Techno-bio-politics. On Interfacing Life with and Through Technology

Benjamin Lipp · Sabine Maasen

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Abstract Technology takes an unprecedented position in contemporary society. In particular, it has become part and parcel of governmental attempts to manufacture life in new ways. Such ideas concerning the (self-)governance of life organize around the same contention: that technology and life are, in fact, highly interconnectable. This is surprising because if one enters the sites of techno-scientific experimentation, those visions turn out to be much frailer and by no means “in place” yet. Rather, they afford or enforce constant interfacing work, a particular mode of manufacturing life, rendering disparate, sturdy, and often surprisingly incompatible things available for one another. Here, we contend that both of those aspects, pervasive rationalities of interconnectability and practices of interfacing mark the cornerstones of what we call a new(ly articulated) techno-bio-politics of life. In order to grasp the government of life under the technological condition, we must understand how both human and non-human entities are being rendered interconnectable and re-worked through practices of interfacing. We take neuro-technology and care robotics as two illustrative cases. Our analysis shows that the contemporary government of life is not primarily concerned with life itself in its biological re-constitution but rather with life as it is interfaced with and through technology.

Keywords Techno-politics · Life · Bio-politics · Interfacing · Foucault · Governance · Neuro-technology · Care robotics

Politics Beyond “Life Itself”

Technology takes an unprecedented position in the government of contemporary life. In recent decades, especially information and communication technologies have manufactured and re-configured the technosocial fabric of how we live. In doing so, they continue to inspire fears and hopes about what will come next. On the one hand, such technologies have been carried by a techno-centric view. From this perspective, everything can, in principle, be manufactured and re-engineered in technological terms: human labor, intimate thoughts, or emotions. On the other hand, this has provoked longstanding debates about human nature and the limits of technology. Taken together, such discourses organize around questions like: Will the advent of intelligent machines bring about a jobless future [1]? Will humanoid robots strip...
us from our humanity [2]? Or, will ever more intimate brain-computer interfaces engender a new type of human, a neuro-technologically upgraded Übermensch [3, 4]? In this article, we offer a different perspective that seeks to go beyond such alternatives. Their variety notwithstanding, we argue that such discourses, both apologetic and critical, seem to share the assumption that the ubiquitous interconnection of life and technology is either imminent or already happening.

This is surprising because if one enters the sites of techno-scientific production and experimentation, those visions turn out to be rather frail and by no means “in place” yet. Care robots are a good example here. Contemporary political and scientific discourses are full of imaginaries of humanoid robots roaming around homes and care facilities caring for older people or working hand in hand with their human caregivers. However, if one seeks out the sites where these machines are manufactured and experimented with, these imaginaries break down quickly. Robots fail or have a hard time to manage even the easiest of tasks like picking up a bottle or navigating under changing lighting conditions [5]. Instead of autonomous beings, robots turn out to be in need of care themselves. Roboticists, users, and others need to invest considerable effort in rendering the milieu, where robots are supposed to operate, “robot-friendly” [6]. Similarly, new types of neuro-technology require to intimately interface the “techno-cerebral subject” [7] with various brain devices within different socio-technical milieus. More or less invasive, such neuro-technologies modulate bodily experiences of self, agency, and pain [8] while at the same time affording particularly “broadened” institutional arrangements of clinical surveillance [9]. These interfacing processes are constantly afflicted by noise, interferences, and withdrawals on the part of those entities that are often portrayed as readily available for interconnection: brains, bodies, selves. Again, neuro-technical devices, too, turn out to be in need of ongoing care and maintenance. The aforementioned visions of techno-social interconnectability are not simply “in place” but rather afford or enforce constant interfacing work rendering disparate, sturdy, and often surprisingly incompatible things available for one another.

Two observations are striking here: the ubiquitous rationalities of interconnectability as well as the corresponding projects of interfacing which pervade contemporary political life. They mark the cornerstones of what we call a techno-bio-politics of life. With this conceptual contribution, we focus our analytical attention on the government of life under the technological condition [10] and within a society that “takes technical change to be the model for political invention” [11]. This diagnosis is not entirely new, since technology has always played a pivotal role in societal reproduction and governance [12]. However, it is newly articulated through increased levels of manufacturing and interfacing life in recent decades. The notion of techno-bio-politics should hence not be understood as signifying an entirely new era. Rather, it denotes an analytical tool to register and amplify certain aspects of the contemporary government of life. Here, we contend that we must go beyond conceptualizing life only in terms of its biological and decidedly bio-political production [13, 14] and extend our focus towards understanding how both human and non-human entities are being rendered interconnectable and re-worked through practices of interfacing. Hence, we argue that more recent technological phenomena such as social robotics or neuro-technology are not primarily concerned with the government of “life itself” [15]. Rather, we focus our attention on life as it interfaces with and through technology. For this, we need a newly calibrated analytical framework of techno-bio-politics which specifically enquires into claims of interconnectability and expands the analysis towards life as it is lived with and through technology. Hence, we take a step back and wonder what makes it so plausible nowadays to think of those utterly heterogeneous elements as interconnectable in the first place and why the actual, manifold, and ongoing practices of interfacing mostly remain invisible, or misrecognized [16–18].

We start off with spelling out the shortcomings of purely bio-political approaches under a technological condition (2), which require a conceptual update to be able to register contemporary forms of government beyond bio-politics. This brings a techno-bio-politics into view as it interfaces life with and through technology (3). We propose conceptual tools to capture this newly articulated political positivity along the lines of rationalities of interconnectability and practices of interfacing (4). Based on this framework, we will analyze two illustrative cases, neuro-technology (5) and care robotics (6) as representing two domains, in which we see a techno-bio-politics at
work. In both cases, we observe a broadening of biopolitical governance with and through technology. Finally, we will draw some conclusions from these cases regarding the contours of the government of life under a technological condition (7).

Bio-politics: Governing Life Itself—and Beyond

How is society governed today? Studies of governmentality have hitherto answered this question by pointing to the profound transformations of political life in Europe and the West since the beginning of the eighteenth century: the “birth of bio-politics” [13]. However, a number of authors have uttered discontent with this notion not fully capturing the contemporary condition of society and its government. Hence, in the following, we will spell out the contours of bio-politics as a framework to analyze the government of “life itself” and confront it with some criticisms in the process relevant for developing an analytical framework of techno-bio-politics.

For Foucault, the eighteenth century marked a break in how governing society operates and the beginning of a “bio-politicization of life” [19]. Central to this was the “invention” of the population as a target for statistical measurement and political intervention. The population was not conceived of anymore as a “collection of subjects of right” [20] susceptible to the juridical-political power of the sovereign but as an entity governed by laws of nature. This afforded a new way of governing

... in that the naturalness identified in the fact of population is constantly accessible to agents and techniques of transformation, on condition that these agents and techniques are at once enlightened, reflected, analytical, calculated, and calculating [20].

A population cannot simply be ordered to be healthier or more fertile. Instead, it affords rationalized scientific methods and procedures to understand and regulate it according to its “natural” logic, “the biological or biosociological processes characteristic of human masses” [13]. This kind of biopower also operated on the individual level through bodily discipline and physical enclosure within a plethora of newly established disciplinary institutions. Modelled on Jeremy Bentham’s Panopticon, the clinic [21], the asylum [22], or the almshouse [23] served as milieus to subjugate and dress the individual according to disciplinary norms [24]. Overall, the primary target value of biopower has been to optimize life through regulatory control, “to foster … or disallow it” [25]. Its horizon was life in biological or medical terms, i.e., a population’s sexuality, health or racial purity, which was continuously invested in projects of both production and destruction. Hence, bio-politics has configured the question of how to govern in terms of securing life and its prosperity by defending it from internal perturbations, sexual perversion, inactivity due to old age or racial commingling [13].

Since Foucault has coined the term bio-politics for critical enquiry into the modes of governing society, a range of scholars have criticized and added to this line of thinking [19, 26]. Particularly relevant for our focus on government in a society suffused by technologies and constantly challenged by techno-scientific innovations are three lines of criticism. Studies on bio-politics tend to (a) separate between productive discourse and passive matter, (b) focus mostly on “life itself” as defined in biological terms, and, as a consequence of the former two points, (c) underestimate the immense importance of the technical sciences.

First, concepts of bio-politics still often rely on the separation between productive discourses and passive matter [27]. Even in studies where Foucault deals with the intersection of discourse and materiality, as in his study of the prison and forms of disciplinary punishment [24], materiality remains essentially passive. For instance, the body of the prisoner remains but a “surface” [28], into which power/knowledge inscribes itself and which does not have agency of its own. Lemke [29] has recently defended Foucault against this criticism arguing that while in practice Foucault indeed creates the impression of a dualism between matter and discourse, there are attempts, albeit peripheral ones, to analyze them more symmetrically. Here, he invokes the notion of the “government of things” [20] and, in particular, the notion of the milieu, which “defines an ‘intersection between a multiplicity of living individuals working and coexisting with each other in a set of material elements that act on them and on which they act in turn’” [29]. While we concur with Lemke’s argument that Foucault’s work offers potential avenues to overcome the primacy of discourse in his own work, an analytics of
techno-bio-politics aims to account much stronger for the role of especially technologized matters in the government of life.

Second, bio-political approaches put emphasis on “life itself” [15] in biological terms with human life as the central reference point. This focus has defined the scope of phenomena that usually fall under the bio-political lens, i.e., the realm of biology [30, 31]. This does not mean that these works do not consider the technological dimension of contemporary phenomena of bio-politics [see 26]. Rather, they have constricted the “technological” to interventions into biological life, i.e., the engineering of genetic code or the medicalization of the human body by way of pharmaceutical drugs. Here, Lindner [32] has put forward a convincing critique arguing that in the case of wearable and ostensibly other information technology, life is not so much configured in biological terms but rather in terms of life as it is lived. For one, he argues that sensor- and data-driven technologies like wearables interconnect with life on a different level than assumed in bio-political analyses. Wearables are continuously embedded in everyday routines and environments. In this, he sees an aretaic shift, “which relates to a way of life that aims for practical excellence and is pursued differently in different fields by building on behavior, bodily strength, and knowledge” [32]. This opens up a playing field beyond genes, molecules, and medical interventions. It focuses on people’s lived experience with technology, as we will later show in the case of neuro-technology and chronic pain. Furthermore, this aretaic shift results in an extended relationship between data, self, and the body. “What is predominantly understood as biopolitics, namely the government of bodies and populations, is now merging with self-care for body-behavior and the obligation to lead a normatively good life” [32]. Crucially, we would add that this continuous self-governance involves a range of non-human, technologized entities: not only wearable devices but also smartified environments, sociable robots, and cyborgian entities at the brain-computer interface.

Third, this has resulted in a partial neglect of the importance of the technical sciences in bio-political works. Phenomena such as wearables, information and communication technology, or robotics have only recently started to be considered pertinent in the government of life [5, 32]. Since these phenomena are seen as rendering the human less biological [15], their role in the government of life has not been appreciated the same way as recent advances in bio-technology. So, while bio-political scholarship has long argued over different dimensions of life [33, 34], the empirical scope of the technologies that manufacture it seems strangely narrow. This is partly due to the former two shortcomings. As Barad argues, Foucault and others have hitherto largely ignored the formation of the technical and natural sciences, such as physics or computer science [35]. While it may be true that this is merely a question of Foucault’s empirical interests and less a conceptual shortcoming in principle, it still begs the question of whether bio-political analyses of engineering or wearable information technology might nevertheless benefit from a techno-political update.

In line with these criticisms, we argue that the concept of bio-politics indeed restricts the analytical and empirical scope of contemporary phenomena of a government of life under the technological condition [10, 36]. Never before has life been so thoroughly technologized. It is true that human civilization has always been technological and thus techno-political to an extent [37] but the meaning of technology has effectively shifted from more or less distinct instruments and systems towards vast techno-ecologies, in which humans are only one component among many [38, 39]. For us, this elevated position of especially information and communication technology in late-modern society has culminated in a changed meaning of what it means to live and to manufacture life. Within such a context, the old naturalism and biocentrism of “life itself” is fading. Both the epistemological claim of the objective determinacy of life as a biological category and the political claims of biological essentialism can no longer be upheld [40]. Instead, we live in a society of “monsters” [41], a world of “hybrids” [42] and “cyborgs” [43]. Here, bio-political approaches underestimate non-human agency (first criticism), life as it is lived (second criticism), as well as the importance of the technical sciences in manufacturing life (third criticism). Governance under the technological condition is thus insufficiently captured by a framework that remains within the bounds of a bio-politics of life itself.
Governing Life Under the Technological Condition

Philosopher Erich Hörl has suggested that we live under a genuinely technological condition [10]. In his view, the proliferation of the computer and miniaturized sensors like RFID chips has come to expose(s) the originary technicity of sense, that constantly merges human and non-human actors, that operates before the difference between subject and object, that is endlessly prosthetic and supplementary, that is immanent rather than transcendental, and that is to an unheard-of degree distributed and indeed ecotechnological [10].

One prominent feature of this technological condition is a new primacy and urgency of “techno-scientific innovation” [44]. The technosciences are no longer restricted to observing and purifying nature “out there” but rather they intervene into and re-configure the world as a milieu for techno-social, natural-cultural, and techno-political interconnection, thus transgressing traditional dualisms between mind and body or humans and non-humans. However, these links do not mean that differences become empirically obsolete, i.e., that everything is hybrid. Rather, we can observe trends of simultaneous differentiation and de-differentiation, especially when it comes to the interfacing of human and machine [45]. As such, the technosciences seek to extract, expand, and exploit such connections, thus engaging in a new ontological project: technologically redesigning society. Key to their success is that they transgress diverse social spheres in which, and through which, countless mixtures of technologies, socialities, natures, politics, and selves unfold [42]. The project of techno-scientific world-making has therefore diffused into a project that might be called the “technoscientification of society” [46]. In this context, innovation becomes ubiquitous (embedded in all facets of our society), heterogeneous (affecting all kinds of artefacts, institutions, structures and processes), and reflexive (including anticipation, involvement, testing) [47]. Innovation is thus much more than just a mode of producing new artefacts. Rather, it is on the verge of becoming a dominant mode of societal reproduction.

This has motivated a number of scholars to go beyond bio-politics as the sole framework to account for contemporary forms of governance. For instance, Barry’s analysis of European governance focuses on “technological zones” [11] instead of national territories and populations. Such zones are concerned with fostering the circulation of technical skills, capacities, and knowledge among individuals, institutions, and states—and not primarily with their regulation or defense. Haraway, too, is concerned with the limits of bio-politics when she sketches out a “cyborg politics” [48], where “[t]he home, workplace, market, public arena, the body itself – all can be dispersed and interfaced in nearly infinite, polymorphous ways” [48]. She argues that bio-politics is merely a “flaccid premonition” of such an “informatics of domination” [48]. Finally, Deleuze argues that contemporary governmentality is characterized by (cybernetic) control rather than internment and enclosure. Societies of control strive to perpetually modulate everything within their reach and are enabled by and embodied in a particular machine, the computer [49].

With our notion of a techno-bio-politics of life, we argue that one can meet those overlapping discontents with the notion of bio-politics by registering and amplifying the technological condition under which government operates now and has done so for a while. With this, we aim to satisfy the conceptual shortcomings of bio-political analyses of (bio-)technology by way of extension not replacement. The notion of techno-bio-politics expands the analytical scope of traditional analyses of bio-politics towards the decidedly material-discursive practices of government, both on micro and macro levels. It extends the notion of life towards the manufacturing of life as it is lived, thus going beyond bio-centric notions of life itself. Finally, it extends the range of technological phenomena towards the technical sciences, thus acknowledging the importance of information and communication technology in the contemporary government of life. Again, this is not to replace the notion of bio-politics altogether but rather to investigate “a specific set of attitudes towards the political present which have acquired a particular contemporary intensity, salience and form” [11]. Our notion of techno-bio-politics will amplify this newly articulated relationship between politics, life, and technology.

The notion of techno-politics has been used before and these uses need to be partly distinguished from our project at hand [50]. Broadly speaking, we can distinguish two common meanings of techno-politics,
one of which is concerned with the re-configuration of the public sphere through digital technology. In this context, scholars reflect on new challenges and possibilities of the internet for intellectuals and activists [51]. Works in the same vein focus on how digital technology is used in political processes, thus becoming “techno-political” [52], or how novel enhancement technologies stir up new controversies around conceptions of citizenship, rights, and the polity essentially troubling longstanding conflictual lines “between technoconservatives and technoprogressives” [50]. The second meaning of techno-politics, although the term is not always used as such, could be circumscribed by Langdon Winner’s classical notion of “technological politics” [53]. With this, he describes how particular socio-technical arrangements can attain political qualities by either enabling or outright forcing certain political orders on human organization. Thus, techno-politics refers to the fact that technology is constitutively political in the sense that it always materializes particular political assumptions, motives, or effects. Another example would be Mitchell’s historical study of the role of techno-politics in ancient Egypt [37]. In this, he describes how plagues of mosquitoes and the management of the malaria disease had an intricate part to play in the constitution of the economic sphere at the time. Nimmo [54], in his historical study of the British milk trade at the end of the nineteenth, beginning of the twentieth century, takes this one step further by combining actor-network theory with Foucault’s work on governmentality in order to account for such non-humans in political life. Here, the management of milk-borne Tuberculosis operates as an “ontological political technology” [54], re-enacting the boundary between the social and the non-social.

Towards an Analytics of Techno-bio-politics

Our approach partly synthesizes and radicalizes these common notions of techno-politics. A techno-bio-politics, as we conceive it, denotes a newly calibrated conceptual and empirical playing field for reflexive social science research. Conceptually, we will carve out the way government operates under a genuinely technological condition. This will open up new empirical pathways to investigate contemporary phenomena of life as it interfaces with and through technology. We will offer a tentative conceptual frame before exploring the cases of neuro-technology and care robotics. Both of them denote illustrative examples which come into view once we extend our focus towards a techno-bio-political spectrum.

The phenomena that we frame under a techno-bio-politics of life share the assumption that technology is deemed almost universally interconnectable with any political problem or societal domain. Contemporary political discourse is pervaded by claims about the compatibility of, for instance, robotic devices and the impending demographic crisis [55] or of disabled peoples’ needs and the benefits of neuro-technological innovation [56]. Furthermore, they are underscored by assumptions about interdisciplinary collaboration and integration [57, 58], about the legibility of the human brain by way of neuro-technology [59] or the roboticizability of almost any aspect of human labor [1]. To be sure, techno-scientific discourses have been researched and theorized in terms of expectations [60, 61] or socio-technical imaginaries [62]. However, we are after something slightly different, something more general than those approaches. Unlike expectations, which are usually tied to specific technologies’ promissory discourse, and imaginaries, which pertain to the construction of (mostly national) communities, our analytics focuses on the broader question of how contemporary political rationality becomes both intelligible and actionable within a genealogy of power-knowledge [25]. Here, we follow a Foucauldian understanding of rationality [21, 63, 64], which is defined as

… a discursive field in which exercising power is ‘rationalized’. This occurs, among other things, by the delineation of concepts, the specification of objects and borders, the provision of arguments and justifications etc. In this manner, government enables a problem to be addressed and offers certain strategies for solving/handling the problem. In this way, it also structures specific forms of intervention. For a political rationality is not pure, neutral knowledge which simply ‘re-presents’ the governing reality; instead, it itself constitutes this intellectual processing of the reality which political technologies can then tackle [64].

Hence, focusing our attention on rationalities of interconnectability expands the scope of STS analyses
of the political. While promissory discourses usually refer to certain technologies and socio-technical imaginaries to national narratives about certain technologies, the notion of techno-bio-politics looks at how those problem/solutions are rationalized by a wider regime of governmentality. Hence, the concept of rationality describes the more general rules of how government operates in a certain context at a particular point in time rendering it comparable to other forms of government. In other words, the concept of techno-bio-politics gives insight into how apparatuses of power render the world governable, specifically under a technological condition.

While phenomena on the techno-bio-political spectrum are pervaded by such rationalities of interconnectability, this does not mean that these visions are unequivocally realized. As scholars in STS have kept insisting, techno-scientific projects such as robotics or neuro-technology are much more fragile and conflictual than their flamboyant narratives of automation [5, 17, 65] or cyborgian integration suggest [7, 66]. Here, we can observe manifold, laborious attempts at interfacing what political discourses construct as interconnectable. For instance, despite persistent hopes of tackling demographic change, robots still utterly fail or have a hard time to manage even the easiest of tasks like picking up a bottle or navigating under changing lighting conditions. As studies in STS have shown, robots are dependent on extensive, coordinative efforts by roboticists and others to render them social actors [67]. This requires to mutually adapt machines, people, and their environments vis-à-vis one another [6, 68]. Similarly, neuro-technology requires to intimately connect the “techno-cerebral subject” [7] to various brain devices, and vice versa. This seemingly petty labor is mostly absent from political discourses and thus largely remains invisible [17, 18]. This means that, in addition to a genealogy of rationalities of interconnectability, analyses of techno-bio-politics also investigate the nitty-gritty, material-discursive practices of interfacing that are provoked or motivated by such rationalities. Such a symmetrical analytics intimately connects the analysis of individual case studies to broader trends in the political sphere. It manages to evade the common divide in STS between, on the one hand, approaches that focus on and compare discursive or political structures [60–62] and, on the other hand, those that focus on micro-logical case studies of situated entanglements between life and technology. Put in more theoretical terms, it aims to do away with an asymmetry between the discursive and the material [27], the virtual and the actual [69].

Yet, how to analyze this peculiar mode of governing? Most importantly, where should an analysis of interfacing start? As our starting point, we follow Karen Barad in giving primacy to relations or, rather, processes of bringing into relation, over relata. In other words, “relata do not pre-exist relations” [27] but come into being through, what Barad calls, intra-action. This means that they are produced and (re)configured while being brought into relation with one another. From such a perspective, we are not interested in things themselves, be they concepts or objects, but rather in their continuous, mutually entangled becoming. Entities, both discursive and material, are not just there, interacting, not a mere “thing, but a doing, a congealing of agency” [27]. Hence, the analyst cannot qualify those elements unless they have entered into some sort of relation. It means that the entry point for analysis and description is not each element by itself but rather the relations within which they come into being in the first place.

Under a technological condition, we argue that the elements we are mostly concerned with, technology and life, are being brought into relation and re-worked by a specific class of practices, which we would like to call interfacing. We define practices of interfacing as activities, which render technology and life available for one another and thus produce them as different but compatible elements of an interconnection. This means that practices of interfacing both distinguish and interconnect. Unlike approaches such as actor-network theory, which primarily is interested in processes of mediation [70] or hybridization [42], interfacing allows us to analyze how differences between relata emerge while interconnecting them, or, to borrow again from Barad, how techno-bio-politics enacts “ational separability – the local condition of exteriority-within-phenomena” [27]. Furthermore, interfacing work does not merely happen in laboratories or hospitals but also in policy papers, in funding programs, or the European Commission’s meeting rooms. Hence, we conceive of interfacing as a decidedly material-discursive practice [27]. Furthermore, interfacings do not merely stabilize a particular interconnection. Unlike a persistent tendency in actor-network theory to focus
primarily on the durability of relations or associations [12], we see interfacing as a practice “in its intra-active becoming” [27]. This means that practices of interfacing are not what hold the techno-scientific world together. Rather their ubiquity and fragility offers, obliges, and maybe even forces actors to keep interfacing. It is what allows a techno-bio-politics of life to proliferate.

Through this lens, we analyze our two cases, neuro-technology and care robotics. As hinted to above, we consider them illustrative for a techno-bio-politics since they both attest to a broadening of the kinds of technologies, practices, and discourses invested in a newly articulated government of life as it is lived. Rather than being fully-fledged empirical analyses, we rather take our own and others’ work as an occasion to re-interpret and extend the scope of common bio-political analyses. The section on neuro-technology will trace the intricate micro-practices of interfacing which come to constitute a neuro-techno-medial subject. It contains a secondary analysis of existing studies, which will capture the way cerebral life is becoming interfaced with and through technologies of neurofeedback, invasive spinal cord stimulation, and deep brain stimulation. The section on care robotics will illustrate how ageing have come to be re-framed as it interfaces with robots in the European context. It focuses specifically on rationalities of interconnectability as they have emerged and taken effect in contemporary innovation policy discourses. These two cases thus also represent complementary analytical movements: a techno-bio-politics is constituted both by way of embodied, experiential, and institutional practices of interfacing “from below” as well as by way of discursive, political, and institutional practices of interfacing “from above.”

Neuro-technology: Interfacing the Neuro-techno-medial Subject

The first movement follows three empirical studies on neuro-technology: ongoing intra-action of both human and non-human agentive entities are persuasively shown in Joanna Brenninkmeijer’s analysis of neurofeedback practices [71]; Lucie Dalibert’s work on spinal cord stimulation testifies to the necessary efforts at embodiment and incorporation [8]; finally, John Gardner’s study on pediatric deep brain stimulation makes us see the according broadening of the clinical gaze [9]. These three ideal-typical interfacing practices, while each being open and distributed but also comparable in their concurrence, today constitute the neuro-techno-medial condition of subjectivation. We argue that an important accomplishment of all these interfacings is that they decentralize the self but still produce some level of coherence. What holds the soma-technologized self together [72] is “a throughput of technoscientific materials, practices, and representations […] that render” its ‘parts’ into a more or less coherent whole, even as those parts relate in different ways to different technoscientific materials and representations” [73]. Ultimately, this is a matter of power relations: who becomes a subject of neuro-technological intervention and how? As such, the soma-technologized self is a deeply techno-political project, not only projecting but also effectively configuring the “healthy,” the “symptom-free,” and the “optimized” subject. In the end, interfacing life and technology amounts to producing sufficiently coherent, neuro-techno-medial selves out of these albeit heterogeneous and sturdy elements.

Neurofeedback: Intra-action of Human and Non-human Agentive Entities

The case of neurofeedback, a non-invasive form of self-treatment, provides insights into the intra-action of human brains and neuro-technological devices. While neurofeedback has many non-therapeutic areas of application such as education and cognitive enhancement, it is also used in therapeutic contexts (e.g., epilepsy, stroke, depression). Basically, it is a technique of self-regulation in which parameters of electroencephalograms (EEG) recorded from the client’s head are presented to them. Based upon the concept of “operant conditioning,” the guiding idea is to reinforce those brain states that come close to the ones of a healthy reference population. In order to facilitate this process, clients are confronted with easy visual, tactile, or auditory signals which are meant to help them achieve the “right” condition, i.e., become sleepy or awake or attentive. By thus reaching a more efficient mode of brain functioning, the client will improve psychological and physical symptoms and functions—eventually without the assistance of the neurofeedback system.

In her study, which asked users and clinicians about doing neurofeedback, Joanna Brenninkmeijer
saw indeed “heavy interfacing” at work: for, neuro-feedback systems not only depend on but also afford and force to render available a whole ensemble of computers, electrodes, cables, reclining chairs, brain waves, neuro-technical concepts, and diagnostics, as well as therapeutic goals. Interconnecting them happens in specific treatment rooms and is performed by a team of health professionals, continuously intra-acting with patients (e.g., their mimic, their posture, their body temperature) as well as with the surrounding material environment (e.g., screens, chairs, electrodes) and diverse sources of information (e.g., expert explanations, data and visualizations). All of this is happening so that clients can make their brain available. In fact, “the client should make his brain available” [78, our emphasis] and thus the neurofeed-back system interfaces with “the self” and vice versa.

All these practices of interconnecting brains, selves, health practitioners, and neuro-technologies, no doubt, impact on the ways the self acts upon itself. Most tellingly, the users studied by Brenninkmeijer switch their vocabulary from psyche- to mind- to brain-terminology and “explain their problems in phrases like ‘my 6 hertz mystery’, ‘my theta’, ‘those alpha and theta things’, ‘explosions in my brain norm’, ‘all 42 points in my head’” [71]. In this new framework, “theta” testifies to the self while the self becomes explainable in “theta.” However, all these intra-actions notwithstanding, the words “my” and “me” are telling as well: “my Theta” and phrases like “the computer rewires me” also indicate successful interfacing of brain states and the neurofeedback process such that a sufficiently coherent self emerges, responding to its milieu. The users of a neurofeedback system become with and within this milieu; they change their relational existence as it changes them: now being affected by a non-invasive neuro-technological method. The important mode of bringing mutual availability of different relata about is, hence, “operational pictoriality”:

The diagrammatic is an operative medium which, as a result of an interaction within the triad of imagination, hand and eye, mediates between the sensual and the meaning by means of senseless things such as abstract objects and terms embodied in the form of spatial relations and thus not only ‘conceivable’ and understandable, but also generated in the first place [74].

A series of intra-actions is created and controlled in this example, above all, diagrammatically: not only between the technical, the organic and the subjective, but also between different conceptions of the self (“psyche,” “soul,” “my theta”). In so doing, the diagrammatic evokes and promotes the intra-action of apparently incompatible relata (self/”theta”), thus rendering neuro-technological life liveable. Even after training, when this socio-technical arrangement is no longer needed, it remains part of the subjectivation milieu—as a successfully interfaced, yet potentially irritable, technology of the self.

Spinal Cord Stimulation: Becoming a “Neuro-techno-medial Subject” Through Embodiment and Incorporation

While the diagrammatic points to an important techno-medial mechanism of bringing the intra-action of human and non-human entities (not only in neurofeedback) about, the neuro-technical subjectivation milieu entails many more mechanisms. Lucie Dalibert has studied how people learn to live with spinal cord stimulation (SCS). This is a neuromodulation technology implanted in bodies and, more often than not, hardly visible [8]. However, on Dalibert’s account, both embodiment and incorporation are crucial. “While embodying the neuromodulation technology entails groping processes in which gestures are central and an increased intimacy with one’s bodily materiality, incorporating it is highly relational and entangled with others, humans and nonhumans” [8].

SCS as a treatment of chronic pain is mostly used after nonsurgical pain treatment options have failed. A small device, similar to a pacemaker, is implanted
in the body. It delivers electrical pulses to the spinal cord. In addition, it entails two external components: a remote control and a coil. The goal is to block pain signals before they reach the brain and thus to decrease the use of opioid medications. In her study, Dalibert presents two cases—she calls them a “happy” and an “unhappy” one—in order to show that and how living with SCS entails becoming and the materialization of particular bodies [8]. Both cases are specific, depending on many factors, one telling example being the crucial techno-medial device: the remote control. By its sheer “technological presence” [75], its use is “scripted” [76]: the screen display informs about the amplitude of the stimulation (the vertical bars increasing in size); the remote control invites to modulate the stimulation amplitude and thus to switch between programs. However, the remote control may also disable some bodies. In the “unhappy case,” the person suffers from diabetic neuropathy. As the latter weakens the hands and causes blindness of one eye, the person can hardly use the remote control, for the screen and buttons are too small and, in addition, the buttons are too rigid. This is much more than a lack of user-friendliness. Rather, such devices have to be understood as “somatechnologies, that is, as technologies that act upon and intervene in bodies” [72]—or fail to do so. Hence, both people and the technological device in their materiality and as agential entities have to be accounted for.

In order for SCS to become part of the milieu of subjectification not only embodiment is needed, it is also a matter of incorporation. By way of an illustration, Dalibert reports that two of its components, the lead positioned on one’s spine and the pulse generator, positioned at the level of one’s lower abdomen or upper buttock, both enact the body-in-pain and bring the “body-in-paresthesia” about [8]. Since the intensity of paresthesia can be influenced by posture and bodily movements, it not only creates and transforms bodily movements but also kinesthetic experiences and bodily sensations. In a “dance of agency” [77], one’s body and its materiality are appreciated anew: SCS becomes part of the milieu of subjectification as a constitutively distributed activity.

SCS is thus more than just a tool, an instrument or a component of a body even; it is, as Dalibert puts it, a “soma-technology” [66]. Bodies with (soma-)technologies are entangled with both humans (relatives, friends, and colleagues) and with a dense “texture of [the] technosphere” within which we undertake our daily affairs” [78]. Moreover, they become interconnected with entire apparatuses of bodily reproduction. These socio-technical arrangements include values and norms as well, pertaining to, e.g., gender, age/ing, or able-bodiedness. A techno-bio-politics of life as it is lived becomes most obvious in the two cases studied by Dalibert: in the unhappy case, it is a woman who is afraid of the skeptic gaze of others, including her husband’s. On these grounds, she just cannot get along with the visible pulse generator in her back. By contrast, the person happy with the neuromodulation technology refers to it as “his pacemaker for the legs,” [8] thereby normalizing it for himself and others. Hence, being able to stage and perform happy age/ing or “being a woman” to others is crucial for the un/successful incorporation of SCS. Wearing the neuromodulation device renders visible norms of gender, able-bodiedness, and old age. In some ways, “somatechnologies produce aging, and even elderly bodies”—or gendered bodies and abled bodies, respectively [8]. Creating neuro-technologized milieus of subjectification thus implies multifaceted work at interfacing human and non-human entities in one’s life as it is lived in conjunction with the persistent “obligation to lead a normatively good life” [32].

Deep Brain Stimulation: The Neuro-techno-medial Subject and Its Clinical Constitution

Interfacing life and neuro-technology is not confined to the self (its brain, its body, its disease, its pain), and to norms and power structures, but also to a professional environment acting upon it. Indeed, whenever be(com)ing a “self-neurotechnology-interface,” entanglements with bodies are intertwined with what matters as the target of medical intervention. These entanglements are, at the same time, vital, material, social, symbolic, and normative in nature. Given the complexities involved, not surprisingly, health policies currently recommend to treat such patients in a patient-centered manner. Drawing on ethnographic research on Deep Brain Stimulation (DBS) in children with movement disorders, John Gardner convincingly illustrates that this type of clinical care is embedded within a broader socio-technical arrangement [9]. It involves, first, an interdisciplinary clinical team, second, an architectural structure to support the
heterogeneous diagnostic efforts, and third, a standardized assessment tool (AMPS: Assessment of Motor and Process Skills). The complexity of this intra-action enforces, as Gardner puts it in a Foucauldian way, “the broadening of the clinical gaze” [9].

To begin with, interdisciplinarity is positioned as allowing to treat patients’ conditions both in biomedical and social and psychological terms. Each team member contributes their disciplinary input to the informational profile of the patient. Furthermore, the hospital’s architecture supports collaborations including the patient but also different health professionals: it provides opportunities to call on additional health professionals to co-operate and add their expertise when needed. Taken together, the “built environment reflects a clinical concern for patients’ wider social context” [9]. Finally, the standardized assessment tool, AMPS, too, structures the assessment interaction in each detail, including a space for patient involvement, albeit a “highly configured” one [9]. The socio-technical arrangement DBS thus materializes a broadened clinical gaze. It no longer restricts itself to the shapes and structures of the body, life itself, but includes the thoughts and emotional state of the patients as well as their social context, hence, life as it is lived. It also changes how clinicians and patients interact with one another, and the way both understand, measure, and manage the illness. Importantly, the socio-technical arrangement as a whole is supported and suffused by technical devices that incessantly interconnect the heterogeneity of information, diagnoses, and treatments.

In this context, patient-centered practices assume, as Gardner puts it, a new type of “disciplinary power” [9]. Monitored by a vast socio-technical infrastructure (architecture, assessment tools, interdisciplinary team, neuro-technical devices) “patients are described, assessed and graded according to specific biopsychosocial traits” [9] and thus rendered actionable for the clinical gaze. As a result and in addition to Gardners’ diagnosis, such a clinical regime refocuses on life as it interfaces with and through DBS. This deeply invasive technology affords continuous follow-up care and legitimizes the invasion not only into the patient’s body but also in their life as it is lived. It constitutes a new form of life, one which is not primarily constituted by biological or bio-social categories, but which views itself and its reproduction through neuro-techno-medial opportunities of self-care and optimization [79]. It configures patients as “malleable biopsychosocial citizens” [15] by way of interfacing them within the socio-technical regime of the broadened clinical gaze.

Conclusion: Governing Subjects with and Through Neuro-technology

Taken together, the aforementioned practices that make the neuro-techno-medial subject, while illustrative only, testify to a techno-bio-political mode of governing life through and with neuro-technology. It requires to persistently interface what it configures as separate, yet interconnectable: brains and cognitive functions, brains and bodies, brains and nursing staff, brains and relatives, as well as brains and immediate surroundings both domestic and professional. This is achieved by way of manifold media-technological materialities such as modulatory technologies, screens, measurement practices, and remote controls. Governing individuals by advanced neuro-technologies thus amount to a multifaceted project of interfacing activity: through ongoing intra-action of both human and non-human agencies, through successful efforts at embodiment and incorporation, and through the broadening of what counts as life to be governed.

The techno-bio-political regime of subjectivation thus also reconfigures what is understood as life. Neuro-technologies for the modulation of living beings ultimately address the body as “molecular software that can be read and rewritten” [80]. Through the particular intersection of computer codes and neuro-technology, the human body is configured in terms of neuronal activities, and in terms of software, databases, and programs that can be manufactured so as to produce novel configurations of “biodigital life” (pace Mackenzie and McNally [81]). These representations of the human body as it interfaces with and through neuro-technology require new forms of governmental practices: neurofeedback training sessions, soma-technological practices of embodiment and incorporation, as well as a plethora of not only biomedical but also decidedly technical therapeutic work. In other words, it does not merely require the confinement and dressing of individuals, as it is commonly argued in works on bio-politics, but rather their continuous interfacing with and through technology.
Care Robotics: Interfacing Ageing Populations and Robots

While the becoming of the neuro-technologized self was to illustrate the interfacing activities concerning brains, bodies, and technologies “from below,” the next example, the governance of an ageing population through care robotics, is meant to illustrate the complementary movement: interfacing an ageing population and robotic technologies “from above.” Within the past two decades, elderly care and robotics have become stabilized as a powerful interconnection within European innovation policy discourse. Here, the challenge of an ageing society is connected to the development of socially assistive robots as a matter of course. However, from the analytical perspective of techno-bio-politics, this is not self-evident at all but rather the contingent result of a wide range of political, social, and technological processes that have rendered both of those domains interconnectable in the first place.

In the following, we will show this by way of three instances of interfacing that have underscored the intra-action of robotics and care within the context of European innovation policy. First, we will show how this development has rested on a re-definition of the concept of ageing in relation to discourses on technological innovation. Here, the “challenge” of demographic change has been re-configured into an opportunity for economic and technological production. Second, this has paved the way for numerous interfaces between robotics and elderly care. Social robotics could take shape as a promising solution to challenges in the everyday life of older people, while, at the same time, elderly care has become an appealing testbed for robotics research, i.e., for probing a new paradigm of human-robot interaction. Third, this development is based on an altered logic of care as (robotic) assistance. Care is re-imagined as interfacing older people and assistive services at the point of need within networked arrangements of care, thus broadening the nursing gaze via digital infrastructures.

Demographic Change and Technological Innovation

Recently, we can observe a shift in how ageing is configured politically [82]. Especially, initiatives in European innovation policy discourse have subscribed to a “positive vision on ageing” [83], where, following the World Health Organization’s concept of “Active Ageing,” demographic change is seen as “one of humanity’s greatest triumphs” [84]. Furthermore, the European Commission urges member states to view ageing as an opportunity to grow a “Silver Economy” [85]. Within this context, a range of actors from the healthcare domain, researchers, tech businesses, and policy makers imagine a world where an increasing number of older people will create a new “silver” market. In this, older people are addressed as consumers with particular needs to which new industries must cater. Hence, in this logic, the older population is configured as a new class of consumers and users especially of assistive information and communication technologies (ICTs). Specifically, the group of technologically minded, affluent, fit, and “young old” individuals is heralded as the new archetype of later life [86, 87].

This marks a stark contrast with regard to the genealogy of old age as a bio-political category [23, 88, 89]. In industrialized societies, ageing has come to be problematized, because older people are marked as unproductive [13]. As a result, alarmist discourses have eyed “a rapidly growing population of needy, relatively affluent persons whose collective dependence is straining the economies of Western industrialized nations” [23]. Such ageist stereotypes still persist in contemporary debates around ageing, for example, in the metaphor of the “ageing tsunami” [90]. However, this grand challenge of ageing is not primarily framed in terms of an “alarmist demography” [23] anymore but rather in terms of an “opportunist economy” [55]. Within this context, politics is first and foremost concerned with making use of the “grand challenge of ageing” by way of technological innovation [91]. Hence, an ageing population is not primarily governed by what Foucault termed an “apparatus of security” [20] but rather what could be termed an “apparatus of innovation” [55].

This apparatus attaches unprecedented urgency to the facilitation and creation of technological innovation as “our best means of successfully tackling major societal challenges” [91]. Within the EU’s “positive vision,” an ageing society becomes a problem not of homeostatic regulation but of “disruptive” innovation. The foremost target of governing an ageing society is not anymore to keep demographic change at bay but rather to translate it into a program...
for fundamentally changing societal practices. Discursively, this mantra of “disruptive innovation” sets the tone for how such an apparatus rationalizes the governance of life and technology. It sets in motion an ensemble of discourses, techniques, and practices, which are oriented towards translating demographic change into techno-scientific and economic gains. The overarching theme of the Silver Economy entails innovation programs, investment in research and development, and venture capital as well as a new class of “smart” entrepreneurs and “innosumers” [87] to shape and exploit the techno-scientific field of ageing.

Within such an apparatus of innovation, robotics and elderly care can be positioned as the “perfect match,” and this, despite the fact that examples of robots being actually used in care facilities are still very rare. However, the combination of an opportunistic register of European innovation policy and the impending “explosion” of healthcare costs provides a “robot-friendly” discursive milieu, where the promise to automate (at least parts of) healthcare is rendered interconnectable with the societal challenge of demographic ageing. This is not a readily accomplished situation but the result of an ongoing process of interfacing life and technology within a techno-bio-political regime. Through an apparatus of innovation, it has come to value the attainment of technological innovation as political priority [92, 93] and has attached an unprecedented urgency to interconnecting novel ICTs with the daily life and experience of ageing. Such a form of government differs greatly from how an ageing society has featured throughout modernity. It has essentially re-programmed government under the technological condition.

**Active and Healthy Ageing and Social Robotics**

As a result, ageing has shifted from being mostly configured as a scientific problem of biomedicine, demographic forecasting, and clinical assessments, towards a techno-scientific problem. Demographic change has become a key ingredient of promissory discourses in fields like computer science, AI, and robotics. This “regime of technoscience” [44] puts unique emphasis on technologically mediated intervention into and modulation of the world. This does not require a purified separation of nature and technology but rather their persistent interfacing in the context of development, design, and real-world experimentation. Here, the techno-bio-politics of an ageing population “takes technical change to be the model for political invention” [11] in that it views “the future … merely [as] a repository of technical possibilities that await to be realized” [44]. The example of care robotics shows that this also comes with a shift in how the problem of ageing is treated and, in particular, who is concerned with it.

As an example, we point to the theme of “Active and Healthy Ageing” as it has been taken up in European Framework Programs since the beginning of the 2010s [82]. The interconnection of elderly care and robotics takes shape in the context of a “[n]ew integrated problem-solving approach” to research funding in the EU [93]. This means that funding is organized not according to disciplines but rather so-called Key Actions “integrating the entire spectrum of activities and disciplines” needed to solve a given societal problem [93]. In this context, “Active and Healthy Ageing” (AHA) emerges as an overarching theme seeking to combine and integrate approaches from gerontology, biology but also, increasingly, engineering and robotics. Especially, in the programs addressing the latter, ageing does not come up as a biological demographic fact but rather in terms of daily living and everyday activities of older people. Here, the EU’s approach to AHA attaches an unprecedented urgency to developing information and communication technology, for example “[s]ervice robotics within assisted living environments” [94]. Hence, the problem of ageing is increasingly re-shaped by a focus on assistive machines and other ICTs that target ageing as “life as it is lived” [32].

Throughout modernity, the bio-politics of ageing has predominantly framed old age as a scientific problem, for example, of demography [23], gerontology [88], and biomedicine [95]. Such disciplines have traditionally problematized old age in terms of categorizing older people, understanding biological aspects of the ageing process, and statistically estimating as well as forecasting demographic trends with regard to the older population. The treatment of old age has long been in line with “the scientific enterprise” [44] rationalizing the world of old age in terms of biomedical categories of ageing or deteriorating levels of daily activities. However, in the context of European science and innovation...
policy discourse, we can see how this focus has effectively shifted towards problematizing old age in terms of “techno-scientific innovation” [44]. As a result, this has also changed who is concerned with it. Here, the technical sciences take center stage in intervening into older peoples’ everyday lives by way of sophisticated assistive machines. Ageing has “re-entered” the political domain on techno-political grounds.

Independent Living and Robotic Assistance

Since quite some time, we can observe new levels of technologization in nursing practice [96] and with this, a transformation of its professional milieu, e.g., through documentation software [97], tele-care technology [98], and, albeit rarely, robotics [99]. In this context, we argue that care robots and other assistive technologies materialize a shift from a “logic of care” [100] towards one of robotic assistance. We will show this by the example of “Independent Living,” which has recently been taken up within European innovation policy discourse. While the idea of independent living originates from the US disability movement [101], European innovation policy has mobilized this concept as enabling older people to live at home without clinical care for longer by equipping their homes with smart environments and robotic assistants. This is to avoid hospitalization [102] and thus “disburden” European healthcare systems.

This discourse configures care with regard to particular assistive tasks respectively robotic capabilities specialized to fulfil such tasks. This constitutes a central design philosophy in assistive care robotics today. In order to render itself relevant for elderly care, robotics identifies distinct everyday “problems that older people face” [103], which can then supposedly be met by using specialized robotic capabilities like navigation or “grasping.” In this context, the lifeworld of care receivers is represented by standardized, dissectible activities manifested most prominently in gerontological scales like the Lawton Instrumental Activities of Daily Living metric [104]. Such assistive services are underscored by a techno-ecological infrastructure of (tele) care. Here, smart home applications in connection with assistive robots promise to deliver care “at a distance” [105], for instance, informing care personnel remotely in the case of an older person’s fall. This re-configures the logic of care into a logic of assistance, which is carried out within distributed, technologically mediated care networks [98]. On the lines of the previous argument with regard to deep brain stimulation, one could argue that the presence and interconnectedness of assistive technologies such as robots also broaden the “nursing gaze” [97] towards the milieu of networked care arrangements.

Conclusion: Governing Ageing Populations with and Through Robotics

European innovation policy, its funding programs, policy agendas, and innovation initiatives, thus serves as another case for how a techno-bio-politics of life operates in contemporary society. The phenomenon of care robotics denotes first and foremost a political reality underscored by a number of rationalities of interconnectability. An ageing population has come to be problematized in a new way under the imperative of fostering techno-scientific innovation. Contrary to bio-political regimes of confinement and alarmism, demographic change is seen as an economic and technological opportunity in this context. The task of initiatives like Active and Healthy Ageing or Independent Living is to persistently interface older people with novel, assistive devices such as robots. This is not simply a change in tone but rather has profound consequences for how an ageing population comes to be imagined as governable.

On the one hand, it expands the disciplinary scope of who is concerned with demographic ageing. Here, we can observe a decisive shift away from the “usual suspects” such as biomedicine, demographic statistics, or molecular biology and towards computer science, human-machine interaction, and engineering. This is of course not to say that these discourses simply replace the former but the European funding strategies attest to at least a shift in priority. It also comes with a re-definition of ageing. Rather than a medical problem and a problem of healthcare, old age is reframed as a problem of robotic assistance. We argue that this is not a linear story, one simply causing the other, but rather one of simultaneous interfacing: as ageing becomes re-defined, robotics is morphed into a “universal” tool to intervene into sites of daily living in close proximity to people. For instance, this results in a networked view of care, where older people’s daily activities and robotic capabilities are interfaced at the point of need as is already tangible in projects of tele-medicine and ambient assisted living.
Governing Life as It Is Interfaced with and Through Technology

In this article, we have shown the conceptual need and benefit of an analytics of techno-bio-politics and its specific relationship to life as it is lived, which is often overlooked by bio-political approaches. Our conceptual contribution re-frames current phenomena of governing life in terms of rationalities of interconnectability and practices of interfacing. Furthermore, we have shown this in the two illustrative cases discussed above. Relations between robotics and elderly care and neuro-technology and the brain could only attain reality, because they rely on a techno-bio-political regime, which conceives of those entities as compatible and their interfacing as desirable. Here, neuro-technology could inscribe itself into the quest for optimizing, treating, and caring for the self. At the same time, care robotics has come to be staged as one of the key solutions to an impending demographic “crisis.” This is not merely due to the mindset of single engineers, entrepreneurs, and policy makers but rather denotes a broader set of attitudes that seem to be defining of our current governmental landscape. Moreover, when entering this landscape, we do not find those interconnectabilities “in place” but rather we can observe a manifold range of practices and politics oriented towards their attainment. When following the vision of neuro-technology, we see that a whole array of actors and actants, bodies, nursing staff, relatives, and clinical environments, are involved in laboriously interfacing those things, which have for so long been staged as being compatible. We have shown this, in particular, with regard to the interfacing of the neuro-techno-medial subject, which is not a stable entity but rather something that has to be constantly re-stabilized, incorporated, and institutionalized. We see in these examples, the modus operandi of a techno-bio-political regime that works towards rendering formerly disparate entities available for one another. These processes are afflicted by constant noise, interference, and other troubles. They have also been constitutive of a societal order, which puts itself under the expectation of constant innovation and re-configuration.

This leaves us with an important question: if, as we have argued, the hypothesis of a techno-bio-politics of life has some analytical merit to it, then what is it that is actually governed? What is life under the technological condition? As we have contended above, we believe that the classical notion of bio-politics governing life itself still provides a valuable perspective but also underestimates another continuity of modern society: that life has increasingly become manufactured or, as we would like to call it, ever more intimately interfaced with and through technology. Such a perspective does not take for granted but thoroughly investigates rationalities of interconnectability as they pervade political, scientific, or public discourses. Assumptions about technology and processes of technologization thus seem to organize around alliances and conflicts that pertain to the question of what can be interconnected with what and whom under what circumstances. Can or should robots take over some aspects of care work? [107] Do the human brain, in actuality, legible by machines? [108] Do such machines dehumanize older people? [106] Do neuro-technologies alienate us from ourselves? [107].

An analytics of techno-bio-politics offers an intriguing entry point for analyzing the emergence of such questions. Here, we chose to not pick sides in the ontological back-and-forth of the actors that usually pose these questions. Rather, we chose to enquire into the social, technological, and especially political conditions and processes through which life and technology are rationalized as interconnectable. In doing so, we trace the material and discursive practices that manufacture and re-work both life and technology into fitting components while also paying attention to the many interferences and withdrawals of life as it is lived in the process. Here, in neuro-technology and the brain, an understaffed nursing sector and sociable robots are elements that have continuously been re-worked in order to “fit” within particular regimes that favor patient-centered care or that conceives of demographic ageing as an economic opportunity. This, in the end, is the contribution of such a framework to the many case studies of technoscience and its governance in STS and elsewhere: we aim to approach these phenomena on the level of their political rationality that spans singular promissory discourses or socio-technical imaginaries. This includes the many critiques and resistances within this regime. After all, humanistic oppositions to care robots or neuro-technology also assume that their interconnection is, in principle, possible and imminent. Hence, these critiques are not “outside” of thisspiel but rather wrestle with the same kinds of questions as those projects that deem such interconnections desirable. Ultimately, we
see here that practices of interfacing offer, provoke, or even force actors to keep interfacing in this or that way. In the end, this calls attention to and requires to update the pressing political and, incidentally, critical question of our time: to interface or not to be interfaced “like that and at that cost” [108].

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