



# On the Trail of Some Human Heat. Thermal Imaging, Visual Culture and the Covid-19 Pandemic

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The paper is divided into two main aims. In the first part, it wants to investigate the presence of thermal imaging in the context of contemporary visual culture, especially during the Covid-19 pandemic, when thermal imaging widely demonstrated how currently optics models of vision are increasingly accompanied by thermal models of visualisation. The result of the latter is thermography: at the same time, a process that transforms our epistemic relationship with reality, extending the possibilities of visualising information beyond the limits of the visible spectrum; and an image that maintains the indexical bond with its referent, but that is conceived as the outcome of an elaborated and displayed dataset. In the second part, the paper focuses on the artistic field in which thermal vision gained further relevance in the context of the pandemic. On the one hand, the artists have criticised and deconstructed it; on the other hand, they have relaunched its use in a biopolitical horizon, such as in the case of the photographic project *Virus* (2020), in which Antoine d'Agata roamed the deserted streets of Paris and visited some intensive care units with a thermal camera, during the first national lockdown in 2020.

**Keywords**  
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*We are only a little stored, organized solar heat, a memory of Sun.  
A little phosphorus that burns in the meninges of the world  
(Paul Cézanne, quoted by Antoine d'Agata, La vie nue)*

## INTRODUCTION

37.5 is not merely a number. If combined with a unit of measurement (the degree Celsius), it becomes a temperature indicating an increase in body heat, generally called fever. During the peak phases of the Covid-19 pandemic, this temperature has long been considered a threshold, a watershed line. 37.5 °C was, at least in Italy, the limit set by the Government to establish an alert level: finding that temperature, or a higher one, meant being affected by the most common symptom of infection. A significant consequence of this bodily overheating was the obligation to stay at home, losing the right to frequent public places. Consequently, to ensure compliance with this decree, access to schools, hospitals, offices, supermarkets, and workplaces started to be

monitored by thermal cameras and thermal scanners. These devices, placed near the entrances of many buildings, acted as social guardians, allowing (or denying) entry to anyone based on the body temperature detected.

Therefore, the health emergency has created a shared system of norms, rules and behaviour determined by and depending on thermal conditions. In a word, it has created a *thermopower*. A concept that describes 'the ways that temperature management defines subjects, produces objects, and locates both in grids of social and political organisation. [...] It] operates as a form of biopower, a means of administering and regulating life'.<sup>2</sup> Thermopower is a concept that can be relaunched in an ecological perspective, considering thermal conditions as something that shapes our presence in the complexity of our reality. However, it is also a concept that primarily deals with bodies, especially within the pandemic framework. Bodies indeed are the main protagonists of this pandemic as any other. They are the first vector of contagion, the medium of the virus;<sup>3</sup> they constitute an alarm heating up.<sup>4</sup>

Let us return to thermal cameras and thermal scanners. These devices signal a social danger concerning the human body by quantifying excessive heating, a phenomenon undetectable by human vision. Another example that suggests how, in the pandemic/temperature relationship, thermal media and technologies have played an important role precisely concerning body monitoring: from traditional instruments, such as the thermometer for domestic self-detection, to advanced visual technologies, such as the thermal imaging used to visualise the spread of micro-droplets in the air.<sup>5</sup> In the emergency context, thermal imaging has provided information about our bodies operating outside the visible spectrum. Allowing us to visualise the invisible effects of the virus — and reminding us, as Cézanne does, of what we are in our biological essence.

## ON THERMAL CAMERA

It may be helpful to clarify the theoretical principle on which the thermal camera is based to understand how thermography works.

In the seventeenth century, Isaac Newton, experimenting with a dispersive prism, was the first to realise that sunlight is composed of coloured rays with different angles of refraction. Contrary to what was believed at the time, he demonstrated that white light could be divided into seven different colours. In the nineteenth century, James Clerk Maxwell added an important piece. He unified work on electricity and electromagnetism into four famous equations and established that visible light (VIS) corresponds to a small section of a large continuous spectrum of radiation: the electromagnetic (EM) spectrum. All radiation in this spectrum behaves as if it were travelling in the form of waves, governed by two inversely proportional measures: length (cm) and frequency (hertz). Therefore, the smaller the wavelength, the greater the wave's frequency.

A limited part of the EM spectrum — the VIS, whose spectral range is between 0.38  $\mu\text{m}$  (violet) and 0.78  $\mu\text{m}$  (red) — can be seen by the human eye; but going

immediately above and below these limits, we encounter portions of the spectrum that are no longer visible to humans. Beyond the upper end of the visible spectrum begins *ultraviolet* (UV) radiation, which extends from 0.38  $\mu\text{m}$  to the X-ray portion of the spectrum (about 10 nm). On the other hand, below the lower end of the VIS range is the *infrared* (IR) radiation, which extends from 0.78  $\mu\text{m}$  to the Microwaves edge (about 1 mm). However, assuming that only a small part of the IR range is used for imaging, IR radiation can be further divided into different regions, depending on their distance from the VIS limit [Fig. 1].<sup>6</sup>

Determining this distance is essential. For example, it clarifies how thermal

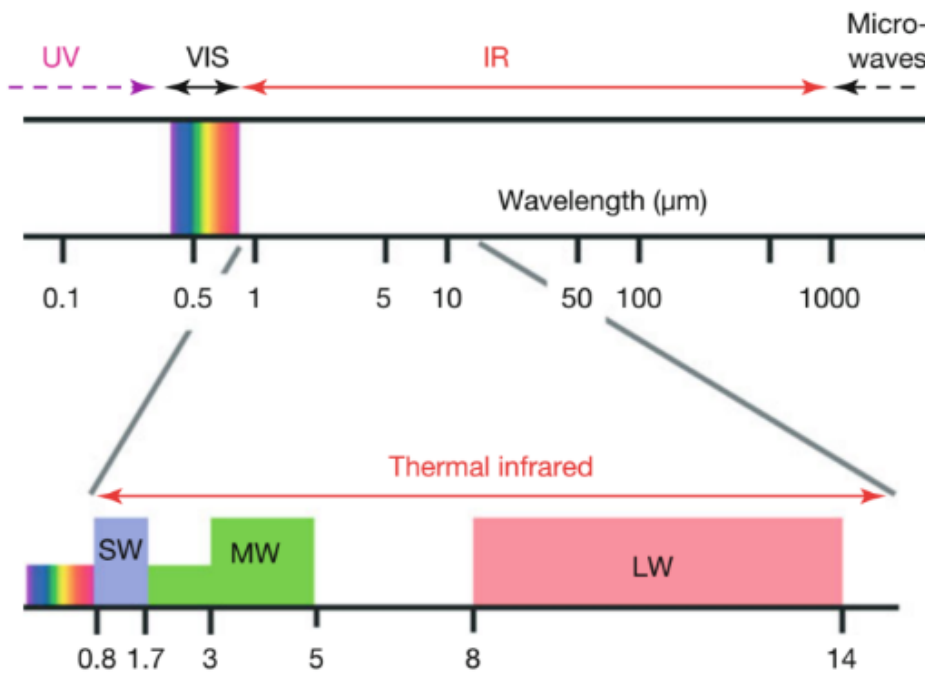


Fig. 1  
A portion of the  
electromagnetic spectrum

imaging, although belonging to 'what could somewhat be defined as a real "infrared visual culture"',<sup>7</sup> is not conceivable as a night vision equivalent. NVDs (Night Vision Devices) operate on the borderline between the VIS and the Short-Wave (SW) IR region (approximately 0,8-1,7  $\mu\text{m}$ ), absorbing small amounts of natural or artificial light, amplifying it considerably, and displaying it on a screen. Like the human eye, they are not suitable for too much light, nor when it is entirely dark. In this sense, we can say that the human eye and NVDs operate on the same basic principle: light hits an object, and then a sensor receives it and converts it into an image. On the other hand, current thermal cameras can measure IR wavelengths until the Long-Wave (LW) IR region (8-14  $\mu\text{m}$ ), far from the VIS edge. It means that thermal cameras can operate both in the presence of ambient light or in its total absence: in other words, they work watching a blazing sunset or exploring a completely dark room. It happens because thermal cameras do not detect light but heat, the thermal energy generated by the IR radiation.<sup>8</sup>

Everything we encounter in our daily lives deals with thermal energy. Some

things absorb heat, such as the asphalt of a road on a hot sunny day, or a chair after someone has sat on it. Other things emit it, either mechanically (a running engine) or biologically (the human body). Considering that 'there are no thermal objects, there is only thermal action',<sup>9</sup> thermal cameras can measure this invisible action and display it in a visual form, revealing thermal variations between adjacent objects and between objects and environments. With some technical limitations (for example, a thermal camera cannot *see* through a window, because glass acts like a mirror for IR radiation); but also without restrictions due to weather conditions, even in the presence of smoke, fog and rain.<sup>10</sup>

The website of FLIR,<sup>11</sup> the global leader in thermal imaging, illustrates the extraordinary versatility of this instrument, which extends our possibilities to acquire information and visual knowledge about reality in various fields. First in military research, where experiments with analogue images and Mid-Way (MW) IR or LWIR have been conducted since the 1930s, up to the latest generation of thermal cameras, capable of collecting thermal data and visualising them digitally. Subsequently, thermal cameras also multiplied in the civil sector. And today, qualitative (displaying heat distribution) and quantitative (quantifying the *heat signatures* of the framed objects) thermal cameras are increasingly adopted in workplace safety, territorial surveillance, biological and ethological research, climate change studies, and medical diagnostics. Moreover, thermal cameras have become a popular accessory in the domestic market, following the development of more practical and less expensive models.<sup>12</sup>

Once the principles of a thermal camera's technical operation have been established, a fundamental question arises – what image status can we assign to thermography?

## ON THERMOGRAPHY'S REFERENTIALITY

Since thermal cameras record thermal information, thermal imaging is a process no longer belongs to the domain of optics, the branch of electromagnetism that describes the behaviour and properties of light; according to Carolyn Kane, it belongs to a domain ruled by information systems and algorithms.<sup>13</sup> Moreover, it is not a process based on ocular vision, but on what Lev Manovich has described as a process of data visualisation.<sup>14</sup> Therefore, as Ruggero Eugeni suggests, we can consider thermography as a particular IR image that is no longer part of the modern economy of light, although it fully belongs to the contemporary economy of visibility: a computational image that updates the acquisitions matured on the EM fluxes of the early nineteenth century with the current digital datafication processes.<sup>15</sup>

A relevant consequence of this definition concerns the thermography's referentiality. Given the recurrence we have experienced in this pandemic, let us take the human body as an exemplar case to understand how thermography visually presents its referent [Fig. 2].

This *thermal selfie*<sup>16</sup> demonstrates that in thermography the body is configured



Fig. 2  
A *thermal selfie* shot with  
an iPhone SE and a FLIR  
ONE PRO

as an aggregation of pixels that takes the form of a halo with an irregular profile, chromatically returning the thermal radiation of its referent. The halo visually presents this radiation behaving as an index of the body that was necessarily in front of the camera at the moment of detection, maintaining thermography a connection of *physical continuity* with it.<sup>17</sup> It is precisely this continuity that allows us to capture bodily heat. Invisible energy whose effects we can only observe with the naked eye through some other natural indexical signs (like sweat or skin reddening); but which can also be quantified and visualised thanks to a technologically determined process. A process in which colours act for arbitrary reasons (cultural, symbolic, ideological) as 'a system of control used to manage and discipline perception and thus reality'.<sup>18</sup>

Although thermography's indexicality persists, its referentiality seems compromised regarding referent's recognisability and identifiability. In general,

NVDs make it possible to identify the framed object. Since what allows visibility is still natural or artificial light, an IR night image can show at least the main features of monitored bodies and faces, even if tinged with the spectral green typical of night vision. On the other hand, in thermography, the body is only recognisable as a silhouette that displays the outcome of converting thermal data into pixels, returning a shape vaguely compatible with the human one. Nevertheless, it is difficult, often impossible, to identify a body in its singularity – the case of the artistic project *Virus*, realised by the French photographer Antoine d'Agata in the spring of 2020 and analysed in the following parts of this essay, offers a decisive testimony to this referential anonymity.

Of course, an optical camera is often embedded in a thermal imager. Therefore, the thermography can result in an imbrication between optical and algorithmic logic: as with the FLIR MSX, a system that adds visible light details in real-time for better clarity by incorporating edge and contour details into the thermal visualisation.<sup>19</sup> In addition, there are ongoing experiments in the field of thermal facial recognition: not based on the similarity of exterior features, but on the recognition of the structure of blood vessels, vascular networks and facial tissue, which can be used as unique biometric features.<sup>20</sup> However, the point is that the framed subject can lose its outward recognisability with thermography.

This visual condition is perfectly recalled in *Predator* (John McTiernan, 1987), the first mainstream film to integrate thermography into the diegetic dimension. Especially when the alien creature scans the landscape from the trees, detecting human bodies only as heat sources, and recognising *what*, not *who*, is in front of it. Alternatively, it is highlighted in the more recent *There Will Be No More Night* (*Il n'y aura plus de nuit*, Éléonore Weber, 2020). A military found footage film in which the author's voice-over, describing thermal imaging's adoption during some recent war operations, remarks how 'the thermal camera cannot distinguish between a farmer holding a rake or a soldier armed with a Kalashnikov'.

The same visual condition is even more surprising in processes of thermal self-visualisation. As in *Songbird* (Adam Mason, 2020), a movie set in a dystopian future in which the Covid-19 (now Covid-23) pandemic has taken over, and the US government asks citizens to monitor themselves daily for precautionary purposes. The device dedicated to this task is a smartphone that detects body heat and issues an immediate alert to the authorities if the recorded data is too high. The thermal camera integrated into this device does not show the features of the face but only the colour shade that displays the correspondent heat radiation [Fig. 3]. A reminder of how self-visualisation in thermal imaging means missing out on self-recognition, but also making everyone immediately distinguishable from the dominant thermopower.

Following this last example, we can conclude that the recent Covid-19 pandemic, constantly exposing us to the action of thermal imaging cameras, has consolidated a twofold awareness of the relationship between the human body and thermography. On the one hand, precisely because of the difficulty of identifying the referent to which it is nevertheless linked, thermography finally

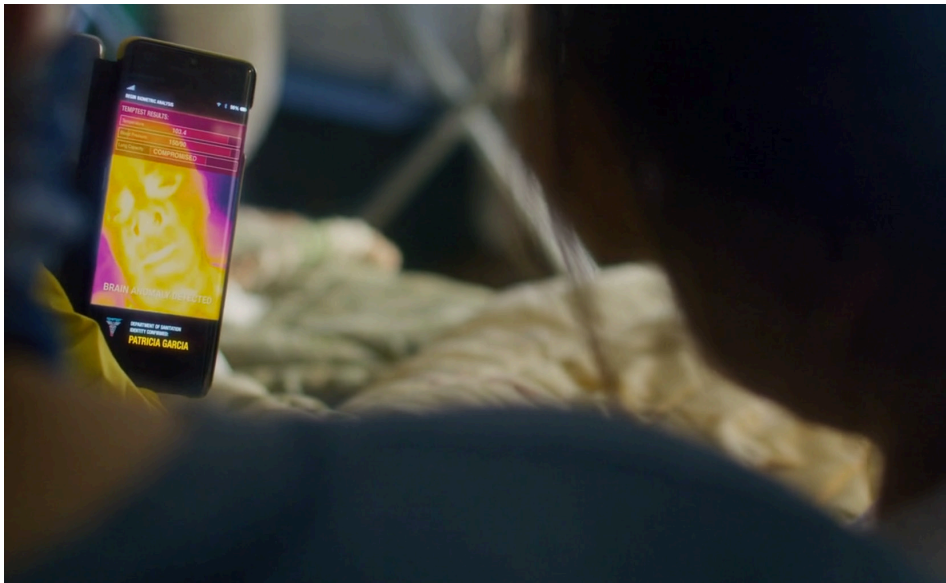


Fig. 3  
Songbird (Adam Mason,  
2020)

seems able to provide a neutral, impartial, unbiased human image: an image operating beyond appearance, gender, ethnicity and skin colour, displaying the warmth of a body regardless of its physical appearance. On the other hand, though the thermal image promises a more *objective* visualisation, 'it naturalizes a sense of certain bodies as mere heat and amplifies and sexualizes forms of power'.<sup>21</sup>

Consequently, also thermal imaging ends up renewing political and social struggles with new power dynamics, dividing those who can access resources and manage information from those who are subjugated, overwhelmed, or relegated to the mere position of a detected object. In the well-known transition from the *disciplinary society* described by Michel Foucault (based on the importance of vision and central monitoring) to the *society of control* profled by Gilles Deleuze (where computer machines are entrusted rather with the task of tracking, capturing and scanning a target), it is decisive to grasp the 'fundamental alteration from the use of vision and optics to the use of information systems and algorithms to control and manage bodies and behaviour'.<sup>22</sup> Bodies that can be detected, quantified, controlled, related to normativity criteria established on a thermal basis, and then subjected to thermopower as a form of new biopolitical management.

## THE WARMTH OF BASIC FORM-OF-LIFE

Although the field of applications of thermal images is wide and mainly pertains to the military and surveillance sector, thermal imaging has seen a rising interest in the contemporary artistic scene in the past few years. Increasingly, more photographers and video artists employ this new technology. On the one hand for criticizing and deconstructing it, on the other hand for relaunching its use in a biopolitical horizon. One above all: the French photographer Antoine d'Agata.

In particular, we will bring *Virus*<sup>23</sup> (2020) into focus, a project developed during the confinement following the outbreak of the Covid-19 pandemic.

Human bodies no longer just reflect light, but produce heat. As mentioned before, they emit EM waves: invisible radiation collected by thermal imager and converted into visible images. It is not the first time that the photographer utilizes a thermal camera for his work. Already in 2017, he chose this device for *Figures of Worship*,<sup>24</sup> a Magnum Live Lab project, in which people of different faith are portrayed practicing their respective religions. Catholic mass at Notre-Dame Cathedral; a group of Muslims who go to the mosque of Argenteuil; people praying in the Montparnasse cemetery. A documentation of rites and religious practices which coexist on French territory, three years after the terrorist attack on the Bataclan music venue in Paris by fanatics: images which display only bodies, stripped of any cultural and political specificity, solely captured as the essence of being living persons. Traces of IR thermal radiation — which would otherwise be impossible to identify without the help of captions — who gather in similar ways, regardless of their religious leanings. The photographer was fascinated by this process of visualising heat data, which reduces human subjects to essential figures, devoid of any other characteristics such as gender, skin colour or specific identities. As he remarked: 'The thermal image freezes forms, postures, figures, poses, zones imperceptible to the naked eye'.<sup>25</sup>

D'Agata deliberately chose again this sophisticated device for *Virus* to represent the resistance of human beings during the pandemic crisis: an emergency in which it was possible to introduce practices of surveillance and discipline over people's bodies, to recall the very origin of this technology. 'It is in this ambivalence between solidarity and contamination, this inevitability of social and physiological death, that I tried to apprehend, traversing a language of senses and of resistance that transfigures the body',<sup>26</sup> he declared.

The first national lockdown ordered by the Government on March 17, 2020 — and ended nearly two months later — has transformed the French capital into a ghostly city. A strong sense of responsibility guided him at that time, the same need to create a political and aware reaction to the situation, which convinced one of his friend Mathilde Girard, philosopher and writer, to keep a daily written record from the beginning of the confinement. She gets in touch with d'Agata early on — both findings themselves alone in Paris. The two started some correspondence: he of images, she of fragments from which a common vision emerged. Traces of the frenzy of speeches and health rules of those days: the physical separation, the forced isolation, the effects of limits in social interactions. Everything was documented in an exchange of texts and images.

Throughout this period d'Agata roamed the deserted streets of the city at night, holding a thermal camera to record various invisible IR rays emitted by the few isolated human beings he met, wandering among the walls of ghostly buildings. Reds, yellows and flashes of dark blue: a variety of cold and warm hues which, according to their thermal zones, reveal the outlines of public spaces, benches, trees and buildings. Among these architectures rare human figures, nothing more than hot coloured silhouettes, stand alone in the streets



of Paris, transformed by the confinement into a disturbing theatre of rambling bodies. With a huge amount of thermal images collected during this period (he believes he may have taken almost 13,000 in total), d'Agata wanted to capture the hallucinatory desolation in which the city, and its suburbs — like most of Europe — suddenly found itself during the lockdown.

After the first days of confinement spent tracking the heat stored both in human

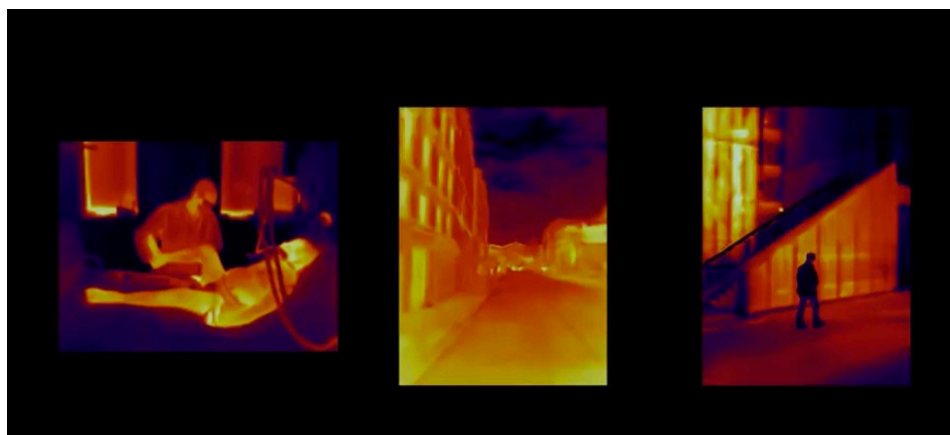


Fig. 4  
Antoine d'Agata, extract  
video from *La vie nue*,  
Opéra National de Paris,  
France, 2020

bodies and in buildings to make sense of the current crisis, d'Agata widened his research to the situation in the intensive care units of medical centres in Paris, Bordeaux, Marseille and Nancy [Fig. 4]. Nonetheless, the images of the hospital and those on the street are the opposite: there an empty city, here overcrowded hospitals; there the new rules of physical distancing, here the action of the caregivers who touch the bodies of the patients: care, comfort and gestures full of humanity. As many of us realized: 'People are doing much more than they are paid to do. In the hospital I saw people dying and nurses who were helping people do that with dignity, holding them in their arms'.<sup>27</sup> The thermal images here capture the deep empathetic and carnal dimension of bodies that touch and are touched: the human warmth linked to *caring* made up of gestures of closeness, of attention — while we are asked to avoid any kind of everyday interaction. In one of the few articles dedicated to his work,<sup>28</sup> Alice Leroy underlines how this traditional tracking system is used by d'Agata in a deliberately improper way. Here, in fact, by detecting heat waves emitted by bodies, he did not try to locate and identify people, but, on the contrary, he wanted to protect their identity, without forgoing to document such a tragic moment. Continuing the suggestion of Judith Butler to exhibit 'images that convey the full horror and reality of the suffering' — remind Leroy — the French photographer took images of vulnerable patients along with the 'gentle sensuality of a gesture of attention to others'<sup>29</sup> performed by the healthcare staff.

But exactly what does it mean to touch? Mark Paterson recalls that in *De Anima*: Aristotle in his theory of sensation relegates it to the last place in the hierarchy of sense faculties due to its different nature. For each sense there is a distinct organ and a physical medium which performs a specific function.

For tactility, instead, there is neither a single organ to which it corresponds, nor a medium: it is our own flesh that acts as a medium, and not something external – unlike air for hearing or diaphanous for vision. Touching therefore always means being touched. In physical contact, while we perceive an object which is external to us, we also touch our receptiveness at the same time. This may help explain why Aristotle defined tactility 'not only as indispensable, but as prior to the other sensory modalities'.<sup>30</sup> Being in contact with another body means to have, at the same time, an experience of ourselves: the consciousness of our physicality, of our being in the world. Through touch there is therefore an exchange of feeling among human bodies. In short, capturing body heat, these images catching the essence of another heat: that of affectivity, a fundamental dimension for human life.

Both situations were connected by a common thread. The political and health crisis linked to the pandemic gave d'Agata the opportunity 'to craft this idea of "bare life" both on the streets and in the hospitals into shape'.<sup>31</sup> That dimension of bare life debated by Giorgio Agamben in *Homo Sacer*,<sup>32</sup> continuing the analysis which Michel Foucault interrupted, such as the practical modes with which power operates on the bodies of human beings transforming them into



Fig. 5  
Antoine d'Agata,  
*Bagatelle Hospital during  
Covid-19 Outbreak*,  
Bordeaux, France, 2020

submissive bodies. Agamben asserts that on the threshold of the modern era something changed dramatically. The space of bare life — that is biological life with its needs — once situated on the margins, progressively becomes what is at stake in the modern age: the new political subject. That bare life, which can be killed and yet not sacrificed of the *homo sacer*, a paradox once distinctive of this figure of archaic Roman law, with modernity it has become operative in the status of every living being, so much so that the (biopolitical) power system exerts control over the bare life of all individuals. A risk with which d'Agata is very concerned, since he clearly stated: 'The consequences of this are probably worse than the virus itself: the way in which the war against the disease is being used to strengthen control, both political and economic'.<sup>33</sup> This reference to the Italian philosopher is so evident that d'Agata called his last short film, based on *Virus* project, *La vie nue* [Fig. 5]. In this three-screens projection of thermal images flow at different paces, following a mechanic rhythmic dimension which tries to echo 'the mechanism in which the society has been caught'<sup>34</sup> — as d'Agata explains in a video interview granted to the Paris Opera.<sup>35</sup>

## HEATMAPS OF MIGRANTS

Deeply inspired by Giorgio Agamben, we can't here skip to mention the photo series of *Heat Maps* (2016) and the three-channel HD video, *Incoming*,<sup>36</sup> both part of a long-term project developed by the Irish photographer Richard Mosse. From 2014 to 2017 he depicted the experience of migrants in camps, and the urgent refugee crisis, recording only the contours of relative heat difference, with a thermal sensitive, military grade surveillance camera. For these projects he adopted a heavy, technologically advanced device, which mounts a lens made by germanium, a chemical element transparent to infrared radiation. This long-range thermal camera — designed to capture LWIR region and to visualise it in shade of greys — is connected to a cadmium telluride sensor refrigerated to minus 323 degrees centigrade and controlled by a computer. This type of thermal imager is commonly used by the army and navy for border surveillance and law enforcement since it can detect a human body at thirty kilometres. It is not surprising that exporting thermal imaging systems, and IR cameras, may be regulated by the United States Government's thermal camera export restrictions and may fall under International Traffic in Arms Regulations (ITAR).<sup>37</sup> Mosse explained the reason why he used a surveillance technology striving to work it against itself, avoiding '[...] to rescue this apparatus from its sinister purpose. Rather, we were trying to enter into its logic — the logic of proprietary government authorities — to foreground this technology of discipline and regulation, and to create a work of art that reveals it'.<sup>38</sup>

Valeria Cammarata dealt with this work in an essay<sup>39</sup> dedicated to the comparison of this series of images with the work *Recits d'Ellis Island*, by Georges Perec and Robert Bober united by the same indirect way of reflecting on the Shoah, looking at the phenomenon of migration. When refugees

move away from their Nation, in fact, they break 'the intimate and necessary connection'<sup>40</sup> between man and citizen and consequently they lose every human rights. As Giorgio Agamben explains: 'In the system of the nation-state, the so-called sacred and inalienable rights of man show themselves to lack every protection and reality at the moment in which they can no longer take the form of rights belonging to citizens of a state'.<sup>41</sup> They therefore find themselves in the same condition as those deported to concentration camps: a bare life, that is, the life of sacred man, stripped of all civil and human rights and exposed to sovereign violence. Thermal cameras visualised images which represent bare life,<sup>42</sup> since they cancel any kind of difference between bodies, levelling all. Their phantasmatic and sinister presence, moreover, perfectly reflects Agamben's concerns about a tendency towards totalitarianism regarding the contemporary political space.<sup>43</sup>

## VISUALISING IMMUNIZATION REACTIONS

Linda Alterwitz, a multi-media artist with wide-ranging interests in the fields of medical research and the natural environment, is the last case we would like to briefly mention here. She soon started using thermal images — as she states on her website — exactly in 2013, 'as a mean of envisioning the connections between science, technology, our environment and contemporary culture'. Employing a high-resolution thermal camera, she reconfigures its original meaning of this device by showing the otherwise not visible energy which vitalised animals and men alike: temperature is a universal feature that connects all matter, living and non-living beings. 'From having a fever in one's body to the effects of global warming, temperature pervades our lives'.<sup>44</sup> As it is particularly clear in *Signatures of Heat*, a sextet of thermal images in grey scale which reveals the unseen rhythms of the human body and its relation to the surrounding natural habitat of which it is part.

*Injection Site: Making the Vaccine Visible*,<sup>45</sup> one of her latest works started in 2021 and still on, is particularly suited to emphasizing the relationship between thermographies and the medical front. It consists of a collection of images which shows people's arm from fifteen minutes to four weeks after receiving the Covid-19 vaccine. What you see are several darker spots on the participants' skin around the injection area, a sign of a concentration of heat, an inflammation provoked by the immunological individual response [Fig. 6]. Each person's reaction is different: some images present vast black marks, while others reveal minimal visual heat: 'Through this series of work, I offer an opportunity to participate in conversation about an ongoing topic that continues to create human division' — the artist declares to explain the inner reason of this new work.<sup>46</sup> In fact, the vaccine can cause opposite reactions, not only physical, but also psychological: on the one hand fear or concern for possible side effects that are still little known, on the other a feeling of protection against any possible severe evolutions of the disease.

## CONCLUSIONS



Fig. 6  
Linda Alterwitz, panel of  
*Injection Site: Making the  
Vaccine Visible* (2021),  
at the artist's studio,  
Las Vegas, Nevada

The recent Covid-19 pandemic highlighted the significant role of thermal imaging in monitoring the body for diagnostic purposes. However, it also established new individual conducts and unprecedented social behaviours that bodies had to adhere to, in line with the thermopower in force during the emergency. In addition, the pandemic emphasised how thermography makes it possible to visualise information that the human eye could not perceive, but beyond its presumed objectivity, it shows the body just as an anonymous referent, hardly recognisable in its individuality. The anonymity that Antoine d'Agata interrogated with the project *Virus* — in which he set out on the trail of some human heat in the spring of 2020 — has been deliberately used against this advanced technology, which is mainly employed for control purposes. Here, in fact, by protecting people's identity thanks to lack of details of the thermographies, he was able to report the gravity of such a historical moment, catching just the shapes of human bodies reduced to the most basic form-of-life.

# Notes

<sup>1</sup> Lorenzo Donghi is the author of the first three sections; Simona Pezzano is the author of the other three. The short conclusions were written jointly.

<sup>2</sup> Nicole Starosielski, *Media Hot & Cold* (Durham, London: Duke University Press, 2021), 7.

<sup>3</sup> Angela Maiello, 'Viralità post-mediata. Quando il medium (del virus) siamo noi', in *Virale. Il presente al tempo della pandemia*, ed. by Roberto De Gaetano and Angela Maiello (Cosenza: Pellegrini, 2020), 149–153.

<sup>4</sup> *The Thermal Human Body*, ed. by Kurt Ammer and Francis Ring (New York: Jenny Stanford Publishing, 2019). The authors point out that, in our globalised and interconnected world, body overheating was a danger before the Covid-19 pandemic: 'In recent years following pandemic fever outbreaks, e.g. severe acute respiratory syndrome (SARS) and avian flu, the need for fever screening in international travel led to the employment of thermal imaging. The International Organization for Standardization was required to address the issue of minimum standards needed to detect the presence of fever', 5.

<sup>5</sup> Ekaterina Koroteeva and Anastasia Shagiyanova, 'Infrared-based visualization of exhalation flows while wearing protective face masks', *Physics of Fluids*, 34 (2022) <<https://doi.org/10.1063/5.0076230>> [accessed 2 May 2022]

<sup>6</sup> Image from Michael Vollmer and Klaus-Peter Möllmann, *Infrared Thermal Imaging: Fundamentals, Research and Applications* (Weinheim: Wiley-VCH, 2018), 2nd ed., 10.

<sup>7</sup> Federico Pierotti and Alessandra Ronetti, 'Beyond human vision: Towards an archaeology of infrared images', *NECSUS* (Spring 2018) <<https://necsus-ejms.org/beyond-human-vision-towards-an-archaeology-of-infrared-images/>> [accessed 2 May 2022].

<sup>8</sup> 'Heat [...] and light are both parts of the electromagnetic spectrum, but a camera that can detect visible light won't see thermal energy, and vice versa', FLIR website, *What's The Difference between Thermal Imaging and Night Vision?* <<https://www.flir.com/discover/ots/thermal-vs-night-vision/>> [accessed 2 May 2022]. See also Vollmer and Möllmann, 1–10 and Richards A. Austin, *Alien Vision: Exploring the Electromagnetic Spectrum with Imaging Technology* (Bellingham: SPIE Press, 2nd ed., 2011), 41–65.

<sup>9</sup> Elena Beregow, 'Thermal Objects: Theorizing Temperatures and the Social', *Culture Machine*, 17 (2019), 2, <<https://culturemachine.net/vol-17-thermal-objects/>> [accessed 2 May 2022].

<sup>10</sup> *Can Thermal Imaging See Through Walls? And Other Common Questions*, FLIR website, 4 October 2019, <<https://www.flir.com/discover/cores-components/can-thermal-imaging-see-through-walls/#:~:text=Can%20thermal%20imaging%20see%20through%20glass%3F,reflection%20of%20yourself%20in%20thermal>> [accessed 2 May 2022].

<sup>11</sup> <<https://www.flir.com/>> [accessed 2 May 2022].

<sup>12</sup> See footnote 16.

<sup>13</sup> Carolyn Kane, 'Digital Infrared as Algorithmic Lifeworld', in *Chromatic Algorithms: Synthetic Color, Computer Art, and Aesthetics after Code*, (Chicago: The University of Chicago Press, 2014), 211–240..

<sup>14</sup> Lev Manovich, 'What Is Visualisation?', *Visual Studies*, 26 (2011), 36–49.

<sup>15</sup> Ruggero Eugeni, *Capitale algoritmico. Cinque dispositivi postmediali (più uno)* (Brescia: Morcelliana, 2021). See also Sean Cubitt, *The Practice of Light. A Genealogy of Visual Technologies from Prints to Pixels* (Cambridge, London: MIT Press, 2014).

<sup>16</sup> We realized this selfie with an iPhone SE and a FLIR ONE PRO: it is not a thermal camera but a smartphone mobile accessory that can measure temperatures between -20 °C and +400 °C, with a spectral band of 8.000-14.000 nm. The device has a relatively low thermal resolution (160 × 120); however, it is provided with an optical camera with 1440 × 1080 resolution (parallax errors in the alignment of the two cameras are pretty inevitable). This thermal image was taken excluding the optical camera and using a colour palette named *lava*, which maintains the classic blue-cold and red-hot association.

<sup>17</sup> Barbara Grespi, 'L'evidenza dell'immagine. Postfotografia e idea documentaria', in *Dalla parte delle immagini. Temi di cultura visuale*, ed. by Barbara Grespi and Luca Malvasi (Milano: McGraw-Hill, 2022), 100.

<sup>18</sup> Kane, 201.

<sup>19</sup> Unlike image fusing, that is the merging of a visible light and thermal image, MSX (Multi-Spectral Dynamic Imaging) does not dilute the thermal image or decrease thermal transparency, <<https://www.flir.it/discover/professional-tools/what-is-msx/>> [accessed 2 May 2022].

- <sup>20</sup> Vincent A. Weidlich, 'Thermal Infrared Face Recognition', *Cureus*, 6.13 (2021), <<https://www.cureus.com/articles/51064-thermal-infrared-face-recognition>> [accessed 2 May 2022].
- <sup>21</sup> Starosielski, 170
- <sup>22</sup> Kane, 213.
- <sup>23</sup> See the catalogue published after the project: Antoine d'Agata, *Virus*, photographies: Antoine d'Agata; Texts: Mehdi Belhaj Kacem, Mathilde Girard, Philippe Azoury, Léa Bismuth, Juan Branco, Yannick Haenel, Frédéric Neyrat, ([n.p.]: Studio Vortex, 2020).
- <sup>24</sup> Antoine d'Agata, *Figures of Worship*, see: <<https://www.magnumphotos.com/arts-culture/antoine-d-agata-worship/>> [accessed 21 May 2022].
- <sup>25</sup> From a statement written by Antoine d'Agata for presenting his work *Virus* see:<<https://studio-vortex.com/product/virus/?lang=en>> [accessed 1 May 2022].
- <sup>26</sup> <<https://studio-vortex.com/product/virus/?lang=en>> [accessed 1 May 2022].
- <sup>27</sup> *I'm starting to Feel the Pain*, a conversation between Sophie Wright — Former Global Cultural Director of Magnum Photos, now photographer and art consultant — and Antoine d'Agata about his project *Virus*, available on Magnum Photos website,<<https://www.magnumphotos.com/newsroom/im-starting-to-feel-the-pain-antoine-agata-covid-19-coronavirus/>> [accessed 30 April 2022].
- <sup>28</sup> It is quite surprising that d'Agata work — so dense and explicit in political, philosophical and theoretical themes — has hardly been taken into consideration by scholars who deal with visual studies.
- <sup>29</sup> Alice Leroy, 'The Fever of Images: Thermography, Sensuality and Care in Pandemic Times' in *Pandemic Media*, ed. by Philipp Dominik Keidl and others (Lüneburg: Meson Press, 2020), 91–98 (96).
- <sup>30</sup> Mark Paterson, *The Senses of Touch: Haptics, Affects and Technologies* (Oxford: Berg, 2007), 17.
- <sup>31</sup> The Paris Opera, shut down by the governmental decision taken after the pandemic, decided to highlight the work of those artists who documented the ongoing crisis and how the pandemic impacted on the society. See the interview *La vie nue, Entretien avec Antoine d'Agata*, online video recording, YouTube, 18 January 2021, <<https://www.youtube.com/watch?v=2tWg7CN8Mmw>> [accessed 27 April 2022].
- <sup>32</sup> Agamben, *Homo Sacer*.
- <sup>33</sup> *I'm starting to Feel the Pain*.
- <sup>34</sup> Exhibition at Tbilisi Photography & Multimedia Museum on 11 March 2020, <<https://tpmm.ge/en/exhibitions/bare-life-by-antoine-dagata-magnum-photos->> [accessed 28 April 2022]. It is also the title of a short movie by Antoine d'Agata *The bare life* (*La vie nue*, 2020) available on YouTube, <<https://www.youtube.com/watch?v=aexsJAeHlGM&t=19s>> [accessed 30 April 2022].
- <sup>35</sup> *Le vie nue, Entretien avec Antoine d'Agata*.
- <sup>36</sup> Richard Mosse, *Incoming*, three screen HD video installation (52'10"), with 7.1 surround sound (2014–2017).
- <sup>37</sup> FLIR System, known for being one of the leading companies in producing this technology, was accused of violations for selling overseas UFPA uncooled focal plane array 'while seeking and obtaining an official classification', as you can read in the first paragraph of *Order Relating to FLIR System, Inc.*, <<https://efoia.bis.doc.gov/index.php/documents/export-violations/export-violations-2021/1303-e2656/file>> [accessed 23 April 2022].
- <sup>38</sup> Niall Martin, 'As "index and metaphor": Migration and the Thermal Imaginary in Richard Mosse's *Incoming*', *Culture Machine*, 17 (2019).
- <sup>39</sup> Valeria Cammarata, 'Fantasmi e trasmigrazioni. Le memorie degli altri in Georges Perec e Richard Mosse', in *Tempo e Shoah. Politiche dell'oblio e forme testimoniali*, ed. by Matteo Di Figlia and Daniela Tononi, (Palermo: Palermo University Press, 2020), 113–130.
- <sup>40</sup> Agamben, *Homo Sacer*, 75.
- <sup>41</sup> *Ibidem*.
- <sup>42</sup> See the book of stills from *Incoming* project (which contains an Agamben's essay), Richard Mosse and Giorgio Agamben, *Incoming* (London: Mack, 2017).
- <sup>43</sup> 'The camp, which is now securely lodged within the city's interior, is the new biopolitical *nomos* of the planet'. Agamben, *Homo Sacer*, 99.
- <sup>44</sup> This quote and the previous one are taken from the project page *Signature of Heat* (2012- ) in Linda Alterwitz personal website, <<https://lindaalterwitz.com/project/signatures-of-heat/>> [accessed 24 April 2022].
- <sup>45</sup> For this other project see: <https://lindaalterwitz.com/project/injection-site-humanizing-the-vaccination->

[process-2021/](#) [accessed 30 April 2022].

<sup>46</sup> Linda Alterwitz personal website, <<https://lindaalterwitz.com/project/injection-site-humanizing-the-vaccination-process-2021/>> [accessed 30 April 2022].