashes" not only compete with one another for the most clicks, but also have to hold their own against GoPro clips from war zones like Afghanistan and Syria, delivering images directly from combat action. A "precarious culture of 'failure'"[7] has formed around GoPro and its involvement in a digital distribution infrastructure, in which the most extreme vulnerability of the human body, the possibility that the person wearing the camera could die in the very next moment, is exhibited and

6 Maya Deren: "Amateur Versus Professional," in: *Film Culture* 39 (1965), pp. 45–46, here p. 46.

7 Gerling/Holschbach/Löffler: *Bilder verteilen,* op. cit., p. 135.

evaluated in relation to the attention economy. But how does this risky exposure to the vulnerability and mortality of the human body in the documentary GoPro footage relate to the loss of control in Swamp that on the one hand emerges from the conditions of the aesthetic staging and yet is in no way completely equivalent to Holt and Smithson's intention?

Relations of Collaboration

Swamp has so far only marginally been examined in the writing in art history about Holt and Smithson's work. One possible reason for this marginalization, cited by Eva Ehninger in an essay on the film works of land art artists like Walter De Maria and Smithson, is the "sketchy quality" of the work and its "lack of connection to an installation."[8] In biographical terms, the film is seen as a collaborative work between Holt and Smithson. In fact, however, the relevance of the work from the viewpoint of current aesthetics and media philosophy is hardly justified when it is described as a collaborative work between two human agents. What might it mean to say that in Swamp – as it says in the title to this essay – the swamp films? Isn't it first and foremost the camera that films? The lens through which Holt's gaze falls, as well as that of the viewers, belongs to a 16mm Bolex hand-held camera. The spring operated model Bolex H16 RX3 is perhaps *the* iconic apparatus of the New American Cinema, and was used by filmmakers such as Deren, Jonas Mekas, Andy Warhol, and Marie Menken. While the RX3 permits the usage of 30 meters of film for shots of a length of just under three minutes, the fact that the six minutes of Swamp are uninterrupted would lead us to presume that Holt was using the heavier follow-up model RX5, which is operated by an electric motor, and which has a magazine of up to 120 meters in length.[9]

[8] Cf. Eva Ehninger: "360°. Landschaftsprojektionen und ihr bildkritisches Potential," in: Lilian Haberer, Annette Urban (eds.): *Bildprojektionen. Dispositive des Cinematischen in Kunst, Film und Architektur*, Bielefeld 2014, pp. 281–298, here p. 291. Ehninger also does not see Swamp as a work of land art, but locates the film in the context of a post-minimalist understanding of space, which is significantly characterized by a critique of the perceptual regime of central perspective (cf. ibid.). On the post-minimalist understanding of space, cf. also Eric de Bruyn, "Topological Pathways of Post-Minimalism," in: *Grey Room* 25 (2006), pp. 32–63.

[9] On the history and functionality of the Bolex, cf. Rosa John: "Bolex and the Act of Filming," in: Volker Pantenburg (ed.): *Cinematographic Objects: Things and Operations*, Berlin 2015, pp. 161–179. The author would furthermore like to thank Rosa John for information on the various models of the Bolex.

Holt carefully makes her way through the boggy substrate, with the reeds constantly blocking her view. She herself speaks of a concept of restricting perception through the camera's lens: "All I could see was what I could see through the camera."[10] Off camera we hear Smithson's directions: "Just walk in a straight line [...] Straight in . . . to that clump. It's OK now. You're on fairly solid . . . ground. Straight in. Just go right in. Go straight in. Over that way. Turn to your right. Your right. In . . . into that clump right there. Directly in. It's OK. Go ahead."[11]

Smithson himself is not to be seen in the image, and yet his directions can be understood as part of the diegetic space. They come from the area of the visual off-space, which is called "hors-champ," that is, from the area that might come into the frame after a pan of the camera, and in fact the film plays with just this expectation, without ever fulfilling it. The deeper Holt pushes on into the swamp, the closer she moves toward the reeds with the lens, the more the situation gets out of control, the more she begins to lose her orientation. "So much of this is out of focus," she responds to Smithson, who is calmly encouraging her to push onward. The discrepancy between Smithson's precise directions and the blurriness and instability of the image intensifies the impression of being exposed to the environment. If at the beginning the swamp still appears as a rather harmless moorland, with the reeds gently blowing in the wind, over the course of the action they become an impenetrable thicket, a jungle. This also suggests the jungle of Vietnam, in which the limits of the American colonial self-image were traumatically being disclosed at the time.

Filming against filming

In terms of media aesthetics, however, this is a work for which the term performative camera is particularly appropriate. The voice of the woman holding the camera can be heard, the movements and the positioning of her body are translated into a moving image – if Holt's gait fluctuates or falters in the swampy ground, the picture also fluctuates or wobbles. This also always means that the apparatus is thematized. In contrast to GoPro videos, however, it is not the exhibition of the special technologi-

[10] "Swamp", *Electronic Arts Intermix*, http://www.eai.org/title.htm?id=11675 (last seen: 4.1.2019).

[11] Cf. the transcription in Ines Schaber: "The Claims She Stakes. A Reading of Nancy Holt's Archive," in: Alena J. Williams (ed.): *Nancy Holt: Sightlines*, Oakland/California 2011, pp. 163–180, here p. 167.

cal possibilities of the camera that is foregrounded here, but precisely the representation of the limitations entailed in perceiving through the camera. In Swamp the camera appears neither as an extended eye, nor as an autonomous apparatus, detached from human perception, but primarily as an obstacle. To a certain degree then, it is about filming against filming, or more precisely: about filming that seamlessly fits together two of the most widely disseminated conceptions of filming as an aesthetic practice. The first conception – an extension of human perception through the camera – can be found, for instance, in a passage from Walter Benjamin's "Artwork" essay. Using the terms "Umwelt" [environment] and "Merkwelt" [way of viewing the world], as coined by the biologist Jakob von Uexküll, Benjamin characterizes the changes in perception due to film as follows: "Film can be characterized not only in terms of man's presentation of himself to the camera but also in terms of his representation of his environment by means of this apparatus. [...] A similar [compared to psychoanalysis, J.J.] deepening of apperception throughout the entire spectrum [*Merkwelt*] of optical – and now also auditory – impressions has been accomplished by film."[12]

We can indeed easily speak of a deepening of apperception in relation to Holt's gait through the swamp, but this does not take place in the sense of a camera-supported extension, it is not about seeing more, nor about discovering an "optical unconscious" that previously would have to have remained hidden from the naked eye without a camera, nor it is about "another nature which speaks to the camera as compared to the eye."[13] The possibility of a change in perception is not raised by the technical conditions, but only arises by restricting orientation. The gaze through the camera is not presented as superior in any way to direct or cameraless perception, but as a specific kind of mediation that not only includes the eye, but the entire body.

In contrast to the expansion of the human eye addressed in Benjamin, the second ideal conception of film practice consists in unifying body and camera, as had already been expressed in Maya Deren's plea for using the human body as a flexible tripod. Flexibility is understood as the result of a melding of the moving body with a light, hand-held camera such as the Bolex, in which vitalistic qualities can even be attributed to the camera itself: "I do not look upon the camera as simply a recording

[12] Walter Benjamin: "The Work of Art in the Age of Its Technological Reproducibility: Third Version," *Selected Writings*, Vol. 4, 1938-1940, Cambridge 2003, pp. 251–283, here p. 265.

[13] Ibid., p. 266.

device. There is a living quality that can be reached in the elements of filmmaking, and this quality can carry the filmmaker forward beyond his initial intentions. A work cannot live if it only realizes intention, as fine as that intention may be,"[14] writes Deren's colleague Robert Beavers. In this conception, the camera possesses a performativity of its own, which can divert or thwart the filmmaker's intentions. Even if this step beyond one's own intention described here by Beavers comes very close to the role of the camera in Swamp, the semantics of unifying and melding are still not quite pertinent. While the promise of the Bolex – and today for instance of action-cams like the GoPro – consists in the idea that "the human body, the cinematic apparatus and the environment merge into a single organism,"[15] in the example of Swamp we can see a reciprocal foreignness of body, camera, and environment that continuously determines and spurs on the events.

Filming as a technique of the body and physical experience

While in view of both film theory and film practice the relationship between camera and body can be defined in a wide variety of ways, the third element, the environment itself, has remained underdefined. Therefore, if the swamp is not simply the background of the events, but itself intervenes, it remains an open question as to how to approach this intervention theoretically. In order to steer the relationship between camera and body to this third dimension, we should first distinguish filming as a performative practice in its connection to physical experience from an understanding of filming as a technique of the body, in order then to grasp the materiality of the swamp more precisely in its autonomy.

Methodologically, such an approach takes on quite a contestable position, since the phenomenological distinction between the lived body [*Leib*] and the inert body [*Körper*] does not seem very fruitful, particularly from the perspective of media philosophy. On the contrary: For Harun Maye, for instance, "the whole dilemma of phenomenology"[16] is expressed in the demarcation of the body as the seat of presumably direct experience by the objective body. Rather that the lived body and its associations with

[14] Tony Pipolo: "An Interview with Robert Beavers," in: *Millenium Film Journal* 32/33 (1998), pp. 15–16.
[15] John, "Bolex and the Act of Filming," op. cit., p. 178.
[16] Cf. Harun Maye: "Lassen sich Körper- und Kulturtechniken am Leitfaden des Leibes denken?", in: Jörg Sternagel, Fabian Goppelsröder (eds.): *Techniken des Leibes*, Weilerswilst 2016, pp. 19–31, here p. 20.

subjectivity, consciousness, and what is unique to the human being, he emphasizes the inert body, or, referring to Marcel Mauss,[17] the notion of "techniques of the body."

The advantage of this term consists, according to Maye, in the fact that a technique of the body would not exclusively be reserved to human beings, but material things and non-human creatures could also be designated as bodies. Understanding filming, for instance, as a technique of the body thus allows us to see the technological medium's power to act as something that is always in advance of the isolation and singularity of the body. At the same time, however, an antecedence, something that precedes the self and is constituted in this way in the first place, tends to be reduced to technology. In the case of Swamp, we find ourselves before the alternative of describing the performativity of the body in a spectrum between anthropomorphic and technomorphic dimensions.

By contrast, in his *Phenomenology of Perception* Maurice Merleau-Ponty distinguishes the objective body, which can be described by the sciences as an aggregation of individual, causally interacting parts from the lived body (*corps propre*). The lived body is a dynamic whole, inserted into each concrete situation of perceiving and acting, which is not simply a mere thing in the world, but first of all a "means of our communication with [the world]."[18] While Maye sees the body as a "hybrid agent made up of things, organs, technologies, and signs,"[19] and thus assumes activity to be an ontologically overriding principle, Merleau-Ponty's conception of the lived body allows for a genuinely passive dimension in the relation to the surrounding space. The lived body is not only an agent that is joined to its environment and the things found there to create a hybrid capable of acting, but always also suffers through its relation to the environment, moving as it is moved through the environment. The environment itself is therefore also no longer simply ascribed the status of a background in front of which the activity of the body ultimately plays out in the first place.

Precisely this alteration in the understanding of the environment as background to one that comes from an acting subject, without this meaning that it itself would have to assume the coequal status of an agent capable of action, is what is cinematically presented in Swamp. On her way through the swamp Holt keeps sinking deeper and deeper, landing ever further in the lurch. The loss of stability on the boggy ground cor-

17 Cf. Marcel Mauss, "Techniques of the Body," in: *Techniques, Technology and Civilisation*, New York 2006, pp. 77–96.

18 Maurice Merleau-Ponty, *Phenomenology of Perception*, London 1966, p. 106.

19 Maye, "Lassen sich Körper- und Kulturtechniken am Leitfaden des Leibes denken?" op. cit., p. 29.

responds to the loss of focus, to Holt's efforts to center the image, or to keep the reeds away from the camera. If conventional landscape documentation in moving images is based on a distant gaze, which facilitates a panoramic overview, and on regularly introduced camera movements and pans, which seek to translate the breadth of the space of a landscape into the film space, this distancing fails in Swamp. Holt manages to get very little distance from the surrounding reeds, and the viewer manages equally as little. Since the image refuses any overview and stability, it develops haptic qualities. The camera does not look from outside at the situation, but is itself part of what happens. "It gets jostled, it stops and starts, it pans and tilts, it lurches forward and back. It follows the rhythms of the whole body, not just that of the eyes," writes Steven Shaviro in his designation of such a regime of visibility, which is no longer only visual, but tactile and haptic.[20]

Although Holt's body cannot be seen in the image, her experience can affect the viewer bodily through the camera. The register of embodied perceptual experiences thus ranges from uneasiness and light dizziness to contact with the reeds as they strike back, which, we can at least presume, might be quite painful for Holt. In Vivian Sobchack's phenomenological film theory, the movement of the camera is tied to the body scheme of viewers. If the camera movement corresponds to the conventional body scheme and its intentional movement pattern, an identification with the film events becomes possible, the camera is experienced as the extension of the viewers' body scheme. This possibility of identifying, however, is based on the assumption that both the camera work and the physical relation to the surrounding space are marked by intentionality.[21] In Swamp, however, this unity of body, camera movement, and intentionality is no longer a given. Not only does this show the limits of a film theory tied to the intentional scheme in and through the moving image. Holt and Smithson's film sketch is also suited to tracing a theoretical development in the mode of the aesthetic that Merleau-Ponty carries out from his early to his late work: from a phenomenology of the subject – to which

[20] Steven Shaviro: "Regimes of Vision. Kathryn Bigelow, *Strange Days*," in: Polygraph 13 (2001), pp. 59–68, here p. 62. On "haptic visuality" cf. the foundational work by Laura U. Marks: *The Skin of the Film: Intercultural Cinema, Embodiment, and the Senses*, Durham, London 2000.

[21] Cf. Vivian Sobchack: "Toward Inhabited Space: The Semiotic Structure of Camera Movement in the Cinema," in: *Semiotica* 41, 1-4 (1982), pp. 317–335.

he self-critically attributes his own bodily phenomenology – to a media phenomenology that is conceived structures that condition the self.[22]

The break with the coupling of body and intentionality should be understood within the context of the break with phenomenology as a philosophy of the subject. The body is no longer given the role of securing an immediacy of experience or authenticity of the human being. Much more, physicality can only be understood at all as being exposed to others or to the other. Instead of the body as a noun, the adjectival form would be more suitable, it would be better not to speak of *the* body, but of the "bodily components of my experiences."[23]

The "flesh" (*chair*), the term that Merleau-Ponty develops in his late work *The Visible and the Invisible* for the chiastic entanglement, no longer conceived in relation to the body, of the perceiving and the perceived, makes it possible to be more precise in pointing out the role of the environment as medial in relation to Swamp. The flesh is not a medium in the sense of an instrument or an apparatus, but refers to a concept of the medial in perception as a surrounding materiality, as can be traced back to the pre-Socratics. Its mediality does not bypass mediality, but is given, precisely on the basis of a particular, permeable material quality, without, however, positivizing this materiality and assigning the development of its mediating achievement as a task to the objective sciences. The visible is then also never something merely at hand, which can be brought close from a distance by the gaze, but should be understood "as an encompassing, lateral investment."[24] The subject is thus not the center of its own environment, but is caught in the "rays of the world."[25] Perception is thus constitutive on a negativity, referred to a withdrawal and an invisible.

Swampy materiality

In Holt's work these moments of not-managing, fading out, failing, of the not-yet-quite-visible play a central role as constitutive moments of

[22] Cf. Maurice Merleau-Ponty: *The Visible and the Invisible: Followed by Working Notes,* ed. Claude Lefort, Evanston 1968, p. 200. On the concept of a "medial phenomenology, cf. Emmanuel Alloa: *Das durchscheinende Bild. Konturen einer medialen Phänomenologie*, Zürich 2011.

[23] Emmanuel Alloa: Aktiv, Passiv, Medial. Spielarten des Vollzugs," in: Jörg Sternagel, Fabian Goppelsröder (eds.): *Techniken des Leibes*, Weilerswilst 2016, pp. 133–148, here p. 147.

[24] Merleau-Ponty: *The Visible and the Invisible*, op. cit., p. 217.

[25] Ibid., p. 218.

perception. In Swamp the camera's gaze is confronted with a materiality from which there is no escaping, which cannot be formatted into the object of a distance observation. Her most well-known work, *Sun Tunnels* (1973-1976), four concrete tubes in the deserts of Utah, is blocked, merely by the size of its form, from complete appropriation by perception. The idea that a landscape is not simply a passive object represented by the camera and captured by it, is also for significant for others of Holt's film works. For Pine Barrens (1975), which was shot not far from the Meadowlands, her concern was expressly about "filming various aspects of the land without a single person in it. In this way the landscape is no longer a mere backdrop for human activity; it begins to assert its own presence."[26]

This presence imposes itself in Holt and Smithson's film sketch with an intensity that not only calls into question the role of perception, but also conceptions of environment. While around 1970 an ecology based in systems theory was starting its triumphal march through the USA and western Europe as not only a scientific but also a socio-political paradigm, Swamp blocks such a concept of the environment as a systematic whole.[27]

But Swamp even breaks with the idea of a subject as the center of its own environment, such as was introduced into biology by Jakob von Uexküll. Uexküll makes a strict division between the "environment" [*Umwelt*] as an organism's specific living space, and the "surroundings" [*Umgebung*], the space that can be measured geometrically. The environment of a creature includes only what this creature can perceive based on its physiological constitution, and what in turn it itself can have an effect on.[28] In Georges Canguilhem's interpretation of the history of the science of conceptions of surroundings, Uexküll's notion of the environment represents the decisive step toward a "reversal" [29] in the relationship between organism and the surroundings. Instead of being determined

[26] Nancy Holt: "Selected Artist's Writings," in: Alena J. Williams (ed.): *Nancy Holt: Sightlines*, Oakland/California 2011, pp. 235–262, here p. 248.

[27] On the occasion of a presentation of the work in an exhibition at the Julia Stoschek Collection Berlin, Cord Riechelmann writes: "Holt and Smithson record their film and do not think of the reed area as being "in-between," as ecology has consistently done, and not only in their time, but as something that means being right at the heart of things for those that live there. In this respect, they are the first people to not have perceived or discussed such coastal mangrove swamps or indeed any swamps as fringe areas." (Cord Riechelmann: "Essay," in: *Jaguars and Electric Eels*, Julia Stoschek Collection Berlin, 2017, pp. 6–9, here p. 9).

[28] Cf. Jakob von Uexküll: *Umwelt und Innenwelt der Tiere*, ed. Florian Mildenberger and Bernd Herrmann. Berlin, Heidelberg 2014.

[29] Georges Canguilhem: "The Living and Its Milieu," *Knowledge of Life*, New York 2008, pp. 98–120, here p. 99.

centripetally from outside, the organism itself organizes its relation to the surroundings, centrifugally radiating out to it.

For his part, Merleau-Ponty, in the lectures he held on the term nature at the Collège de France from 1956 to 1960, develops a conception of environmentality in direct engagement with Uexküll, a conception that emphasizes a centripetal moment, the conditionality of the organism by an inaccessible environment, without falling back on the idea of objectifiable impulses that would result in equally objectifiable responses. Just as the one perceiving is enclosed in flesh, Merleau-Ponty also speaks of an enclosure into a surroundings [*Umgebung*], that can never be fully locked up by the subjective environment [*Umwelt*].[30] Drawing the boundaries between the subjectively available environment and the remaining, foreign and unavailable surroundings therefore never completely succeeds, it remains a remnant or a difference, a duplicity of separation and connection, which characterizes the relation to the environment as a genuinely medial one. Merleau-Ponty thus releases the surrounding outside from the binary scheme of being either an environment understood possessively *for* a subject, or abstract surroundings that are irrelevant for just this subject.

Swamp exhibits this loss of sovereignty in relation to an unavailable, oppositional material environment. The material and its qualities – the elasticity of the reeds, the mixture of soil and water – operate as well in the act of filming. If we speak of Swamp then as a collaborative short film, we should not neglect the collaboration of the swamp. It is not only Holt filming with the Bolex, not only the Bolex filming – the swamp is filming. Just before the end of the film study, when Holt is stepping out of the reeds, once again getting a sure foothold and thus control of the situation, she asks: "How many feet left on the wheel?" In the logic of "Swamp" this is consistent. At the moment in which reflecting on the medial practice of filming is (re-)introduced, a works ends whose aesthetic is defined in particular by the progressive loss of any reflexive and intentional consciousness over the particularity of a material environment.

Not least, the film study therefore also allows for connections to ways of thinking about materiality in current discourses from philosophy and cultural studies. Under the heading "New Materialism" theorists such as Karen Barad, Rosi Braidotti, Diana Coole, or Tim Ingold have been calling for a radical revision of hylomorphism, the separation of material and form, which they identify as the starting point for central dualisms such

[30] Cf. Maurice Merleau-Ponty: *Nature: Course Notes from the Collège de France*, Evanston 2003, p. 174ff.

as those between nature and culture, activity and passivity, between man and woman, human and animal, as well as between the organic and the inorganic. Beyond an abstract notion of materiality, activity, generativity, and vitality are thus ascribed to matter and its qualities.[31]

If, however, there is often a tendency to embrace the cosmological in these new ontologies of the material, in which the ability of the material to act must be held out as a basic principle, which everything from the nanoparticle to the universe as a whole is supposed to possess equally, in Swamp there is a revision of the matter-form division in the mode of the moving image. The timeliness of the work today is thus not only grounded in the formal aesthetic proximity to the aesthetic of the performative camera in the images from action cams like the GoPro. Rather, it can be seen that the performative dimension of filming cannot be reduced to a unity of camera and body. The human tripod aspect of GoPro footage also remains independent from an environment that is much more than just the background against which a heroic readiness to run a risk in extreme sports videos or war footage can be staged. At the same time, the resistant presence of the swamp goes beyond Holt's own attempts to get a landscape to emerge in the image itself. Swamp is not a film *about* a swamp, but a film *by* the swamp.

[31] Cf. Karen Barad: *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter*, Durham 2007. Diana Coole, Samantha Frost (eds.): *New materialisms: Ontology, Agency, and Politics*, Durham, London 2010. Tim Ingold: "Toward an Ecology of Materials," in: *Annual Revue of Anthropology*, 2012, pp. 427–442. Kerstin Stakemeier, Susanne Witzgall (eds.): *Macht des Materials/Politik der Materialität,* Zürich, Berlin 2014. Rick Dolphijn, Iris van der Tuin: *New Materialisms: Interviews & Cartographies,* Ann Arbor 2012.

Fishes[1], Their Eyes: A No Hero's Journey

Nanna Heidenreich

"[...] it seems of interest to ascertain how the external world appears to the fish," writes R.W. Wood, professor for experimental physics at Johns Hopkins University, in 1906. In his article he introduces the concept of "Fish-Eye Views, and Vision under Water."[2] Wood begins by describing what has elsewhere been named *Snell's window*,[3] the phenomenon by which an underwater viewer sees everything above the surface in a cone of light. This phenomenon is an idealization, because, as Woods points out, our human eyes "behave so abominably under water, however, that we can see nothing of this curious picture."[4] To see clearly underwater we need, as Natascha Adamowsky has put it, "*technisch-mediale Ermöglichungsformen*,"[5] media-technical forms of enabling. During a lecture Wood had an epiphany: "It occurred to me [...] that an excellent notion of how we appear to the fishes could be obtained by immersing a camera in water."[6] His experimental setup of camera, bucket, and water produces the first images taken with a fisheye lens with its convex, non-rectilinear distortion. The result "gives us a good idea of how the visitors at an aquarium appear to the fishes."[7]

1 "We traditionally refer to anything from two to a trillion fish by the singular term 'fish', which lumps them together like rows of corn. I have come to favor the plural 'fishes', in recognition of the fact that these animals are individuals with personalities and relationships." Jonathan Balcombe: *What a Fish Knows: The Inner Lives of Our Underwater Cousins*, London 2018, p. 6.

2 Robert Williams Wood: "Fish-Eye Views, and Vision under Water," in: *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, 12/68 (1906): pp. 159–161. Retrieved at http://www.fisheyelens.de/html/vision.html#cite_ref-1 (last seen: 31.12.2018).

3 Snell's law is named after Dutch scientist Willebrørd Snell (1591–1626). However, in "Who really discovered Snell's law?" Alistair Kwan, John Dudley, and Eric Lanz retrace the history of this law and its various discoveries and attributions, in: *Physics World*, 15 (April 2002), p. 64. The first discovery thus needs to be attributed to Persian mathematician and physicist Abu Said al-Ala Ibn Sahl, who described the phenomenon some 650 years earlier in 984, with reference to Ptolemy of Alexandria's Optics (c150). Ibn Sahl's writings were reconstructed by historian Roshdi Hifni Rashed in 1990.

4 Wood: "Fish-Eye Views, and Vision under Water," op. cit.

5 Natascha Adamowsky: Ozeanische Wunder. Entdeckung und Eroberung des Meeres in der Moderne, Paderborn 2017, p. 23.

6 Wood: "Fish-Eye Views, and Vision under Water," op. cit.

7 Ibid.

"Why look at animals?" asked John Berger in 1977,[8] taking as a starting point the nineteenth century, when humans (mostly in the Global North, I must add) took a distance from animals and severed all previously existing traditions that mediated between them.[9] New perspectives (of distance and observation) were created, such as that of the zoo, which allowed for the study of animals in experimental (Berger adds: unnatural) conditions.[10] The aquarium, which makes its appearance in Wood's argument, was a creation of the nineteenth century too, a collective creation, as Mareike Vennen argues in her study *Das Aquarium*,[11] and it brought us a new form of underwater vision: the vertical cut and the vertical mobilization of the gaze that resulted in the frontal view into the underwater space.[12] The vertical cut introduces the sea as image and as screen, diving beneath the surface, cutting into the water's depth, premediating the arrival of the camera's frame. Like the zoo, the aquarium was presented as natural environment, so the new perspective came to be understood as naturalistic. However, not only is the description of a human vision under water not realistic, or natural (our eyes "behave so abominably," as Wood has put it), the fisheye view too is a creation – an approximation and a projection as well as a technology. The fisheye view is a human imagination of an animal perspective – a musing on what it would mean to look from and through a foreign (yet elemental and primal) medium – water – into human space: land-borne, air-filled (not airborne though, that would mean entering bird and insect territory- and drone vision). What Wood developed in his experimental setting should in fact best be understood as a new medium and less as the description of the vision of actual fishes: "[...] fishes have diverse, advanced modes of sensory perception," writes ethologist Jonathan Balcombe in his bestselling *What a Fish Knows*.[13] Fishes' eyes resemble the human eye (minus the eyelids), but are equipped with spherical lenses of high refractive index, so they can see clearly underwater (just as humans see in air).[14] They also have a number of ocular properties that far exceed our own, including independent eye rotation in some species (Balcombe concludes that fish with such eyesight, such as flounders, must "be able to process

8 John Berger: "Why Look at Animals?" (1977), in: John Berger: *Why Look at Animals?* London 2009, pp. 12–37.
9 Berger: "Why Look at Animals?" op. cit, pp. 12ff.
10 Berger: "Why Look at Animals?" op. cit, p. 31.
11 Mareike Vennen: *Das Aquarium. Praktiken, Techniken und Medien der Wissensproduktion (1840 – 1910)*, Göttingen 2018.
12 Ibid, p. 141.
13 Balcombe: *What a Fish Knows*, p. 25.
14 Ibid., p. 26.

two visual fields at a time"[15]). Then there is the four-eyed fish, fishes that can heat up their eyes thereby increasing vision, and "most modern bony fishes are tetrachromatic, allowing them to see colors more vividly than we do,"[16] some also see light in the UV spectrum. Fishes also often make use of the refractive properties of water, using the underside of the water surface as mirror – they do not, as Wood implies, simply *see through* the surface and out into the air.[17] What the 'fisheye view' Wood described, or rather created, does however, is reflect the way humans recognize they are being seen by animals. Again John Berger:

> The eyes of an animal when they consider a man are attentive and wary. The same animal may well look at other species in the same way. He does not reserve a special look for man. But by no other species except man will the animal's look be recognized as familiar. Other animals are held by the look. Man becomes aware of himself returning the look. The animal scrutinizes him across a narrow abyss of non-comprehension. [...] The man too is looking across a similar, but not identical, abyss of non-comprehension. And this is so wherever he looks. He is always looking across ignorance and fear. And so, when he is being seen by the animal, he is being seen as the surroundings are seen by him. His recognition of this is what makes the look of the animal familiar.[18]

„He is being seen as the surroundings are seen by him" sounds like a pretty adequate description of Wood's "Fish-Eye Views", the photographic image/imagination of how fish look at us: "While the views used for the illustration of this paper savour somewhat of the 'freak' pictures of the magazines, it is believed that the fact that they illustrate how one half of the world appears to 'the other half' is sufficient excuse for their publication," Wood concludes.[19]

Since Wood's lard pail and camera set up, fisheye lenses have become the industry standard.[20] They were first used for meteorology, since, as Wood already speculated, "the device will photograph the entire sky."[21] Fisheye lenses not only create a convex distortion, they capture more

15 Ibid., p. 27.
16 Ibid., p. 31
17 Ibid., p. 30. What Balcombe fails to mention are Blind Fish, fishes without functional eyes.
18 Berger: "Why Look at Animals?" op. cit., pp. 13–14.
19 Wood: "Fish-Eye Views," op. cit.
20 Hobby photographer and fisheye lover Peter Wieden describes on his website how as an engineering student he built his own fisheye lenses when he could not afford to buy them (http://fisheyelens.de/html/anfang.html, last seen: 31.12.2018) This part of his charming website is only available in German. I retrieved Wood's article on Fish-Eye Views from it; Wieden also provides his German translation of Wood's 1906 article, see footnote 2.
21 Wood: "Fish-Eye Views, and Vision under Water," in: *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, op. cit.

"content", or more "action," and have thus become a trademark of action camcorders such as the GoPro.[22] Wood even seemed to have predicted the use of GoPro cameras for drone images:[23] "Suspended from a balloon it would photograph the entire surface of the earth out to the horizon in all directions."[24] Fisheye lenses (not only in GoPro cameras) are often used for scientific purposes, such as astronomical images, projections in planetaria, but also for climate control and forestry, as well as for surveillance cameras and flight and combat simulators.

Alfred Neumann, editor of the GDR magazine *Fotografie*, in 1972 wrote "Rund um das Fish-Eye."[25] He describes how fisheye lenses open up spaces that remain closed to the 'normal' wide-angle lens. Fisheye lenses create a spherical perspective depending on their focal length. Lines that do not run through the center of the image are reproduced more or less curved, convex to their imaginary parallel leading through the center of the image. Neumann speaks of a strange interplay of lines as a result, and in the caption to the first illustration in his article – a photo of the Vasil Levski National Stadium in Sofia – he also speaks of the fact that "the appearance of details in the foreground disengaging often creates the impression of emptiness."[26] The use of fisheye lenses in action shots, such as in typical GoPro sports, skating and surfing, singles out the performing subject, while featuring the surroundings as nothing but "context"[27] – as 'empty' otherwise, even if spectacular. This effect is thus not one of decentering (as one might think the fisheye's barrel distortion would achieve), but on the contrary of centering by *capturing* (the use of fisheye lenses for surveillance purposes comes as no surprise then), of scaling in relation to the human figure. It is indeed the very reason why this lens is perfectly suited for the staging of hero-action-space-taking, the very concept that feeds the GoPro "movement," which tells you to "be a hero" by using one of their Hero cameras.[28] And while fisheye lenses

22 See for instance the software Videoproc's website, which offers a way to remove fisheye lens distortion from GoPro shots, https://www.videoproc.com/gopro-video-processing/gopro-fisheye-explained-remove-distortion.htm (last seen: 31.12.2018).

23 In 2018 the company announced its exit from the drone business.

24 Wood: "Fish-Eye Views, and Vision under Water," op. cit.

25 Alfred Neumann: "Rund um das Fish-Eye," in: Fotografie 3/1972, retrieved at http://fischaugenobjektiv.de/html/rund.html (last seen: 31.12.2018).

26 Neumann: "Rund um das Fisch-Eye," op. cit.

27 "Photographers and videographers use fisheye lenses so they can get the camera as close as possible for action shots whilst also capturing context, for example in skateboarding to focus on the board and still retain an image of the skater." Wikipedia "Fisheye lens," https://en.wikipedia.org/wiki/Fisheye lens (last seen: 31.12.2018).

28 The brand is defined not only by the technical artefacts it sells, such as the "Hero" cameras and all kinds of supporting gadgets and equipment (and until 2018 also drones), but by

were literally invented for immersive image making – photographing from within water through its surface – the question of the underwater perspective demands further attention, as does that of the *hero/Hero*.

Going underwater literally means entering into another medium, as Natascha Adamowsky has poignantly argued. A truly water-bound perspective requires understanding the oceans as a profoundly historical and political space, as Natalie Lettenewitsch points out. She addresses the escapist tendencies of cinematic submersion and asks which blind spots result from the romanticizing of oceans (including the celebration of technical achievements).[29] In the waters of the world's oceans, historical traces, regressive fantasies, mythologizations, and concrete political and economic interests meet.[30] These encounters exert tensions, between liquid and solid, between deterritorialization and territorialization, between wonder, fascination, and exploitation, between discovery and neocolonial land-grabbing, between nation state and the movements of migration.

We know very little of the worlds in the oceans, even though they take up about 71% of the surface of the Earth. In fact, we seem to know more about outer space than about the deep sea, as common comparison has it. Both, outer space and the deep sea constitute today's 'new frontiers' and are subject to neocolonial land-grabbing, driven by the present global 'gold rush' for rare minerals and other resources and their (future) exploits. The International Seabed Authority (ISA), instituted in 1994 to oversee the deep seabed as the "Common Heritage of Mankind," issues exploratory licenses for Manganese nodules' mining. Germany's licenses for example cover 75,000 square meters in different parts of the world's oceans. Generally the numerical description of the ocean involves superlatives. Its vastness is also measured in probabilities: what are the chances of meeting a whale? A sperm whale such as the legendary Moby Dick, the white whale hunted by captain Ahab and his crew mostly for the oil extracted from the whale's head cavity? Or a blue whale, such as the one that American scuba-diver, film director, and

the call to "join the movement," to "capture" and "share" "your passion," that is, to upload videos/footage/photos shot on GoPro cameras onto the various GoPro channels. See for example the British GoPro Facebook page: https://www.facebook.com/GoProUnitedKingdom/posts/join-the-gopro-movement-capture/1692400374350281/.

29 Natalie Lettenewitsch: "Fundstücke aus der Tiefe. Filmische Tauchgänge zwischen Naturwissenschaft und Geschichte," in: González de Reufels, Rasmus Greiner, Stefano Odorico, Winfried Pauleit (eds.): *Film als Forschungsmethode. Produktion – Geschichte – Perspektiven*, Berlin 2018, pp. 79–90, p. 84.

30 Natalia Lettenewitsch, from her PhD manuscript (wip), personal communication with the author.

founder of the Oceanic Preservation Society Louie Psihoyo and his team of camera operators and free divers were hunting down for the purpose of producing spectacular images they claim will help save them?[31] Markus Krajewski did the math for his contribution to IKKM Weimar's ongoing historical-speculative commentary on Herman Melville's *Moby Dick*. In "Kapitel 44: The Chart" he looks at the numbers: "Extrapolated to the total sea volume, the ratio of a sperm whale bull to the world sea content is 1.79/100,000,000,000,000,000."[32] The chances of a whaler actually meeting a whale is thus not only slim, it is infinitesimally small.[33] Krajewski then proceeds to trace Captain Ahab's charts, his extrapolation of chances and migratory routes, of feeding grounds and whale territories, predating all systematic oceanography – which, like the Aquarium and Melville's novel was conceived in the middle of the nineteenth century, the very century that began to explore the ocean's depths and, after centuries in which the sea was perceived mostly as liquid surface over a pitch-black abyss,[34] to see it as an endless wonder of technical possibility and scientific discoveries. A perspective that seems to resonate again in today's deep sea enterprises, which, again, bring together scientific research, adventure trips, and explorer stories with media practices, including GoPro, but also 360° videos, VR experiences, fiction, animation and documentary films and series, bespeaking the intrinsic link between seawater and media.[35]

In an eclectic review of Ron Howard's epic whaling drama In the Heart of the Sea (USA 2015) Stefan Aust and Jan Küveler discuss various aspects of whaling, filmmaking, storytelling, and geopolitics, including Aust's musings about the RAF's use of Moby Dick figures as pseudonyms. This film is based on the 'real' story on which Melville based his book, the drama of the whaler *Essex*, a sort of after-the-fact cinema prequel to *Moby Dick*, and a spectacular disenchanting of both fiction and historical events alike. Halfway through their text Aust and Küveler write about the *Pequod*, Ahab's ship in *Moby Dick*, as a symbol

31 The Blue Whale episode features in Psihoyo's film Racing Extinction (USA 2015).

32 Markus Krajewski: "Kapitel 44: The Chart," in: *Neue Rundschau* 2/2012, pp.50–64, p. 50 (my translation).

33 Ibid.

34 Adamowsky: *Ozeanische Wunder*, op. cit., p. 29.

35 Just a few most recent examples: The sperm whale research project *Darewin*, http://darewin.org/ (last seen: 31.12.2018), The Shape of Water (Guillermo del Toro, USA 2017), Aquaman (James Wan, USA 2018). The BBC's series Blue Planet II (GB 2017) was so successful that it supposedly slowed down China's internet (see https://www.independent.co.uk/arts-entertainment/tv/news/blue-planet-bbc-one-download-watch-china-stream-viewing-figures-slowed-internet-a8051631.html, last seen: 31.12.2018).

for capitalist expansion and the conquest of the world (including the deep sea and outer space):

> Whale oil, not crude oil, lubricated the industrial revolution in its beginning. It was indispensable and created a complex exploitation chain: the whalers from Nantucket bought oil and candle factories. They became the sheikhs of the whale oil trade and at the same time the inventors of vertical concentration. [...] The head of the whale contains the so-called spermaceti, the best oil in the world. It is said that NASA still uses it on highly sensitive special equipment.[36]

The hunt for whale oil almost decimated the world's – the ocean's – whale population. It only came to a halt in the mid twentieth century. Another half century later the GoPro was launched (the first digital GoPro camera was released in 2006) and it was a seaborne enterprise to begin with. Nick Woodman, the founder and CEO of the company, wanted to build cameras that could be used while surfing. Today's whale hunts are mostly in pursuit of images – often with GoPro cameras. From the BBC's Blue Planet II series' (GB 2017) filming of a whale fall in the Atlantic,[37] to Blue Planet II cameraman Patrick Dykstra's recommendation to junior underwater filmers with little budget to use GoPro cameras,[38] to Louie Psihoyo's collaboration with *GoPro Originals* in advertising for his 2015 film Racing Extinction, a film which "aims to expose the hidden world of extinction with never-before-seen images that will change the way we see the world."[39]

I will not go into the details of Psihoyo's film (and its obsession with 'Asian' practices of whale hunting – Japan – and illegal trading with rare species – China –, which follows his Oscar-winning 2009 film The Cove) and instead look at the film's "prelude," the *GoPro Originals* 17min production GoPro: The Search for the Blue Whale – A Prelude to 'Racing Extinction' (USA 2015), which centers on the film's spectacular staging of the search for an image containing both a blue whale and a human figure: putting everything into the perspective of human scale.

[36] Stefan Aust, Jan Küveler: "Im Hirn der Terroristen spukte der Weiße Wal," in: *Die Welt*, 2.12.2015, (last seen: 31.12.2018, my translation).

[37] See Ed Yong's interview with Blue Planet II producer Orla Doherty in *The Atlantic*, https://www.theatlantic.com/science/archive/2018/01/the-making-of-blue-planet-2s-incredible-deep-ocean-episode/551729/ (last seen: 31.12.2018).

[38] "How to film whales, swim with sharks and dodge guerillas: lessons from Blue Planet's cameraman", interview with Patrick Dykstra, in: *The Telegraph*, 18.5.2018, https://www.telegraph.co.uk/travel/activity-and-adventure/what-patrick-dykstra-learned-being-a-blue-planet-cameraman/ (last seen: 31.12.2018).

[39] https://www.deeperblue.com/change-view-world-documentary-racing-extinction-airs-tomorrow/ (last seen: 31.12.2018).

Both the prelude and the feature film claim to aim at creating human awareness about species' extinction but only manage to reinforce the perspective of discovery – fittingly the feature film's broadcast premiere was on *The Discovery Channel*.[40] The film's hunt for species 'exterminators' is above all else a spectacular display of technologies: race cars, speed boats, underwater scooters, hidden cameras, and numerous GoPro cameras. Spectacular images with a curious introduction. The Prelude to Racing Extinction begins with an animation of some of the *Moby Dick* illustrations from the 1902 edition by Isaac Walton Taber.[41] It opens with the harpoonist Queequeg. Queequeg, son of a South Sea chieftain, left home to explore the world and will be paired up with the novel's narrator, Ishmael, with whom he shares a room and a bed, an encounter ("You had almost thought I had been his wife."[42]) Melville has Ishmael obsess about for several chapters. In the Prelude Queequeg's harpoon is replaced with a GoPro mounted on a telescoping pole; the animation sequence ends with the title "the Search for the White Whale," crossing out 'White' and replacing it with 'Blue.' This palimpsest serves the purpose of charging the film's endeavor – the chase – with historical and mythical weight. It does, however, make clear that both film and 'prelude' are themselves part and parcel of the very industry they criticize, including massive CO2 output (which Psihoyo admittedly does address at some point during his filming). But mostly it shows how today's exploration of the deep sea and the world's oceans often appears to be synchronous with the conquest, classification, and collection spirit of the nineteenth century – thus ultimately also with its culture of death and decimation.[43]

[40] For a critical engagement with the genre of endangered species and wildlife/animal protection in film see for example Vinzenz Hediger: "Das Tier auf unserer Seite. Zur Politik des Filmtiers am Beispiel von Serengeti Darf Nicht Sterben," in: Anne von der Heiden, Joseph Vogl (eds.): Politische Zoologie, Berlin 2007, pp. 59-73. On "flagship species" and the discourse on extinction see Ursula K. Heise: Imagining Extinction. The Cultural Meanings of Endangered Species, Chicago 2016.

[41] Not to be confused with his contemporary (they were only 20 years apart) I. W. Taber, photographer and daguerrotypist – coincidentally both were from New Bedford (and the latter Taber also worked on a whaler).

[42] Herman Melville: *Moby Dick*, London 2007, Epub, chapter IV.

[43] Two big collecting 'crazes' of the 19th century, the fern craze and aquarium craze, resulted in the near extinction of some species (fern, sea anemones/actinia), see Vennen: Das Aquarium, op. cit. Today's hunt for spectacular images, the desire to "know more," is generally framed as going against exploitation and decimation. But as with the Manganese nodules' exploration licenses, which supposedly only serve to study the impact of mining and to search for sustainable practices, their inevitable outcome is the territorialization of the ocean and the seabed.

Fig. 1: Queequeg and his Harpoon, I.W. Taber – Moby Dick – edition: Charles Scribner's Sons, New York, 1902

Fig. 2: Screenshot, Prelude to Racing Extinction (USA 2015, 94 min, Regie: Lozie Psihoyo)

Lucian Castaign-Taylor and Véréna Paravel's much acclaimed documentary Leviathan (USA 2012) was shot on a fish trawler off the coast of New Bedford, the very location of *Moby Dick*. The film's critical acclaim includes its use of GoPro cameras, with which the filmmakers and founders of Harvard's Sensory Ethnographic Lab created its immersive, posthuman – machinic, animistic – images and soundscape.[44] Philip Hoare, self-declared 'whale obsessed' writer, discusses in his review of the film the conditions of the former whaling, now fishing town:

> The brute force of Leviathan is itself a reflection – or perhaps a refraction – of modern-day New Bedford. [...] Like Moby Dick, Leviathan reflects an industrial reality more than a maritime romance. Just as Ahab's ship was crewed from around the world, so New Bedford's whaling ships brought Azoreans and Portuguese, black Cape Verdeans and others to its port. [...] Despite concerns over diminishing stocks [...], New Bedford remains the leading US fishing port, with more than three hundred boats landing $300m (£186m) worth of fish and scallops a year. Its cultural mix continues – half its fishermen were born outside the US.[45]

And just like the whaling industry, the fishing industry is a deadly occupation, "suffering the highest fatalities of any industry in the US."[46] Paradoxically the whaling trade was largely run by peaceful Quakers (such as the Pequod's chief mate Starbuck), who, as Hoare points out, also gave refuge to runaway slaves: "New Bedford was an important stop on the Underground Railroad that allowed many slaves fleeing the South to escape."[47]

The dead of the world's oceans are many. There are the vast and as yet still unnamed deaths of the transatlantic slave trade, there were also poor laborers who more often than not were forced or abducted to work those ships, whose deaths were the consequence of desolate and dangerous working conditions, many of whom we might today describe as migrants: those who cross the oceans in search of another life. Today it is mostly the Mediterranean Sea that is known for its ever-increasing massive death toll – for which the European Union's migration policies need to be held accountable.

Berlin-based Syrian filmmaker Khaled Abdelwahed's film Jellyfish (Syria/Germany 2016) was supposed to be screened at the Berlinale Forum

[44] See the various reviews and critiques on the film's website: http://www.arretetoncinema.org/leviathan/reviews.html (last seen: 31.12.2018).

[45] Philip Hoare: "Leviathan. The film that lays bare the apocalyptic world of fishing," in: *The Guardian*, 18.11.2013, https://www.theguardian.com/film/2013/nov/18/leviathan-fishing-film-moby-dick (last seen: 31.12.2018).

[46] Ibid.

[47] Ibid.

in 2016, but it was never shown: "[…] after one of the film's protagonists was detained in Syria, the filmmaker and his producers deemed that screening the film at the festival might bring undue harm to his already ominous situation. The film will therefore only be screened once the protagonist in question has been released and is safe."[48]

Jellyfish is thus an invisible film – about the war in Syria and on the question of image making. "The four protagonists embody the different 'devolutionary' stages of the political crisis, from non-violent insurrection to outright war, a structure inherent to the transformation of content and role of the images."[49] On several occasions images of jellyfish are superimposed on the images of war, flight, violence. In an interview conducted in lieu of the Berlinale screening, curator and writer Rasha Salti asks the filmmaker:

> Why Jellyfish? Abdelwaheed sighed with sadness, 'I read the story of a mother and her three daughters who had taken a boat to Italy seeking asylum in Europe. The boat capsized, the three daughters drowned but the mother survived. The newspaper story noted there were no images of the fatal accident. At that time, I was feeling drowned in images, and I could no longer see. The story moved me deeply. I began to wonder what might have been the most beautiful thing the daughters could have seen as they were drowning in the Mediterranean? A jellyfish perhaps, no doubt. They are actually quite beautiful. Those drowning girls had given me back my sight, the film is also my debt of gratitude to them.'[50]

Jellyfish, I kept hearing, has a scene in it shot on GoPro cameras. I am not sure this scene does exist, and I wonder what it means to create production stories focusing on brand names, but it might be a projected superimposition with the story of Amel Alzakout, journalist and artist, also from Syria and living in Berlin. When she crossed over the sea from Turkey to reach Greece and thus the EU she had a small digital camera attached to her arm that recorded the entire time – again, not a GoPro, but definitely something that would qualify as an 'action camcorder.' Shortly after her boat disembarked it fell apart. She almost drowned (the shipwreck resulted in the death of at least 43 people). Merle Kröger from the production platform *pong*,[51] author and producer, writes about these images. She says she has never seen anything quite like it. They pull

[48] "Ways of Seeing: Behind Syrian Cameras: A Conversation with Khaled Abdelwahed by Rasha Salti," in: https://www.arsenal-berlin.de/en/berlinale-forum/archive/program-archive/2016/magazine/behind-syrian-cameras.html (last seen: 31.12.2018).

[49] Ibid.

[50] Ibid.

[51] *Pong* was founded in 2001 by Merle Kröger and Philip Scheffner. https://pong-berlin.de/en (last seen: 31.12.2018).

you down with you, they call you to let go. Maybe the call is the same Pip from the Pequod might have heard: to join *Drexciya*, the underwater kingdom "populated by the children of slaves who had been thrown overboard during the Middle Passage."[52]

Why does it matter what these images were shot on? What is the difference between the pull of the images in Psihoyo's Prelude and the images of Purple Sea, Kahled Abdulwahed and Amel Alzakout's collaborative film project which is based on the images recorded bay the camera attached to Alzakout's arm?"? The synopsis of the film reads: "I lie on my back, under the surface of the water. The sea is purple. I feel the warmth with every pore of my body. I'm not afraid anymore."[53] What if a logline like this – after all, one of endurance, courage, survival – were featured on one of the GoPro channels: "be a hero?" Obviously, it doesn't. While migrants' routes have in recent years become the subject of numerous films that advertise their production mode as both an adventure of digital devices and of geopolitical – here mostly: human – plight, these, or for example Harraga videos shot on versatile camcorders, are difficult to imagine being featured on a platform next to skydives, bike rides down mountain ridges, surfers going through wave tunnels, etc. GoPro is not simply a camera especially equipped for watery views[54] but a specific format: centered on the subject's moves (even when not in the frame, such as when the camera is mounted on a helmet), the surrounding space expanded by the fisheye lens's distortion, the 'empty' context to frame the *Hero*'s action. Leviathan, the Purple Sea, but also versatile camcorders' images shot by the ocean itself (images recorded by retrieved lost cameras) in this sense do not qualify as GoPro images – regardless of the camera brand that was used. They might have been made with a GoPro camera, but they *do not join the movement*. Not this movement anyway, which is about action in empty context, about repetition of known moves into the unknown, about standing still while doing spectacular things. Images not made by 'heroes' are about other movements. The movement of migration,

[52] Kodwo Eshun from *Otolith Group* in an interview with *Bad at Sports*, 15.2.2012, https://www.artpractical.com/column/interview_with_kodwo_eshun/ (last seen: 31.12.2018).

[53] https://purplesea.pong-berlin.de/en/16/synopsis. See the film's website: https://purplesea.pong-berlin.de/de. The case of this shipwreck and the EU's responsibility for its many deaths, has also been investigated by Forensic Architecture, see: https://forensic-architecture.org/investigation/shipwreck-at-the-threshold-of-europe (all URL last accessed July 22nd, 2020).

[54] There are special GoPro cameras built for divers, and in particular 'sport' anglers, such as the GoFish Cam, https://gofishcam.com/ (last seen: 31.12.2018). Fish swallowing these cameras is an interesting subject, both visually and theoretically – one I dabbled with a bit for the conference this publication is based on.

for example, which is first and foremost a social and political movement. Or as Natalie Lettenwitsch argues: "Whatever it is that human actors want to find under water beyond exploitable resources – immersion in cinematic spaces can also retrieve this other knowledge, in which history and nature are not separated from each other."[55] History, politics, nature, human, animal, and whatever it is we do not know about the deep sea. Not separated, but connected, not only expanded space scaled down to human size, but possibly truly fishes' visions.

[55] Lettenewitsch: "Fundstücke aus der Tiefe," op. cit., p. 88.

Filming Animals: Portable Cameras in Animal Media Practice[1]

Marek Jancovic

Introduction

> Intactae fueratis aves, solacia ruris, adsuetum silvis innocuumque genus, quae facitis nidos et plumis ova fovetis, et facili dulces editis ore modos; sed nihil ista iuvant, quia linguae crimen habetis, dique putant mentes vos aperire suas.[2]
> (Ovid, *Fasti*)

EXT. NIGHT. Fade-in to a low-angle wide shot of a dark park. The light-brown façade of a historical building visible in the distance appears greenish. The camera tries to make the most out of the low-light conditions but the colors are off and much of the image is black. It wobbles forward, close to the ground. The ominous shadows and stark tree silhouettes are practically a set from Hermann Warm. The camera lands on the ground with a small rumble. A grey blob emerges from the shadows in front and quickly approaches the now motionless device. It swells to a monstrous size, its two twiggy legs pausing right in front of the lens (fig. 1). Sudden downward pivot, everything is black. An unseen man yells "Hey! Hey!" A split second of confusion, lift-off. The wind pummels the mic while we witness a short but intense 15-second glide through the air, the historical quarters of Le Suquet appearing below in harsh contrast. A bird's legs, tail, and belly enter the frame from the top in extreme close-up just before it lands somewhere high up. It puts the camera down, towering over it, and immediately lets out a remarkably goat-like bleat. Picks it up again with its beak, rotates it to the side. A few caws. The image moves in and out of darkness. Finally, the camera operator appears: white feathered head, distinct and in focus. After stealing a glance at the camera, the face quickly retreats into the darkness, leaving a tiny slice of the Château de la Castre's tower with a barely vis-

[1] Fragments of this text have previously appeared in the essay and installation "Animal Technics: On Borders and the Labour of Knowing the World," Fotomuseum Winterthur, 2018, http://www.fotomuseum.ch/en/explore/situations/154932.

[2] "You were chaste once, you birds, a rural solace, you harmless race that haunt the woodlands, who build your nests, warm your eggs with your wings, and utter sweet measures from your ready beaks, but that is no help to you, because of your guilty tongues, and the gods' belief that you reveal their thoughts." (Translation by Anthony S. Kline)

Fig. 1: Still from "Seagull stole GoPro."

ible French flag billowing against the black sky. Two more squeals, some chirping and cawing in the background. Fade to black.

It could be mistaken for an enigmatic piece of video art, but in reality, this is Seagull stole GoPro, an amateur video uploaded to YouTube in June 2011. "Seagull stole my video camera in Cannes, France. I found it on the castle wall, where I had to climb," the description explains.[3] The moody nocturnal setting certainly does set it somewhat apart, but Lukas Karasek's video otherwise follows all the conventions of the genre it is clearly a part of. It shares a niche of the viral visual economy with "Seagull Theft – With Telemetry in 4K, Coney Island Seagull Steals GoPro! or GoPro STOLEN by a SEAGULL!! – Unique San Francisco sunset." Some of these titles are more phatic than others, some tout technological advancements, others advertise the locale. Some are branded with a GoPro vanity card and published directly on the company's channel, others refrain from specifying brand names; a handful include animations and visualized data, some a soundtrack, some explicative subtitles, others are completely plain.

Sara Swain called this genre "accidental animal videos."[4] I prefer to call them "spontaneous," since many of them clearly cajole, invite, or encourage animals to participate in their making. A few openly show food being planted strategically, others are more apologetic about this apparent manipulation. YouTube user Viva Frei writes under his video

[3] Lukas Karasek: "Seagull Stole GoPro," YouTube, 23.6.2011, https://www.youtube.com/watch?v=rIu5B3Fsstg (last seen: 20.12.2018).

[4] Sara A. Swain: *Feral Ecologies: A Foray into the Worlds of Animals and Media*, Doctoral dissertation, York University 2016.

"A BIRD WITH A GOPRO!!" from June 2018: "A seagull stole my GoPro. Yes, it had some food on it. But this was epic BEYOND BELIEF! And the part where the seagull stopped flapping its wings and flew over the pond… INTERNET HISTORY I SAYS!!! Enjoy! And be sure to like, share, comment & subscribe!"[5]

Although he has posted exhilarating and widely-viewed recordings made by squirrels in recent years, Viva Frei's seagull video is unlikely to make Internet history this late in the game – such videos are now common and our "semiotic skills"[6] develop quickly. His enthusiasm reflects the video's significance for personal memory more than for audiovisual history, but also speaks to GoPro's implicit promise to open a passage between those two. A big part of what constitutes the thrill of publishing a seagull video, after all, is not just that the footage is exceptional, but that "I" was among those present at its inception. The GoPro's ease of operation and availability potentially extend this "I" to everyone. Videos with animals – especially videos made by animals – account for only a small fraction of the content showcased on the company's platforms, but they nonetheless serve an important role in advertising the versatility of its cameras. Not only do they let GoPro demonstrate in a number of different outdoor settings new features like OverCapture, which makes it possible to selectively and gradually change the image format from spherical to rectangular in post-production, producing genuinely new cinematic effects and transformations in perspective. They also help the company diversify its market segments by experimenting with narrative formats with social appeal for which extreme sports would be less suitable – for example, mid-length documentaries like "GoPro Cause: The Last of the Rhinos" which addresses wildlife conservation concerns.

Thus, even if Viva Frei's seagull video adheres to an already familiar formula, the large catalog of similar moving images certainly does merit our attention.

Defining a new genre

Octopuses, macaques, turtles, and many other animals have also made their mark as amateur operators of GoPros in recent years, occasionally creating recordings so riveting and affectively engaging (to humans) that

5 Viva Frei: "A BIRD WITH A GOPRO!!", YouTube, 10.6.2018, https://www.youtube.com/watch?v=TQ9J1OA2FXA (last seen: 20.12.2018).

6 Donna J. Haraway: *When Species Meet*, Minneapolis 2007, p. 254.

they easily compete with professionally opulent nature documentary footage. As a variant of the phantom ride, recordings made in this way are paradoxically banal *and* spectacular. They present a somewhat exceptional case of cross-species authorship and creative labor, where what we would call camera work is performed by animals, and the editing, post-production, and distribution is done by humans. It is somewhat ungainly to label a sly seagull's stunning aerial journey "cinematography" and evaluate it as such, because cinematography as cultural practice, aesthetic ruleset, art, and learned skill used to be the exclusive domain of humans. It is strange to think of praxis or practice, words so deeply rooted in the theory of human action, in relation to non-human animals. But it is precisely the concurrence of cheap portable recording equipment and free distribution platforms that has made visible just how prevalent, mundane, and ordinary non-human media practices are.

Videos co-authored by animals generally have a somewhat conventionalized three-act structure. They tend to begin with a short exposition – the animal approaches the device – followed by a prolonged peripety – the animal interacts with the device, usually suddenly grasping it and scurrying or flying away. At times, this is accompanied by agitated human attempts at preventing the impending theft and, naturally, the animal's refusal to indulge human codes of appropriate media conduct and legal fancies like property rights. Finally, they commonly end with a quick and cathartic dénouement – e.g. the device falling down from a tree or being discarded and then retrieved by its owner. This dramaturgy is accompanied by a number of typical stylistic elements: rapid and jerky motion, blurring of the image, bewildering falls and whirls, unusual angles and volatile framing, and thuds, pops, cracks, and other aural cues that indicate non-fictional and spontaneous recordings. Editing is rare and usually serves to excise the "boring" parts between the animal's abandonment of the device and its discovery. Spontaneous animal recordings are thus firmly placed in the company of other amateur footage made with action cameras and smartphones,[7] although – especially when made by non-flighted critters – they tend toward low-angle perspectives that are already traditionally associated with the beastly and libidinal.[8]

[7] Florian Krautkrämer: "Revolution Uploaded. Un/Sichtbares im Handy-Dokumentarfilm," in: *Zeitschrift für Medienwissenschaft* 11 (2014), pp. 113–126.

[8] Jessica Ullrich: "'Anything can happen when an animal is your cameraman.' Wie wir Tiere ansehen: Crittercams in der Gegenwartskunst," in: Chimaira – Arbeitskreis für Human-Animal Studies (ed.): *Tiere Bilder Ökonomien. Aktuelle Forschungsfragen der Human-Animal Studies*, Berlin 2013, pp. 267–293, here p. 276.

As Swain notes, these dramaturgical and stylistic tendencies are coherent enough to approach the systematicity of a genre.[9] This, in turn, presents compelling problems for media theory. Florian Krautkrämer has written about the difficulties of applying image theories developed for fiction film to handheld non-fictional footage.[10] Spontaneous animal recordings complicate things further, beyond the realm of form and aesthetics: since they are co-authored by different species, they force us to take animals seriously as a productive force in the history of the moving image. But if animals can become active creators (in addition to being engaged and curious spectators[11]), in what ways do we need to recalibrate our often unabashedly anthropocentric theories of media? When Christine Brinckmann made a distinction between an anthropomorphic and technomorphic camera, filming animals were enough of an aberration that they could be left out.[12] Now, a zoomorphic point of view not only unmistakably claims a position next to the anthropomorphic, but is, in fact, increasingly central to our understanding of the world. Where animals cross paths with technology, new networks of knowledge, new forms of labor, and new mechanisms of power take shape. Animal-made videos may not immediately seem like an avenue for political action, but GoPros are indeed a major component of emerging epistemic regimes important to both science and governmental control. I would argue that animals' gradual move closer to the center of visual culture is intricately entangled with other transformations in our shared understanding of the space in which political power operates, and of the place of humans and non-humans in it.

Updating augury

Unsurprisingly for a camera designed not to be held in human hands,[13] it appears almost as though it were one of the GoPro's affordances to at-

9 Swain: *Feral Ecologies*, op. cit., p. 100.

10 Krautkrämer: "Revolution Uploaded," in: *Zeitschrift für Medienwissenschaft* 11; Florian Krautkrämer: "GoPro-Vision und involvierter Blick: Neue Bilder Der Kriegsberichterstattung," in: Marie-Hélène Adam, Szilvia Gellai, and Julia Knifka (eds.): *Technisierte Lebenswelt: Über den Prozess der Figuration von Mensch und Technik*, Bielefeld 2016, pp. 209–226.

11 Marek Jancovic: "Videos for Cats, Animal Spectatorship and the Future of Media," in: Fred Truniger and Wolfgang Brückle (eds.): *Display / Disruption / Disorder*, Zürich 2021 (forthcoming).

12 Christine N. Brinckmann: *Die anthropomorphe Kamera und andere Schriften zur filmischen Narration*, Zürich 1997.

13 Winfried Gerling, Susanne Holschbach and Petra Löffler: *Bilder verteilen: fotografische Praktiken in der digitalen Kultur*, Bielefeld 2018, p. 133.

tract and be examined, appropriated and used by animals. We might even speculate that the more prominent, widespread, and popular recordings made by animals become, the more likely it becomes that we will get to see GoPro cameras adapted specifically for use by animals. Due to this seeming interfaceability, animals are increasingly operating such portable devices in the service of humans. Since 2016, vultures equipped with GoPros and GPS trackers are used by the Peruvian environment ministry to discover and monitor illegal waste dumping sites. In 2017, stray dogs wearing "smart vests" were trialed as a means of patrolling Bangkok neighborhoods. The vests were equipped with bark-activated cameras, delegating the autonomy for initiating the recording (and thus for data management) to the dogs. Elsewhere, dogs with GoPros strapped to their heads are training computer vision software to model dog behavior – in order to make robot dogs.[14] In Sam Easterson's much-analyzed video A Sheep in Wolf's Clothing from 1998 (the year of Google's founding) sheep would run away from a conspecific intruder equipped with a camera. Two decades later, camera-carrying sheep work for Google as amateur cartographers, mapping the Faroe Islands.

With remarkable mutual transitivity, portable video devices and animals co-emerge as technologies of surveillance, governance, policing, and knowledge production. One of the more extreme examples of the penetration of the machinic into the beastly is the rhinoceros: to inhibit the skyrocketing poaching, some South African reserves have started drilling holes into the animals' horns and fitting them with cameras and GPS devices. Exacerbating "the implicit connections between looking and extinction,"[15] portable media are literally embedded and embodied in the animal. A bizarre twist on Cartesian animality, in which the rhinoceros, a living recording apparatus, occupies the perverse task of livestreaming its own extinction as a last resort to prevent it.

None of this is, historically speaking, "new." Portable photographic machines and animals – birds, in particular – have been used as media of warfare and data transmission for over a century and half. Aside from the animals used throughout history as carriers of incendiary devices, the Franco-Prussian War of 1870, for example, brought forth an intricate animal-based information network. Photographer and microfilm inventor René Dagron utilized his microfilm compression technology together with

[14] Kiana Ehsani et al.: "Who Let the Dogs Out? Modeling Dog Behavior from Visual Data," in: *Arxiv.org*, 28.3.2018, https://arxiv.org/abs/1803.10827 (last seen: 20.12.2018).

[15] Anat Pick: "Why Not Look at Animals?" in: *NECSUS. European Journal of Media Studies* 1/4 (2015), 107–125, here p. 108.

carrier pigeons to establish a communication channel to Paris during its siege. Swain points out how thoroughly intermedial this assemblage was: its functioning depended on pigeons acting in tandem with trains, telegraphs, magic lanterns, microphotography, and hot air balloons.[16] Analogously, the GoPro needs to be understood within a larger lattice of other miniature and energy-efficient devices that record and transmit electromagnetic radiation, such as GPS, GSM, and GLS receivers.

We may also recall early forms of aerial photography developed by Julius Neubronner at the beginning of the twentieth century. Neubronner attached aluminum harnesses fitted with time-delayed cameras to pigeons to obtain what would now be fashionably called "drone's eye views." The present-day use of GoPros in similar contexts at first appears simply like a continuation of these historical practices. But it seems to me that when coupled with location tracking, environmental sensors, and other data gathering techniques, the animal's epistemic status changes drastically. The efficacy of Dagron's pigeons depends on secrecy: to succeed as a medium, the birds must avoid being intercepted or killed by Prussians. In contrast, when animals wear GoPros and telemeters, visibility is essential to their labor and to the surveilling power operating through them: the Peruvian vultures and the vest-wearing dogs are prominently publicized through social media and news outlets. And where nineteenth-century warfare demanded that the homing pigeon perform as a transparent communication channel, simply carrying information from one point to another, then twenty-first-century telemetry depends on animals and their technics to actively produce information in the first place. 'Marine Skins' are being developed for oceanic animals to log environmental data, and living bees have wireless sensors glued to their backs to fulfill the recent human fantasy of a living "Internet of Things."[17] But if telemetry was often deployed in the name of wildlife conservation and protection in the past, it is now increasingly vital for humans. Animals have become "sentinels for human and environmental health."[18] We have realized that the animals' own proclivities and aptitudes – for instance, seagulls' and vultures' scavenging habits or migratory birds' navigational skills – can be useful not only in revealing the political, social, and ecological crises of human making. In some cases, they also begin to offer viable technological solutions to them. The image and data-generating work

16 Swain: *Feral Ecologies*, op. cit., pp. 259–263.

17 Vikram Iyer et al.: "Living IoT: A Flying Wireless Platform on Live Insects," in: *Arxiv.org*, 22.12.2018, https://arxiv.org/abs/1812.09419 (last seen: 28.12.2018).

18 Swain: *Feral Ecologies*, op. cit., p. 60; also Alexander Pschera: *Das Internet der Tiere: der neue Dialog zwischen Mensch und Natur*, Berlin 2014.

animals do for us – a type of labor we commonly attribute to "cultural" and "cognitive" workers when it is done by humans – is crucial for our understanding of the chaotically drifting climatic borders, the changing chemical composition of the environment, the patterns of self-preserving migration and evolving survival strategies. Facing an increasingly inscrutable climate, we have thus returned to ancient Rome and its augury: to divine Jupiter's fickle will and make sense of our world, we look to the birds, hoping their machine tongues will reveal the gods' minds.

The self

On the example of carrier pigeon photographs, Peter Geimer shows how conventional anthropic media-theoretical notions like gaze and authorship cease to function when applied to animal-made imagery.[19] Neubronner's photographs show sceneries that the pigeon would have left behind its back, Neubronner himself was absent at the time an image was taken, and the camera, in a corporeal sense, did not gaze at anything at all.[20] One of the more memorable viral photographs of recent years demonstrates that these conceptual impasses are far from settled: the notorious case of the "monkey selfie" taken by a Celebes crested macaque in 2011 lays bare how animal recordings also frustrate anthropocentric legal doctrines. After being published on Wikipedia, wildlife photographer David Slater claimed the copyright in the photographs and was later sued for it by People for the Ethical Treatment of Animals (PETA). The controversy centered around whether the image was copyrightable at all and if so, whether the rights belonged to the monkey or to Slater, who set up the camera so it could be operated by the macaques.

Although the parties settled in 2017, the appellate court – unusually – refused to dismiss the case. Instead, in a scathing decision against PETA, it ruled that the organization cannot litigate on behalf of animals and reaffirmed that animals have no entitlement to copyright.[21] It is baffling why instead of envisioning new and sustainable forms of protection for

[19] Cf. also Florian Leitner: "On Robots and Turtles: A Posthuman Perspective on Camera and Image Movement after Michael Snow's La Région Centrale," *Discourse* 2/35 (2014), pp. 263–277, here p. 265.

[20] Peter Geimer: *Bilder aus Versehen: eine Geschichte fotografischer Erscheinungen*, Hamburg 2010, pp. 325–329.

[21] United States Court of Appeals for the Ninth Circuit: Naruto v. Slater (No. 16-15469), 23.4.2018, https://cdn.ca9.uscourts.gov/datastore/opinions/2018/04/23/16-15469.pdf (last seen: 20.12.2018).

animal and collaborative interspecific labor, PETA believes it is desirable to wrest non-human creations into the confines of copyright restrictions – the very same genus of monopolistic, private, and monetizable property rights that create the ideal economic incentives for the destruction of animal habitats, including those of macaques *and* humans. But the much more important lesson to draw is, as Swain points out, that animals are always involved in the processes of their own representation.[22] Instead of wondering whether the image is copyrightable and by whom, perhaps the question we should really be asking is: when the animal takes a picture of itself looking directly at a camera, what does this action tell us about both the camera and the animal? What wall is being broken, and by whom? We carelessly call these photographic objects "animal selfies" as if the human narrative of the self wasn't utterly inapplicable to the circumstances of their creation.

Geimer's media-archaeological analysis of avian photographs is useful because it highlights this perpetually ambiguous nature of animal recordings without falling into the anthropomorphizing trap of equating the camera with the visual system of living beings. But his historical case study does not neatly translate to more recent animal interactions with portable media. Formally, there is little that distinguishes Neubronner's pigeon photos from a rapacious bird's GoPro video. At the same time, we must take care not to overlook the praxeological difference between a pre-arranged recording and one taken by an animal spontaneously. James Leo Cahill interprets animal recordings as manifestations of a "post-cinema of animal attractions."[23] He includes in this category closed-circuit and surveillance footage, recordings made by humans in which animals appear purposely or interject themselves unexpectedly, and recordings made by animals (voluntarily or not). I believe we need a label more fine-tuned than the nebulous collective term *animal videos*, given that each of these disparate modalities of recording follows an idiosyncratic cultural logic.

"Animal-borne imagery" is a taxon occasionally used in this context. It applies to projects like the University of Georgia's Kitty Cams (which monitors outdoor activities of cats through video and radio), the previously mentioned SheepView360° (with its slogan "explore the Faroe Islands as an animal") or Google's DogView (which maps areas around the city of Ōdate, Japan "from the perspective" of an Akita). Such initiatives of course fail in their promise to make us see the world through animals'

[22] Swain, *Feral Ecologies*, op. cit., p. 43.

[23] James Leo Cahill: "A YouTube Bestiary: 26 Theses on a Post-Cinema of Attractions," in: Katherine Groo and Paul Flaig (eds.): *New Silent Cinema*, New York 2015, pp. 263–93.

eyes. The images, after all, are made by machines from a vantage point external to the animal's body and adjusted to represent the world in ways that remain legible to humans. Anat Pick maintains that animal-borne imagery and tracking sustain a deep anthropocentrism,[24] though numerous other authors positively evaluate the nascent glimpses of non-human perspectives in such recordings.[25] Jessica Ullrich, for example, in her analysis of art pieces that make use of animal-borne "Crittercams," delineates the ethical boundary in technological terms: in contrast with film and television footage, she highlights the absence of image stabilization in contemporary video art projects.[26] Ullrich reads the chaotic anarchy of non-stabilized animal recordings as an inscription of animal physiology and liveliness, and therefore as a new mode of encountering the world. (Interestingly, with the introduction of electronic image stabilization features like "HyperSmooth" – which is turned on by default on the GoPro HERO7 – these new sensory, aesthetic, and political potentials of shaky video might also soon become a historically localized experience.)

But as a conceptual category, "animal-borne imagery" nonetheless levels the concrete differences between animals who had cameras affixed to their bodies by humans and those that seize them on their own. Donna Haraway foregoes this issue of intentionality by invoking a post-humanist relational network:

> Hermeneutic potency is a relational matter; it's not about who 'has' hermeneutic agency, as if it were a nominal substance instead of a verbal infolding. Insofar as I (and my machines) use an animal, I am used by an animal (with its attached machine). I must adapt to the specific animals even as I work for years to learn to induce them to adapt to me and my artifacts [...]. If those animals are wearing something of my making, our mutual but unidentical coadaptation will be different.[27]

Although the tricky parameter of volition carries its own set of problems, I believe we cannot simply subsume animals' conscious actions under a "dispersed and hybrid actor network, transcending nations and species, in which meaning is no longer controlled by an individual and becomes

[24] Pick: "Why Not Look at Animals?" in: *NECSUS* 4, op. cit., here p. 110.

[25] Leitner: "On Robots and Turtles," in: *Discourse* 2/35, op. cit.; Cahill: "A YouTube Bestiary," in: Groo, Flaig (eds.): *New Silent Cinema,* op. cit.; Heather Davis: "Future Animals," in: Fotomuseum Winterthur (ed.): *Beastly/Tierisch*, Leipzig 2015, pp. 114–129; Swain: *Feral Ecologies*, op. cit.

[26] Ullrich: "Anything can happen", in: Chimaira (ed.): *Tiere Bilder Ökonomien*, op. cit., pp. 286f. Compare this with Rabih Mroué's analysis of amateur recordings from the Syrian civil war, as discussed by Krautkrämer: "Revolution Uploaded," in: *Zeitschrift für Medienwissenschaft* 11, op. cit. in which the use or non-use of a tripod marks a line of political allegiance.

[27] Donna J. Haraway: *When Species Meet*, op. cit., pp. 262f.

fluid,"[28] as Florian Leitner has suggested. This would amount to ignoring what animals themselves attend to, disregarding their manifest interest in human-made objects. Artist Emilio Vavarella's 12-minute video Animal Cinema (2017), assembled from YouTube footage filmed with several generations of GoPro cameras, is very clear about preserving this distinction: what counts as "animal cinema" are videos made by animals *autonomously*.

Neubronner's pigeons, the Peruvian vultures and the multitude of crustaceans, reptiles, amphibians, fish, and mammals with radio and video transmitters glued to their bodies appear as components of media; following their own trajectories, no doubt, but nonetheless machines whose technical operation (the transport or production of information) is preordained. Contrarily, when animals seize recording devices of their own accord, even when this interaction is orchestrated or premediated by humans, something else is at play. The animal *apprehends* the device in a phenomenological sense. It turns from object to subject of media, casting itself in a part normally retained for humans. "That the [animal] grabs the camera suggests that it was for a moment meaningful to it. This appropriation in turn suggests that the camera has qualities that we have not acknowledged or have simply forgotten."[29] The GoPro handled by a seagull or squirrel – as opposed to one attached to them – momentarily becomes an interface between a human and non-human *Umwelt*. Humans can often be heard in the background of spontaneous animal videos, yelling at them to leave their devices alone. It is in these "flashes of actual wild life, moments where nature and culture play while flummoxed humans helplessly stare on,"[30] the moments when animals choose to disobey us, Vinciane Despret and Heather Davis argue, that we are forced to acknowledge their agency.[31]

Thus, recordings spontaneously made by animals are not merely an issue of authorship or copyright, nor only of mutual adaptation, but also of praxis. When animals snatch the electronics that are as much part of their environment as they are of ours, it is neither a glitch, nor happenstance, nor lucky accident, nor an experiment under human control. It is an animal's conscious and directed action.

28 Leitner: "On Robots and Turtles," in: *Discourse* 2/35, op. cit., p. 265.
29 Swain: *Feral Ecologies*, p. 148.
30 Ibid., p. 102.
31 Vinciane Despret: *What Would Animals Say If We Asked the Right Questions?* Minneapolis 2016, pp. 180–182; Davis: "Future Animals," in: Fotomuseum Winterthur (ed.): *Beastly/Tierisch,* op. cit.

Dirt archives

"On the coast of Norway, Kjell Robertsen uses some bread to get some GoPro close-ups of seagulls. Over 5 months later he found his camera so we can all see what happens when you accidentally make a *seagull drone*."[32] This short introduction describing one of the 2017 GoPro Awards winners underscores another pertinent aspect of animal-made images: their embeddedness in the environment. GoPros recuperated out of the mud of a pigpen or crashed drones sunk in bodies of water appear to carry a story simply by being lost and found. They seem shrouded in mystery, since they lied in waiting in animals' "secret" quarters.[33] Thanks to the material constitution of solid-state semiconductor memory with its fair resistance to decay, they can protect and later divulge these secrets. Secrecy is the great framework through which our audiovisual culture interprets animal lives. Their "secret life" is stressed in the titles and marketing of recent animated films, nature documentaries, and photo-books. "GPS tags reveal the secret life of urban seagulls," heralds a recent article in *The Guardian* reporting on a study in Cornwall. "This study demonstrates that gulls behave as individuals and there can be no one-size-fits-all approach when it comes to managing their populations."[34] It says a great deal about human society that the seagull's GPS-mediated emancipation into personhood – beginning with the recognition that they have individually characteristic behaviors – is articulated in the same sentence as the need to control biopolitically the population it constitutes. The seagull as an urban *citoyen* is thus not, as the headline implies, simply discovered as if it had always been there, but very much first produced through GPS monitoring.

Our ongoing small renaissance in nature documentaries is both contingent on and feeds the "human desire to make animals unconditionally visible."[35] As if in enemy territory, the devices used in some of the most popular recent BBC Natural History Unit series are called "spy cams." Like National Geographic's Crittercams, this professional film and broadcasting equipment shares many material characteristics with the GoPro: they are miniature, portable and highly durable. The allure of

[32] GoPro: "GoPro Awards: Seagull Theft – With Telemetry in 4K," YouTube, 11.12.2017, https://www.youtube.com/watch?v=AeB90B9__xM (last seen: 20.12.2018), my emphasis.

[33] Cf. also Leitner, "On Robots and Turtles," in: *Discourse* 2/35, op. cit., p. 274.

[34] Ornithologist Viola Ross-Smith quoted in Steven Morris: "GPS Tags Reveal the Secret Life of Urban Seagulls," in: *The Guardian*, 14.7.2016, https://www.theguardian.com/environment/2016/jul/14/gps-tags-reveal-the-secret-life-of-urban-seagulls (last seen: 20.12.2018).

[35] Pick: "Why Not Look at Animals?" in: *NECSUS* 4, op. cit., here p. 108.

their clandestine recordings is undeniable, but contrary to the specious rhetoric of secrecy, the images tend to be quite quotidian. (This is not to say they are boring, since "familiarity in no way diminishes potency,"[36] as Haraway concedes.)

The value of these secrets in the visual economy is therefore high only insofar as they can cease to be secrets, maybe because they were never very well-guarded to begin with. Yet the more interesting and provocative images to think about are those that will never be seen. Setting aside for a moment the urgent problem of electronic waste accumulating around the planet, there is a growing corpus of recordings made by animals that are lost to us: a large archive of stolen GoPros and *un*found footage hidden in the forests, percolating in the lakes and the rivers, cached under the soil and in the seas.[37] It is useful to keep in mind that animals are capable of both making moving images as well as preserving and destroying them (fig. 2). This applies not only to the lice, insect larvae, and rodents who like to feed on the cultural memory entombed in our archives.[38] Animals inspect and take apart the recording and storage media they find in their world and save parts that appear useful to them or deploy them as tools, toys, ornaments, or building material. "Technological modernity is a multispecies affair,"[39] Swain reminds us. This realization resonates nowhere more clearly than in the wild archive of natural *and* technical history built and embodied by superb lyrebirds, whose mating calls famously include the noise of portable media like camera shutters.

Fig. 2: Still from "FOX KILLS AND EATS my gopro" uploaded to YouTube by TheOpenLens on July 19, 2014, showing a fox dismantling a HERO3+.

36 Haraway: *When Species Meet*, op. cit., p. 258.
37 I have Winfried Gerling to thank for this intriguing thought.
38 Miles Ogborn: "Archives," in: Stephan Harrison, Steve Pile and Nigel Thrift (eds.): *Patterned Ground: Entanglements of Nature and Culture*, London 2004, pp. 240–42.
39 Swain: *Feral Ecologies*, op. cit., p. 150.

Conclusion

In this article, I situated the GoPro camera and other portable video equipment – the Wolfcams and Armadillocams and Nestcams and Dencams and Crittercams and Kittycams and Spycams and Sheepviews and Dogviews – in a larger field of transformations and practices in order to show that, as I believe, we are witnessing not only a profound disruption of audiovisual codes, but also of human subjectivity as it is understood in relation to animals and technology. Besides the appearance of new production methods and genres of moving images, one important adjustment we must address is our obsolete definition of who can count as an "author" of technical recordings. I have argued for the importance of distinguishing between voluntary and passive animal recordings and suggested to call the former "spontaneous" rather than "accidental" in order to emphasize how such images "are made 'accidentally' *on purpose*."[40]

Animals who encounter technological objects, whether they are GoPro-stealing seagulls or parrots operating an Alexa with voice commands, are relentlessly expanding the domains of activity historically thought of as predominantly or exclusively belonging to humans. With wireless and cellular connectivity, algorithmic content analysis and editing, automated uploading features and integrations with platforms like YouTube, we can soon expect to see videos made by animals and post-produced and published by machines entirely without human intervention.

[40] Gerling, Holschbach, and Löffler: *Bilder verteilen*, op. cit., p. 143, my translation and emphasis.

Proof of Illustrations

Introduction

Fig. 1: Analog GoPro
the phoblographer: GoPro Was Originally a 35mm Film Waterproof Camera Manufacturer, 24.3.2014
https://www.thephoblographer.com/2014/03/24/gopro-originally-35mm-film-waterproof-camera-manufacturer/ (last seen: 07.3.2020)

Fig. 2: First digital GoPro
GoPro Digital Hero 5, 5 Mega-Pixel
https://www.bhphotovideo.com/c/product/581948-REG/GoPro_GDH50_Digital_Hero_5_5.html (last seen: 07.3.2020)

Fig. 3: GoPro commercial 2016
Alexandra Jardine: "GoPro Helps You Stay in the Moment, Says Brand's First Scripted Spot," in: AdAge.com, 10.11. 2016
adage.com/creativity/work/this-is/49895 (last seen: 07.3.2020) (Screenshot)

Fig. 4: GoPro in its packaging
cam for pro: "GoPro HERO7 Black Holiday Bundle"
https://www.camforpro.com/gopro-hero7-black-holiday-bundle/?gclid=Cj0KCQjw0pfzBRCOARIsANi0g0s4_UVzfaRzfXcG4ERwf2ZM4GRBYH-sAa-Ab184b1LUrR8JtxIWd6QaAoA0EALw_wcB (last seen: 07.3.2020).

Fig. 5: Margaret Raspé had developed a Super 8 helmet camera
Margaret Raspé mit Kamerahelm, ca. 1974, Foto: Heiner Ranke http://www.madeleinebernstorff.de/seiten/raspe/biografie.html (last seen: 10.3.2020)

Winfried Gerling:
Go Pro Hero Camera Technology – The Production of the Companion View

Fig. 1: GP Hero with wrist strap
Ben Einstein: "The Real Reason Quirky Failed", in Medium,24.9.2015,
https://medium.com/@BenEinstein/the-real-reason-why-quirky-failed-c362b3a3abd7 (last seen: 10.3.2020)

Fig. 2: Michael V. Korda, Sailboat 1966, and Nikonos Camera
Michael V. Korda: "The Camera that thinks it's a Duck", in: Popular Photography, March 1966, pp. 62-65, here p. 65

Fig. 3: GoPro Hero with wrist strap
Hero 1 Wrist, dropzone, https://www.dropzone.com/gear/cameras/wrist-hero-r560/ (last seen: 10.3.2020)

Fig. 4: Mounts
Go Pro Ultimate Combo Kit, https://www.geewiz.co.za/go-pro-series/93660-go-pro-ultimate-combo-kit-51-in-1-action-camera-accessory-kit-for-gopro-hero-7654-hero-2018hero-session-cameras.html (last seen: 10.3.2020)

Fig. 5: GoPro Evolution (Montage by the author)

Philippe Bédard: *Going Beyond the Human Perspective: GoPro Cameras and (Non-)Anthropocentric Ways of Seeing.*

Fig. 1: The original, wrist-worn GoPro Hero (circa 2004)

Fig. 2: Carl Boenish using a 35mm helmet-mounted Eyemo camera
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Fig. 3: The exo-centric technique (left) and its image (right)
Image designed by Charlotte Courtois

Fig. 4: The exo-centric image in "GoPro: Whistler's Dirt Merchant With Yoann Barelli," YouTube, 21.11.2016, https://youtu.be/gvL1agpqwvE (last seen: 21.2.2020) (Screenshot)

Jan Distelmeyer: *IT sees: Speculations on the Technologization of the View and its Distribution*

Fig. 1: Providing proof: GoPro Advertisement from 2015
http://media.virbcdn.com/cdn_images/resize_1024x1024/77/0b881217247354bf-comp3.jpg (last seen 7.3.2020)

Fig. 2: Proximity – pretty damn close: GoPro Advertisement from 2015
https://daviesmoore.com/wp-content/uploads/2015/07/GoProPrint-Ad.jpg (last seen 7.3.2020)

Fig. 3: Stable Mobility: Still from "GoPro: Pelican Learns To Fly"
„GoPro: Pelican Learns To Fly"
https://www.youtube.com/watch?v=_YEyzvtMx3s (last seen 7.3.2020) (Screenshot)

Florian Krautkrämer: *GoPro Culture: On the Relationship between Apparatus, Manufacturer, and Aesthetics*

Fig. 1&2: Stills from the clip "Million Dollar Challenge", for which the GoPro was attached to an object.
"GoPro Awards: Million Dollar Challenge Highlight | HERO7 Black" (GoPro) 14.12.2018, https://www.youtube.com/watch?v=Prt-G4cPIn4 (last seen: 10.3.2020) (Screenshot)

Nanna Verhoeff and Iris van der Tuin: Footage Redux: Revisiting Cartographic Captures of Time

Fig. 1: Screenshot of a commercial for the GoPro camera with skateboarder Ryan Sheckler, imitating the style of popular amateur action videos.
"GoPro Hero3 TV Commercial, 'On Top', YouTube, Apr 23.4. 2015, https://www.youtube.com/watch?v=wuegT2b-PwY (last seen: 02.08.2020) (Screenshot)

Fig. 2: Footage with data overlay – an image we know well from computer games. (Screenshot)

Tobias Conradi: *Pure, Clinical, Shiny Surfaces: Recreational Drones and Images of Construction and Destruction*

Fig. 1: The "Spaceship" Apple Park in June 2018
YouTube clip Matthew Roberts: "APPLE PARK June 2018 Aerial Perspective 4K", YouTube, 4.6.2018 https://www.youtube.com/watch?v=dnC_dxKc6bk (last seen: 11.3.2019) (Screenshot)

Fig. 2: Virtual floating around the MacBook Pro 2016
YouTube clip (Apple) "The new MacBook Pro – Design, Performance and Features," YouTube, 17.10.2016 https://www.youtube.com/watch?v=WVPRkcczXCY (last seen: 11.3.2019) (Screenshot)

Fig. 3: 'Drone-Dronie' and geometrical patterns
YouTube clip Matthew Roberts: "APPLE PARK June 2018 Aerial Perspective 4K", YouTube, 4.6.2018 https://www.youtube.com/watch?v=dnC_dxKc6bk (last seen: 11.3.2019) (Screenshot)

Fig. 4: 'Moving straight, tilting left'
YouTube clip "Ohio River Flooding Drone Video", Ben Childers, YouTube, 25.2.2018 https://www.youtube.com/watch?v=bB_nBYPiRto, (last seen: 2.3.2019) (Screenshot)

Fig. 5: Cincinnati flooding 2018
YouTube clip "Ohio River Flooding Drone Video", Ben Childers, YouTube, 25.2.2018 https://www.youtube.com/watch?v=bB_nBYPiRto, (last seen: 2.3.2019) (Screenshot)

Fig. 6: Editorial preparation.
Upper row: Screenshots YouTube clip "Coffey Park Fire 10/09/2017", Tom R;
Lower row: YouTube clip "Cal wildfires: Drone footage captures Santa Rosa decimation"
Fox News, https://www.youtube.com/watch?v=iQ2lISnO-nY (last seen: 11.3.2019) (Screenshots)

Fig. 7: Abandoned plots of land
YouTube clip: "WILDFIRE AFTERMATH: Coffey Park Neighborhood of Santa Rosa, California", Duncan Sinfield.
https://www.youtube.com/watch?v=EAAlaub0DfE (last seen: 11.3.2019) (Screenshots)

Anne Quirynen: *Visions of Outer Space*

Fig 1 & 2: Venus Mission
Credit: Anne Quirynen

Fig. 3: Apollo 11 Astronaut Neil Armstrong
Credit: NASA

Fig. 4: TV camera on lunar surface
Credit: NASA scanning credit: Kipp Teague

Fig. 5: Japan Aerospace Exploration Agency astronaut Aki Hoshide.
Credit: NASA

Fig. 6: Johnson Space Center's Mission Control Center station flight control room known as FCR-1
Credit: NASA

Fig. 7: These images were taken by ESA astronaut Luca Parmitano during his spacewalk, together with NASA's Chris Cassidy, 9 July 2013.
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Fig. 8: NASA's Curiosity Mars self-portrait. Sept. 7, 2012.
Credits: NASA/JPL-Caltech/Malin Space Science Systems

Fig. 9: NASA's Curiosity Mars rover self-portait shows the vehicle at "Namib Dune."
Credits: NASA/JPL-Caltech/Malin Space Science Systems

Fig. 10: NASA's Curiosity Mars rover documented itself in the context of its work site, "Rocknest Wind Drift," (Oct. 31, 2012)
Credits: NASA/JPL-Caltech/Malin Space Science Systems

Fig. 11: Fotomontage of NASA's Curiosity Mars rover ride and a third person view of a mountain biker
Credits: NASA/JPL-Caltech

Fig. 12: Five years of images from NASA's Curiosity Mars rover were used to create this time-lapse movie
Credits: NASA/JPL-Caltech
Fig. 13 & 14: Credit: NASA

Simon Menner: *Media Brothers – Fighting Jihad with GoPro cameras*

Fig. 1: Video still from the propaganda video "Resolve of the Brave 2", ca. December 2015
source: Telegram
Fig. 2: Video still from the video "HD Tank with GoPro™ gets multiple Hits in Jobar Syria", October 25th, 2014
source: YouTube
Fig. 3: Video still from the video "попытки штурма центральной тюрьмы Алеппо", February 16th, 2014
source: Telegram
Fig. 4: Video still from the video "Fight the Guardians of Satan", ca. March 2016
source: Telegram
Fig. 5: Video still from the video "Terrify the Enemy of God and Your Enemy", ca. December 2015
source: jihadology.net
Fig. 6: Video still, May 2018
source memri.org
Fig. 7: Video still from the video "Battle of Marawi", November 28th, 2017
source: YouTube
Fig.8: Video still from the video "ملحمة الثبات 3" (Epic Stability 3), ca. September 2016
Fig.9: Video still, unnamed Islamic State video, ca. April 2017
source: Telegram

Christophe Merkle: *The Cardboard Camera – The Highs and Lows in Immersive Filmmaking with GoPro Cameras*

All images were made and provided by the author.

Julian Jochmaring: *The Swamp film(s): Moving Image and Environmentality in "Swamp"*

Fig. 1: SWAMP (USA 1971, 6 Minuten, color, sound, 16 mm film on video, Artists: Nancy Holt and Robert Smithson) (Screenshot)

Nanna Heidenreich: *Fishes, Their Eyes: A No Hero's Journey*

Fig. 1: Queequeg and his Harpoon
I.W. Taber – Moby Dick – edition: Charles Scribner's Sons, New York, 1902
Fig. 2: PRELUDE to RACING EXTINCTION (USA 2015, 94 min, Regie: Lozie Psihoyo) (Screenshot)

Marek Jancovic: *Filming Animals: Portable Cameras in Animal Media Practice*

Fig. 1: Lukas Karasek: "Seagull Stole GoPro", YouTube, 23.6.2011
https://www.youtube.com/watch?v=rIu5B3Fsstg (last seen: 20.12.2018) (Screenshot)
Fig. 2: TheOpenLens: "FOX KILSS AND EATS my gopro", YouTube, 20.7.2014
https://www.youtube.com/watch?v=ojSaYrOttVs (last seen: 10.3.2020) (Screenshot)

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Julian Jochmaring received his doctorate from the University of Potsdam on the Media Philosophies of the Environmental and is a Lecturer at the University of Vienna. He was a fellow at the Brandenburg Center for Media Studies (ZeM) and of the DFG Research Training Group "Visibility and Visual Production: Hybrid Forms of Iconic Knowledge" at the University of Potsdam. Current publications include: "Streuen/Strahlen. Negative Ambientalität bei Merleau-Ponty," in: Christiane Voss, Lorenz Engell, Katerina Krtilova (eds.), *Medienanthropologische Szenen. Die conditio humana im Zeitalter der Medien*, Paderborn 2019. "'Ihre wirkliche konkrete Situation, von morgens bis abends 32 und abends bis morgens'. Filmische Sorgegemeinschaften in Sto Spiti und Huba", in: Winfried Pauleit, Angela Rabing (eds.), Familien-Bilder. Lebensgemeinschaften und Kino, Berlin 2020.

Florian Krautkrämer, professor at the Lucerne School of Art and Design, teaches and researches on the changes in documentary and amateur film brought on by new developments in production and distribution. He wrote his doctoral thesis on writing in film and was visiting professor of film studies at the Johannes Gutenberg-University in Mainz. His thesis and other texts can be found on his website: floriankrautkraemer.de

Simon Menner earned a Diploma (2006) and subsequently an MFA (2007) from the Universität der Künste Berlin, in both cases as a student of Stan Douglas. He has spent time as a student at the School of the Art Institute Chicago. Menner has exhibited his work in photography internationally and amongst other venues, participated in solo and group shows in the Museum of Contemporary Photography Chicago, Anchorage Museum, CO Berlin, Museum for Photography Berlin, NRW Forum Düsseldorf, Benaki Museum Athens, Bauhaus Museum Weimar, Zephyr Mannheim, Galeria Bunkier Sztuki Krakow, and the Biennale de Lubumbashi.

Christophe Merkle is a creative technologist and lecturer from Bern, Switzerland. Transitioned from applied research in cinematic VR to creating interactive VR experiences. Passing on his knowledge at the HSLU D&K Lucerne. Creating spatial experiences out of small action cams and/or Unity is his speciality.

Anne Quirynen is an artist and filmmaker working at the intersection of the digital moving image, installation, music, and dance, focusing on the medialization of the body, space fiction, ecology, and feminist and queer theory. She studied art history in Leuven and video art at the Hogeschool Sint-Lukas in Brussels. In 1994 she belonged to the founders of the independent production company for digital art "De Filmfabriek." A grant from the Nipkow Program led her to Berlin in 1999. She was assistant professor for Film, Video and New Media at the Chicago Art Institute. At present she is professor for moving image at European Media Studies, a co-operation between the University of Potsdam and the University of Applied Sciences Potsdam. Her films and installations have been awarded and exhibited in many international festivals and museums.

James Trew is a British technology journalist based in San Francisco. He has worked for a number of UK and American publications, including: *High Snobiety*, *Men's Journal*, *Computer Music*, *T3* (magazine), *Stuff* (magazine), and *TechRadar*. Currently he is the Managing Editor at Engadget.com, and has covered GoPro closely for the last seven years.

Nanna Verhoeff is Professor of Screen Cultures and Society in the Department of Media and Culture Studies at Utrecht University. She has published on emerging and transforming screen cultures, ranging from early cinema to contemporary mobile and locative media, interactive installations, and urban screens. Her books include the monographs *The West in Early Cinema: After the Beginning* (Amsterdam University Press, 2006) on emerging cinema as new medium, and *Mobile Screens: The Visual Regime of Navigation* (Amsterdam University Press, 2012) on mobile media and interfaces of navigation. She is initiater of research group [urban interfaces] and had co-edited the special issue *Urban Interfaces: Media, Art & Performance in Public Space for Leonardo Electronic Almanac* (MIT Press, 2019).

Iris van der Tuin is Professor in Theory of Cultural Inquiry at Utrecht University (Department of Philosophy and Religious Studies). Working on the intersection of philosophies of science and the humanities, cultural theory, and cultural inquiry, she wrote *Generational Feminism: New Materialist Introduction to a Generative Approach* (Lexington Books, 2015) and co-authored *New Materialism: Interviews & Cartographies* (Open Humanities Press, 2012) with Rick Dolphijn, and *Ethics of Coding: A Report on the Algorithmic Condition* (European Commission, 2018) with Felicity Colman, Vera Bühlmann, and Aislinn O'Donnell.