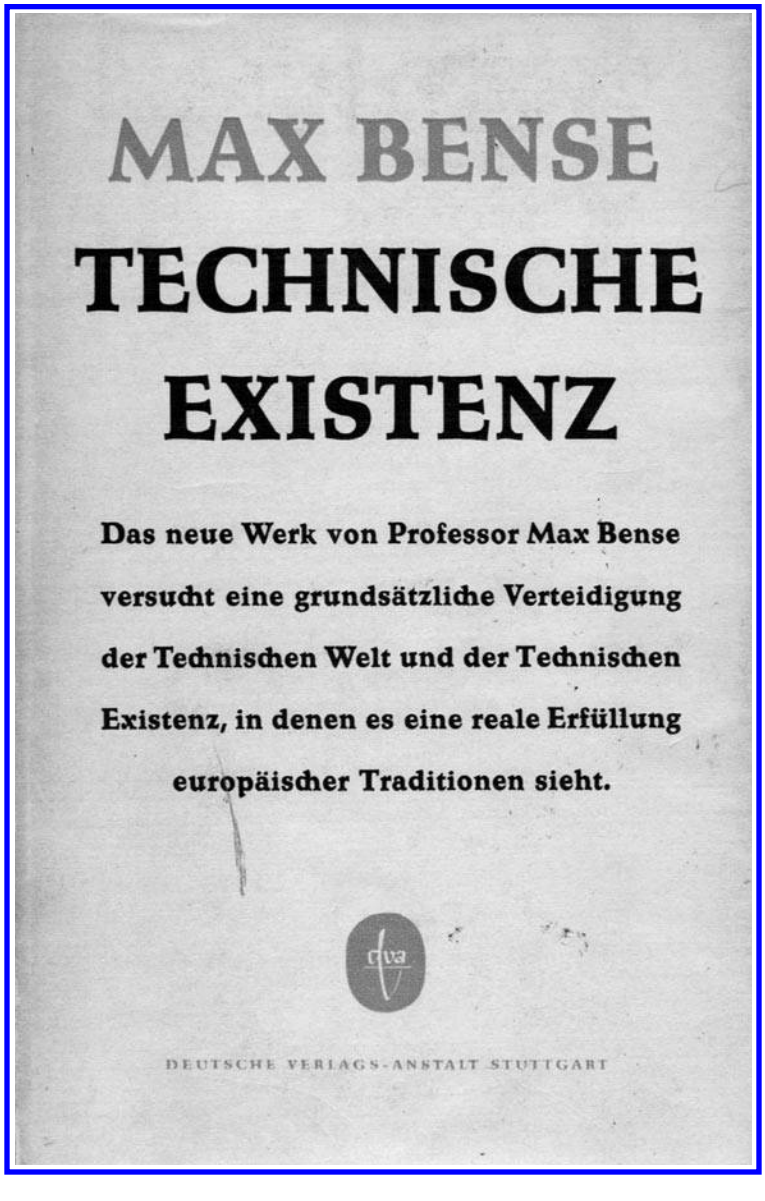
Cover of Max Bense,
Technische Existenz (1949).



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Technical Existence

MAX BENSE
TRANSLATED BY WILLIAM STEWART

and the clever animals see clearly
that we are hardly at home
in the interpreted world.
—Rainer Maria Rilke

1.

The world that we inhabit is a technical world. It is the world of processes, functions, flight paths and station stops, the world of machines and calculations, of gears, noises, factories, and transmissions, the world of technicians, engineers, physicists, experts, specialists, professors, secretaries, and institute directors, the hardly fathomable world of unions, guilds, firms, laboratories, industries, canals, cities, mine shafts, depths, and heights, the world of timetables for trains and electrons, the world of the masses forever knocking at the gate—and the world of a calm intelligentsia [*Intelligenz*],[1] encased by the thin but unyielding walls of responsibility for everything that belongs to this world, protected from any confusion that might disturb the creative process or infect the mind [*Geist*][2] with distrust. This world is no mere potentiality, and it is not a draft that can be revised and rejected, a sketch on a piece of paper. It is an undeniable reality; it is reality outright. In our time, being imposes itself on our interior and exterior existence neither in the shape of nature nor in that of culture. We inhabit not landscapes and gardens, not houses on sloping hills or in bright glades. We inhabit a network of visible and invisible functions and relations, structures and aggregates made of metal and artificial stone that have taken on names like towns, cities, countries, and continents. Technics [*Technik*] concerns us. We both love and hate its forms. They rile us up and calm us down. Technics affects us with the most acute harshness that reality is capable of; it never has an illusionistic effect like the old atmosphere of culture from sweet times past, and it never arouses such a feeling of the sublime as conveyed by the immeasurable ruthlessness of nature. No degree of isolation or withdrawal can prevent the impact of technics' piercing reach. We are the captive guests of everything we have created, yet we endowed none of it with the mercy to let us go free.

2.

Technics is a reality among realities, the harshest, most intractable one of all. It increasingly reveals itself as an irreversible process.

Occasionally, it dons the mask of nature or the mask of culture. That is to say: it can deceive us. By the same token, it is reluctant to admit that the old sense of its name lies hidden in the concept of "artificiality." But it has maligned this deeper meaning for such a long time, taught us to scorn it, perhaps even recanted it . . . The harshness of this reality, which we have created ourselves, has long since ceased to deceive us about its intensity. Clearly, technics constitutes a process of denaturation, one that is neither abstract nor conceptual [*geistig*]; and yet there are those who love what it creates with the empathic tenderness that one tends to reserve for the forms of nature.

Of course, so long as we do not deceive ourselves about the power of technics' existence in our personal and social lives, we can interpret technical creations as a surreal form assumed by matter, an approach which begins to grasp technics' enormous reach. We have all experienced how technics can shake us to the core of our heart and mind [*Geist*]. With gestures of fear and shock, mercy and compassion, happiness and misfortune, trust and suspicion, contentment and embitterment, power and impotence, technics emerges before us, an awe-inspiring result of our calculations, stretching across the entire earth. Technics' significance grows with each passing day, but the form of its physiognomy has yet to be described. Technics eludes, if not computability, then certainly all attempts at containment or control. Though technics' physiognomy recalls the notion of "being in the spirit" [*Sein im Geiste*],[3] as the old rhetoric goes, it reproduces this formulation anew, casting its existence as an interplay of material since time immemorial. We cannot violate this physiognomy of technical forms without hurting ourselves; we cannot destroy it without destroying ourselves. For we have long since become a wheel, a wave, an axle, a human at the controls of this world . . . and still we write and still we narrate and hunger and thirst and freeze in the poverty and riches of a mankind that has forgotten neither how to love nor how to hate.

3.

No mythology, no theology relates us properly to technics. We do not belong to it as its observers but suffer as its subjects. As the technical world's constitutive entanglement with all realms of economic, social, intellectual, and physiological existence becomes ever clearer, we can never be at home in it without intellect [*Intellekt*], without the most acute rationality [*Rationalität*]. And this intellect, this acute rationality can exist neither in myth nor in art. Rather it must be theory, pure theory [*Theorie*]. For the first time, intellectuals [*der geistige Mensch*] inhabit a material plane of existence in which they cannot exist without theory: not only the theory of the masses and their transformation, but also

the theory of an intellectual [*intellektuellen*] and materially individual existence. To a certain extent, theory as a fact of life has already usurped the place of ceremony and convention. Its collapse would mean the collapse of the technical world, in which the inequity between the learned and the unlearned creates a sociological tension far stronger than the inequity between the bourgeois and proletariat. Technics produces a surreal world [*eine surreale Welt*], and the surreal world can be expressed only in the refined language of surrationality [*Surrationalität*]. In every case, art that conveys something, anything at all about technics is an art that participates in it, that is an element of it, that does not portray technics but rather orchestrates it—indeed, a truly surreal art. We encounter as surreal whatever embodies an extreme discrepancy between an old language and new things. In the case of technics, humanity has achieved a new plane of reality, one that can hardly be ignored, and it is certain that only surreal and surrational means can relate this realm of the real to our faculties of understanding. Just as the emergence of a theory of technics—which provides the means to manipulate technics with the intellect, abstractly and concretely [*die Technik geistig in der Hand zu halten*]—relies on a most refined rationalism of highly developed calculations, only an unparalleled surrealism of form and color will be capable of constructing its artistic representation. Indeed, the progression from the intelligible structures of our thought to the denatured structures of the technical world is a spiritual process, an obligatory realization of inhabitable things, functions and relations, structures and aggregates, a transition from a formalism to a physiognomy of matter.

4.

To manipulate the technical with the intellect! [*Die Technik geistig in der Hand halten!*] That is the problem. Art and science, ethics and religion provide intellect with the means to manipulate a thing, to control it, to possess it consciously, intentionally, in its totality. They prevent us from wandering around like clever animals, only to notice, ever so gradually, that "we are hardly at home in the interpreted world." In order to come to know and inhabit the things that we mistrust, we must interpret them. We must describe them, explain them, portray them, exhibit them, express them, judge them, affirmatively and negatively—this is the only possibility to escape their subjugation. For indeed, all things subjugate. Every reality is oppressive, irrevocable, severe. It seems necessary to force the world we seek to inhabit through the frameworks of art and science and the theorems of ethics and religion in order to come to terms with its death. With its death! I recall seeing, in the notebooks of [Giovanni] Fontana, who composed technical tracts in the early fifteenth century, a depiction

of two skeletons dancing around a mechanical object. There are many such drawings of technical forms that gesture to death. Every layer of the world created by human beings contains its own death. Today, we know that technics has spawned its own death. Technics did not appear with the intention of producing immortals. It created a world and therein its death. Nothing more. But inasmuch as we represent technics through art or deduce it through science, we signal the place of death in it and have reconciled ourselves to it in a very human way. For we desire death in the world that we inhabit. We want it. We should not deceive ourselves. For it belongs to our reality. And to the reality of technics. We are finite beings, beings of ruin, beings of demolition . . . and not even technics can sublate these categories of our existence.

5.

Thus, only an intellectual [*ein geistiger Mensch*] can manipulate technics. But what does that mean? An intellectual is one who has intellect [*Geist*], and to have intellect is to have thoughts, thoughts that lend sense to our actions and an inestimable richness to our existence. Technics is in every instance the direct creation of this intellect. It surrounds our existence; it encases our intelligence [*Intelligenz*] like its own body—its surreal shell. What we call the technical intelligentsia [*technische Intelligenz*] includes anyone whose essence is intellect, insofar as this intellect possesses the theorems that would allow this world, were it to be destroyed, to be re-created again. But the technical intelligentsia also consists of those whose intellect interprets this age—indeed, their very own—and depicts it through the power of their prose or the clarity of their theory. And the dungeon of the technical world reveals its exits only so long as the fundamental physiognomy of its structure remains visible to us in analytical clarity, through prose and through theory. For the first time, intellectuals engage more deeply and more enduringly with the material that was heretofore presented to them in the guise of nature. *There is more rational depth and rational clarity in knowing the material physiognomy of technics inside and out than in knowing the mythological physiognomy of nature.* The technical age presupposes the rationalist of the highest caliber.

6.

If we define the category of existence as occupied by any being [*Dasein*] that is aware of its condition and, in order to be at all, toils tirelessly toward self-determination and self-conception, then the intellectual is possible within the technical world only under this rubric of existence. This is the true aporia of this world: technics indefatigably disavows its creators—that is, human

beings, the technical intelligentsia—but these same creators are so deeply embedded within technics that it is technics, too, that can only be sustained if it is constantly being made complete, concluded, perfected, as Friedrich Georg Jünger[4] rightly puts it. But this perfection is exclusively process, never a fixed condition. If technics becomes static for even a moment, it immediately forfeits its identity. Technics is totally and completely embedded in time; it is in the fullest sense of the word *temporal*, *timely*. In the process of the technical world's untiring perfection, humanity lives, starves, freezes, thirsts, mistrusts, thinks, and hopes, absorbed by a being that it brought forth itself and will continue to bring forth. Humanity cannot escape the existence of the technical because this existence presents only the projection of humanity's own existence in the mode of a material potentiality. By that I mean: for those possessing technical intelligence, technics is a new, fourth modality, besides those of potentiality, reality, and necessity. To a certain extent, it is the complex of the three other modalities combined. This may be the reason that Friedrich Georg Jünger speaks of the "utopian flavor" of technics. We must correct Jünger, though, when he tries to thereby characterize technics as a complete phenomenon; he is correct only to the degree that he wishes to express that, in every technical formation, the modus of potentiality takes on a comprehensive form [*Gestalt*].

7.

But I wish to return to what I called technical existence. It is, as mentioned, existential existence; it relates to itself . . . it is in a state of becoming; for it belongs directly to the technical process itself . . . it is concrete; for it is always an exemplary case, namely the role that it has to play . . . it is functional existence; for it is characterized by an unavoidable indignity, namely the indignity of being ultimately exchangeable, or rather, to remain with the language of logicians, of constituting a variable existence. Remarkably, the old expression "to function" takes on a new, existential sense in that, on the one hand, it refers to concrete, human existence in a particular, self-aware role, and on the other hand, it makes this very particular, self-aware role comprehensible only against the entirety of this world—that is, in a specific place, at a specific time. In no way am I alluding to the termite mound.[5] Again, the technical world can preserve itself only if the free, individuated, creative human still occupies a reality, because the technical world preserves itself precisely through creations of our intelligence [*Intelligenz*]. The intellectual who exhibits freedom, individuality, and creativity is no luxury, but rather a generator, the axle and bearings necessary for the incessant revolution of all things. That is to say: we do not exist in the

technical world by indulging in aesthetic, ethical, or religious states. We exist in the technical world in that we *function*, in that we exist *by functioning*, that we are realized in a function. Whoever possesses a function in the technical world and thus renders their existence in this sense a functional existence we call "specialist" [*Fachmann*]. Specialists embody the technical world in their very existence. I should add that these specialists do not belong to a class. They are the classless individuals par excellence. And in the same way, the technical world is ultimately the world of the "withered-away state" [*die Welt des "abgestorbenen Staates"*].[6] In the technical world, the concept of borders is a necessity. What the aesthetes, moralists, and religious call with a lightly aesthetic accent "culture" [*Kultur*] (noting here that, of course, in the technical world, "culture" is not possible), can certainly exhibit within the technical world all the trappings of the usual aesthetic, ethical, and religious ceremonies. However, as mentioned, we do not exist on account of these trappings, but rather we are merely "there," within the identifiable world, on account of them. This "culture" distinguishes itself from the culture of bourgeois civilization or the feudal world only because it possesses not an artistic status but rather a necessary one. The notion of formation [*Bildung*] that it releases (almost as if by subtle emanation) is no longer bound to leisure and liberty but instead to technics and necessity. Every careful observation of the way that the categories of personal formation, culture, aesthetics, or ethics slowly shift from freedom to necessity is capable of communicating extraordinary insights about the phenomena of our creative ability, phenomena that we once clearly perceived.

8.

Accordingly, technics has its own mode of being [*Seinsweise*]. The theory of technics—again, a necessity for manipulating the created world with the intellect—must become an ontology, but an ontology in which the human appears very concretely. We might call it an "existential ontology." We inhabit this technical world with horror because we lack a theory of technics that would allow us to dwell intellectually in that world—and thus cannot yet do so. Where is this theory? I cannot find it. According to an exceedingly long tradition, we have created a world by means of the oldest efforts of our intelligence [*Intelligenz*]. Yet, today we are not in a position to control this world, whether theoretically, mentally [*geistig*], intellectually [*intellektuell*], or rationally. We lack a theory for it, and we thus lack a clarity of technical ethos—that is to say, the possibility to reach necessary ethical judgments that are in accordance with this technical world. And this lack strikes me as the criterium for the discrep-

ancy between the concrete essence [*Sein*] of the technical world and the concrete existence [*Existenz*] that is compelled to inhabit this world in every facet of its life and mind. Perhaps we will one day bring this world to perfection, but we are incapable of perfecting the individuals of this world *for* this world. Such is the burdensome situation of our technical existence.

One could say that we lack the education [*Erziehung*] necessary for our existence in this world. We lack an adequate notion of technical formation [*Bildung*] that would translate technical learning into an ethical sensibility fitting to this world. Indeed, every kind of intellectual formation is preparation for the inhabited world and thus shares in this world's essence, which seeks aesthetic, ethical, religious, and intellectual justification. Therefore, on the one hand, this education must transmit the kind of functional and specialist formation that allows us to orient ourselves in and occupy the world. On the other hand, however, it is necessary to supplement this functional formation with one that provides us with an intellectually creative capacity; that is, the intellectual, rational power to produce thoughts, experiences, ideas, and actions that are of an aesthetic, ethical, religious, and technical character. The whole terrain of pedagogy must be attuned to the technical world, namely, to technical existence and its dual tendency—toward technical specialization, on the one hand, and intellectual existence [*geistige Existenz*], on the other. Within the technical world, the traditional formation based in humanist and Christian principles requires a supplementation, perhaps even a correction, by means of a techno-social formation. To the degree that the former exhibits an aesthetic and religious character, the latter must be ethical and rational. If not, every intensification of the previously noted discrepancy between a functional and a productive being [*Dasein*] will immediately trigger a secular catastrophe, as the productive intellect falls behind the functional intellect.

9.

There are signs that this is already happening. What does the modern artist express? Technical existence? Hardly. What do political and economic systems reveal? They attempt to procure for themselves their intellectual justification through old, not new ideologies. What is happening to the aesthetic, ethical, and religious categories that are proclaimed from the pulpit? They, too, are merely a reflection of the civilized bourgeois world; they, too, speak of a definitively venerable humanism that has not yet penetrated technical existence. Yet penetrate it must, if it does not wish to remain a prop, a vestige. It seems simply impossible to make the world *function*. Everything collapses in the face of the incommensurability between the perfection and the pro-

duction of the world we inhabit. That is to say, our intelligence [*Intelligenz*], that which produces ideas, thoughts, values, and truths, has not yet developed the necessary maturity, contour, depth, and clarity demanded by the technical world. The aporias of the technical world are only made worse when they are addressed by methods that do not belong to this world, that arise from the aesthetic, ethical, or religious spheres of cultural existence but in no way relate to technical existence. We take technics seriously in a machinic sense but not in an aesthetic, ethical, moral, economic, political, or societal one. I see these aporias confirmed in Friedrich Georg Jünger's *The Failure of Technology: Perfection without Purpose*. Indeed, the manner in which Jünger's work plays with a certain mythos of technics reveals that, by dint of its not being taken seriously, this reality, our reality, the reality of the contemporary is exposed to a broad, public misunderstanding.

10.

Intellectually, we lack the stamina to inhabit the technical world. *It is not bodily discontentment* toward technics that produces the aporia of technical existence but rather *intellectual discontentment*. This is why our ancestors were shocked when they first considered the incessant multiplication of technical structures. We have artifacts produced by an intellectual, rational tradition of the first order, but insofar as we have them, our intellect is incapable of furnishing their justification.

11.

Of course, technics has not only rational but also aesthetic, ethical, religious, economic, societal, and political roots. A presentation of the tradition of technics would be simultaneously an intellectual-historical, sociological, economic, political, aesthetic, ethical, and religious undertaking. That should come as no surprise. One must consider that the technical world is the outermost shell of the mythical, cultural, and civilizational layers that conceal Rousseau's long-lost natural world. If one excavates the tradition of technics, one cannot proceed only as a technologist [*Technologe*]. Or rather, from the outset, the technologist must be the most multifaceted historian imaginable.

These technologists can overlook neither the original unity of aesthetic and mathematical consciousness that is revealed in the earliest technical artifacts, nor the deep familiarity of religious man in the early and late Gothic periods with the technical drives of a simultaneously pious and Promethean nature.[7] Technologists will have to demarcate this first stage of technics as its mechanical stage. Moreover, this mechanical stage is not only technics' earliest stage; it is also its natural stage. It is here that technical

existence crosses over, so to speak, into natural existence. True as this proposition may be ontologically, it would still deserve a closer analysis. The natural world extends into the technical world at the place where one speaks of mechanics, where one finds mechanisms to be at work. This is the reason why mechanics is always perceived to be the least frightening aspect of technics, even though, again, Fontana's technical notebooks of 1420 conjoin machinery with dancing skeletons. But this is also the reason why machinists, as creators of technical structures, suffered a disreputable status up until and even during the Renaissance and were segregated entirely from "learned geometers." As Curtius notes, in Italian, "meccanico" takes on the sense of "unskilled" and "raw," and "la turba meccanica" refers to "the great masses." One must also consider that the skepticism shown to Roger Bacon's *scientia experimentalis*; to Nicole Oresme's economic and planetary theories; and finally also to William of Occam's nominalist logic—this skepticism had deeply sociological reasons as much as it had dogmatic ones.

Further, it is worth noting that the awakening of self-consciousness in Italian artists in quattrocento Florence also triggered the development of technical consciousness. Machinists and technicians—above all clockmakers, instrument makers, shipbuilders, sailors, and masons—achieved societal acceptance when "learned geometers" became interested in technical structures within the context of mathematics and the natural sciences; and when artists and artisans learned proportionality, perspective, hydraulics, fort design, road systems, and automation from those machinists and technicians. This development corresponds to the reception of Euclid and Archimedes, of Vitruvius and Apollonius that took place under the guidance of fourteenth- and fifteenth-century scholars and artists. In this context, a relation appears between mathematical, aesthetic, and technical consciousness that provides us with the first hint of a classless, technical existence. For instance, Martin Wackernagel's exceptional study *The World of the Florentine Renaissance Artist*[8] depicts a correspondence between the emergence of a new, perspectival art in the West and the emergence of classical, Galilean mechanics and its technical consciousness. Never was the interrelation of art, natural science, and technics greater than in the time of the Medici family, whose sense for aesthetics was as developed as its awareness of scientific knowledge and technical proficiencies. The Medicis were bound by a mechanical intellect [*Geist*]. The mechanical stage of technical existence matured here to a certain degree, and in the moment that Leonardo declared mechanics to be the paradise of mathematical science, he also established for society the technical age's ideology. From then on, artists, scientists, and technologists would be equally concerned with the world of technical creations.

Clearly, the classical age of *mathesis universalis* also belongs to the tradition of technical existence. Its notion of *perfection* [*Perfektion*] arises from the spirit of *mathesis universalis*. Perfection has a dual meaning. Perfection is progress, and perfection is completeness [*Vollkommenheit*]. Yet perfection always reflects both senses, namely the sense of the self-enclosed totality of a created world. The closed totality of the technical world is brought to completion through progress. This dual meaning results in a new aporia in technical existence's self-conception. Perfection in the sense of completeness and closure is limited. Perfection in the sense of progress is certainly not limited. We can think here of Leibniz's "principle of perfection" [*Axiom der Vollkommenheit*] from 1687, as well as the conclusion to Pascal's fragment "Experiments with the Vacuum" from 1647. We can add to these the introduction of P.S. de Laplace's "Philosophical Essay on Probability" (1814) and Comte's *Positive Philosophy* (1830–1842, vol. 4), which not only handed down but also asserted the legitimacy of Pascal's thinking. In these works, I see the self-conception of technical existence's mechanical stage reach its culmination. This moment coincides with the emergence of a fully new stage of both natural science and technical process that occurs with the intrusion of thermodynamics into mechanics and technics. Additional evidence for the relation between classical rationalism and its technical consciousness may be offered by the following facts: (1) Although Descartes, Pascal, and Leibniz, all of an exceptional, rational mind, were mathematicians and philosophers, at no point was the domain of technics foreign to them. It is not by chance that Descartes's letter exchanges were in large part with machinists and engineers. Here, I would point to Ferrier, the lens grinder, or to Villebressieu, the engineer, but above all to the beautiful letter Descartes sent to Mersenne on October 20, 1642, in which he lays out a plan to eliminate smoke from his chimney. Also not accidental is the fact that Pascal, the mathematician, constructed a calculating machine and that Leibniz, too, occupied himself with technical constructions. (2) Denis Papin, doctor, physicist, mathematician, and inventor, lived in the age of *mathesis universalis*, namely from 1630 to 1750. He was the first to submit descriptions of his new machines to the famous *Acta eruditorum*, a journal previously reserved only for publications on mathematics and physics, and his wonderfully precise prose is distinguished in every way from the technical writings of Fontana, Kyser, or Mönch in the fourteenth or fifteenth centuries. I might add that with Denis Papin the prose style of later technical patents finds its origin, prose that, by the end of that age in 1751, achieved an even literary quality in the technical entries by Diderot for the *Encyclopédie*. (3) If Erhard Weigel, one of Leibniz's teachers in Jena, made clear

in his "Wurzel-Zug des so schlechten Christenstaats" [Uprooting this truly terrible Christian state] that one must insist on technical formation [*technische Bildung*] for economic reasons, then Leibniz advocated in 1667 in his *New Method of Learning and Teaching Jurisprudence* for an increase in practical skills and technical abilities together with theoretical formation. The schools for craftsmen and machinists that he had in mind belong to the trade schools of the well-known industrial pedagogy of the eighteenth century. It was ultimately these schools, following the tradition and intellectual [*geistige*] model of the *Encyclopédie*, that contributed to the seminal École Polytechnique in Paris, where, with the full force of the epoch's intellectual ammunition, theoretical physics was reconceived as technical physics. (4) It is well known that Descartes, Pascal, and Leibniz understood *mathesis universalis* to be the universal science of calculation [*Kalkül*]. Calculation, however, is a method that can be applied to certain elements (objects [*Gegenstände*]) without having to think about the meaning of these elements (objects). Descartes found this kind of intellectual mechanics embodied only in animals; Pascal taught explicitly that the human being is also a machine and that, above all, thought has a mechanical dimension; Leibniz, I suspect, derived thought entirely from calculation and created in this way an intellectual ideology adequate for technical existence. Finally, to add yet one more name, Laplace recognized the hidden demonology of our intellect's mechanics, which is capable of such incredible works—and Goethe, in his now famous speech given at the opening of the mines in Ilmenau, restated this demonology for the first time with a nearly medieval dread, but in his unhurried prose he ascribed to technics all those premises that belong to it.

As I noted above, the classical mechanical stage of technical existence comes to an end with the entrance of thermodynamic processes into the natural sciences and technical production. Of course, this development reaches back—practically—to Papin's steam digester and—theoretically—to Laplace's theory of probability, which Pascal also prefigured. But here, the significance of these discoveries revealed itself. One began to encounter machines that carried out more than just mechanical processes. One began to calculate processes—thermodynamic processes—that are nonreversible and exclude the possibility of returning completely to an initial condition and which were thus named "irreversible processes" according to later, more exact descriptions. In contrast to the mechanical view of nature, which was based on a visible, calculable, and reversible understanding of nature, the thermodynamic view of nature represented a nonreversible, a nonrepeatable understanding of nature. And technical structures that were developed from these principles naturally

bore the sign of this new nature and bore witness to the existence of irreversible processes. The old dreams of machinists, the dreams of an eternally ticking clock and of first- and second-order perpetual motion, were thus destroyed by thermodynamicians.

One could almost say here that, for the first time, the old simile of the body or soul as a clock was emphatically altered. This notion stretches back at least to the time of Rheticus, but it assumed with Calvin the measure of a deistic theology of predestination, an authoritarian theocracy of God's communization and, furthermore, an economic overvaluation of the clock industry in Geneva. The clockwork analogy then returned with Pascal and Leibniz to undergird the foundations not only of cosmology but of the historical chronology of the eighteenth century and its theology of Calvinism and deism. Simultaneous to the development of technical existence's thermodynamic stage, discoveries occurred that were to lead to the next stage in technics' essence [*Sein*], its electrodynamic stage. In 1861 and 1862, James Clerk Maxwell published his famous equations containing a complete theory of, on the one hand, the electrodynamic stage of the natural sciences and, on the other, the technical existence of generators, motors, oscillators, and resonators. It is notable that with the decline of technical existence's mechanical stage and the advent of technics' thermodynamic and electrodynamic moment, sociological, economic, ethical, and political interests in technical phenomena arise that are gathered up in Marx's class theory of historical materialism. In his analyses, which quickly, all too quickly ossified into ideology, technical existence is understood no longer as an existence proper to the individual, but rather belonging to society, the class, the mass. The technical stage recognizes that there will come an age in which society will become classless and the state will wither away. Technical consciousness, which was originally a mathematical, aesthetic, and rational consciousness, expands itself, satiates itself, and becomes at the same time a social, economic, political, class-militant, ethical, revolutionary, and historical consciousness. Hegel left a deep mark on the emerging stages of thermodynamic, electrodynamic, and atomic viz. radio-frequency technical existence. We observe that everything is present in the tradition of modern technical existence, everything that belongs to nature, culture, civilization, aesthetics, ethics, theology, science, philosophy, and politics. From this enormous complex, we can gauge how dense, how ramified, how fraught the theory of technics must be if it seeks to justify itself in relation to its past as well as its future. This theory reveals that, in reality, the technical world constitutes just one layer of many technical stages that must be excavated with the most refined historical and technological methods if one seeks to lay bare its traditions and origins. An archaeology

of the technical world is required to render it intelligible. It unearths the defining features of the individual stages. These are: the clock—or rather, the comparison of the human to the clock—in the realm of mechanics; Carnot's cycle in the sphere of thermodynamics; Faraday and Maxwell's electrodynamic notion of the field and its vectors of force; and last, the wave measurements of radio-frequency engineering and atomic physics. This series constitutes a decline of apparent visibility [*Anschaulichkeit*] and a rise of abstraction, which is binding for scientific theory as much as for technical praxis. Yet every feature that defines one moment is absorbed by the next. The analogy of the clock transforms into the thermodynamic cycle. And in a certain sense, Schrödinger's wave measurement recovers the image of Faraday and Maxwell's electromagnetic field. In fact, even the old image of the pendulum and the clock is preserved in the idea of amplitude in wave mechanics, if as an abstract, mathematical metaphor.

12.

The character of technical stages and thus the temporally situated essence of technical existence does not reveal itself only in these representative features—that is, in the shape of the technical moment. Every technical stage has a characteristic, polyvalent relation to space and time. An analysis of these relations must be added here in order to sketch an idea of the traditions of technical existence.

One may be easily inclined to associate a notion of temporality only with technics' mechanical stage. But that would be too one-sided: the clock offers only a mechanical notion of time. I would name it dead time—to borrow the incisive language of Friedrich Georg Jünger—which foreshadows the dead, empty, reproducible, circular time of Huygens's eternal *horologium oscillatorium* from 1673, embodied, as it were, in his 1657 patenting of the "pendulum clock," which patent the great physicist filed in the States-General of the Netherlands.

But the thermodynamic stage of technics presents a new concept of time, one admittedly far more abstract but nevertheless not without substantial impact on our worldview. The thermodynamic stage achieves this with help from the concept of entropy [*Entropie*]. Since, put simply, entropy is a measure of heat that can no longer be converted into work, and since, following probability theory, the entropy of the world tends toward a maximum, then the amount of entropy is a measure for the time of the world. Of course, thermodynamic time is the time of nonreversible natural and technical processes—so to speak, the classical time of technical perfection as pure progress, not the mechanical time of hands passing periodically around the clockface. Thermodynamic time, that is, consists of real, objective change.

Ultimately, technics' electrodynamic stage produced a new conception of time, one that is also highly abstract. Maxwell's famous equations established the idea of a field in empty space that requires no supporting medium but acts as its own object of physical analysis. The electrodynamic stage of temporally variable fields uncovered the underlying manifold of interrelated natural phenomena, thereby also revealing the electrodynamic interrelation of all kinds of energy, an idea of great relevance to technics. The field regulates the diffusion of energy. This diffusion takes place at the speed of light—as has been theoretically determined with apodictic certainty. Thus, light speed enters into the electrodynamic stage of temporally variable fields, and this universal principle reveals itself more and more to be a limit condition of velocity. As such, the absolute speed of light must be understood to be independent of the relative motion of its source. At the same time, theory was forced "to discard all belief in the objective meaning of simultaneity," as [Hermann] Weyl explains.[9] This means, however, that the synchronizable function of the clock, which was obviously bound to an old notion of simultaneity, had to be abandoned. There was no longer any "simultaneous" clock-time. The former, classical clock-mechanics of Galileo, Newton, or Huygens reappeared, according to Lorentz, Einstein, and Minkowski, as a relative field mechanics situated within a four-dimensional time-space continuum, which is now understood as the "world." In this new cosmic scheme, time no longer possesses any independent status. But due to the time-space synthesis, it nevertheless worked its way into matter, in the sense that mass became a factor of velocity.

Finally, the newest plane of the technical world, the atomic, radio-frequency stage, developed its own notion of temporality, its own measurable clock-time. This atomic, radio-frequency time is also no empty, dead time of a periodically rotating clock. Rather, it is the time of decay of radioactive substances, the half-life. This is a progressive dynamic. The decay of radioactive substances cannot be reversed. The amount of decayed substance in the world is a thoroughly objective and real temporal measure for the inventory of the world. What duly stands out is how the thermodynamic stage has overcome the analogy of the clock and the old notion of clock time. Instead of dead, periodic time, a time indifferent to the world, a fraught, prospective, dynamic time takes its place, a time that demonstrates an alteration of world-matter by means of its very measurement. We must realize these historical phenomena in order to recognize how much we have departed from the mechanical stage of the technical world, which was still reliant on the empty, Kantian, categorical conception of time.

Along with the changing relationship to time, the relationship to space also changed during the various stages of the technical

world. For instance, I might recall here that mechanical technics was linked to a macrophysical dimension of matter and space. The mechanical stage of the technical world is the macrophysical stage. There, one still remains within the limits of natural observation, within the natural worldview that, since the days of Galileo's perception of macrophysical space purely as such, has increasingly lost its labyrinthine character and, in the process, has become of lesser and lesser import. All this changes resolutely with the emergence of the technical world's thermodynamic stage and its theory of physics; namely, the theory of kinetic gasses. Here, one can no longer speak of a material's mass in any naive sense of the word. Instead, one can speak only of the velocity of molecules and the probability of their arrangement. With this realization, technics is compelled to force its way anew into the natural matter of macroscopic mechanics. Here, molecules become elementary. What the elementary loses in visibility and rational clarity, it gains in hypothetical possibility, and therefore the intellect [*Intelligenz*] must become accustomed to probability, rather than certainty—a formidable and easily underestimated rupture in the intellectual disquiet of the mind [*Geist*] and the world that it inhabits. Obviously, this situation is strengthened by the development of the newest layer of the technical world, where processes are relocated into the interior of molecules, indeed at the very inner core of atoms, in the realm of electrons, positrons, protons, and mesons. But these realms remain completely hidden from any unaided mode of visibility. Furthermore, we know that the rational control of this subatomic realm is restricted by certain fundamental limits, limits we can determine precisely but which nevertheless cannot be superseded. Yet perhaps strangest of all, we ourselves are implicated in the very processes and structures of this rational world that is principally inaccessible to us. We work with the effects derived from these hidden, labyrinthine zones, manipulate their energies, reckon with their probabilities, and calculate the economic and political risk of such forces, because even our restricted, rational grasp of these fragile things has not been able to shake our ancient, essential trust in the inert quiescence of matter.

What does this overview of technical traditions reveal? It reveals that, excepting the traditional experience of craftsmen, whose deepest sources lay buried in the ancient world, the late-scholastic *scientia experimentalis* of Bacon, Nicole Oresme, and Occam remains alive in the history of Western technics; that the artistic and scientific trends of humanism and the Renaissance reciprocally informed one another; and that the achievements of classical rationalism have been preserved along with Christian and metaphysical conceptions of the existence and sense of the world. These technical traditions are tantamount to the intellectual tra-

ditions of Western thought, and the world that produced these traditions is an essential, visible segment of a continuous arc of being [*Seinsstromes*] that exhibits an extraordinary capacity to be influenced by the most diverse array of sources. Thus, discontent in the technical world must be understood not least as discontent with an unavoidable intellectual trajectory [*Geistesstrom*]: for every intellect [*Intelligenz*] that participates in this tradition, disaccord with technics will constitute a fundamental paradox.

13.

If I have devoted so much time to the traditions and layers of the technical world, it is because such an analysis strikes me as essential for understanding the nature of technical existence. Now, at long last, I can draw attention to the unique and dangerous fact that our knowledge of the natural world and our comprehension of technical existence have begun to diverge more and more. Originally, technics meant nothing other than the application of our knowledge of the natural world. The early technical stage, namely the age of mechanics, is defined by this simple correspondence between knowledge and nature. In fact, technical creations [in the age of mechanics] are actually nothing more than operations distilled from the context of natural existence and the material course of events. Simple machines like the lever, the pulley, the scale, or the wedge already exist in the world as acts of nature. Theoretical physics and technical physics in the age of mechanics have the same objects: they possess a worldview [*Naturansicht*]. At no point do these technical structures deviate from the mathematical equations that have been established for natural processes.

All of this changes in the thermodynamic stage of technical existence. For the first time, structures appear that have no equivalent in the natural world. The principles of such structures may already exist, but not the realization of these principles in the specific machines of thermodynamic technics. The molecular processes described by the kinetic theory of gasses went unnoticed in the natural worldview, but this theory grasps the structures and operations of technical thermodynamics only in an ideal and abstract manner. Here, a certain discrepancy appears between the theoretical and the technical depiction of thermodynamic processes. The role of differential equations in the former and the role of graphical methods in the latter express this discrepancy only approximately. Already at this point, the structures of the technical world's thermodynamic stage behave unnaturally and untheoretically.

This paradoxical tendency reaches an apex with atomic, radio-frequency technics, in regard to both operation and structure. Interactions are characterized here entirely by the fact that, in

this technical world, everything reflects a distinction between so-called positive and negative electricity, a distinction that is postulated by science following the results of certain experiments, but that, as yet, lacks a plausible theory. Thus, all structures constructed on electro-technical, atomic-physical, and radio-frequency principles are predicated on a distinction that lacks a theoretical foundation but must, to an extent, be factored into the technical process. Moreover, a definitive theory of this technical world of atoms and radiation, which is characterized by a finite number of elementary particles, is still being refined. This does not hinder us, however, from grounding certain technical structures on a hypothetical view of matter, so that with the help of these "hypothetical" structures we can, in actuality, destroy the world. The highly abstract theory of elementary particles and electromagnetic radiation is, in principle, unnatural. While it facilitates a conclusive understanding of the experiments conducted with the cyclotron and klystron, particle accelerators, and radar, it does not communicate the residual trace of technical reality that still belongs to these state-of-the-art products of the technical world's most advanced stage. Within this sphere, theory grasps only a fragment of the real structures. The countless parameters of reality—the functionality of oscillators, of linear beam vacuum tubes, or of the electromagnetically driven cyclotron—do not enter into this theory. Theoretical physics at this scale may perhaps be made controllable by differential equations, eigenvalues and boundary values, or phasors and matrices. Technical physics, however, proceeds with laboratory experiments of an esoteric kind, established on the empirical procedures of circuit diagrams, graphical tables, and approximative methods.

In a theoretical sense, this is reflected in the transition from Lagrange velocity equations to Faraday-Maxwell field equations. But this transition represents a qualitative shift, which is illustrated strikingly by the fact that the process of abstraction that leads to Lagrange's equations still originates in natural structures, a category to which the process of abstraction relied on by the Faraday-Maxwell equations no longer refers.

In the mechanical world, a theoretical equation describes not only the principle but the reality of a structure and its capacity for action. In the atomic and electromagnetic world, a theoretical equation describes only the principle, while the technical reality, as a result, must fall back on pure empiricism. This is of chief significance for the future of technics. It lies entirely within the realm of possibility of technical development that certain technical processes may be discovered whose development will elude all rationality, both in principle as well as in reality. Here, the technical domain reaches its own boundaries and realizes its

ontological limitation.

14.

This presentation of the archaeology and physiognomy of the modern technical world would be remiss if I did not discuss the growing sensitivity and fragility of technical structures. By this I mean the utterly strange fact, physically and technically explicable though it may be, that the technical inventions of the mechanical stage, still categorically comparable with natural phenomena, possess an easily manageable, finite number of parameters that come ready to hand and render the technical instruments themselves imperceptible in the face of vigorous use. At the same time, the creations of technical existence's most denatured stage, namely, the stage of atoms and radio-frequency waves, evince an overwhelming array of parameters, causing these instruments—oscillators, circuits, sonar, cyclotrons, vacuum tubes of all kinds including cathode ray tubes and radar devices, ultracentrifuges, and ultrasound machines—to demonstrate an extraordinary sensitivity toward, for instance, meteorological phenomena, body capacitances, and loose contacts, that brings about a degradation into a kind of technical decadence. This justifies my claim *that in the technical world, too, the higher forms are also the weaker ones*, so much so that a simple mechanical wedge or lever is, in and of itself, more stable and more durable than a modern ultra-shortwave generator or a finely tuned Geiger counter. I should add that the instability in the core of the transuranic elements that we are able to synthesize today through a series of atomic processes only ever increases; in fact, it is precisely this quality that distinguishes "light" nuclei from the rest of the "heavy" elements produced by neutron capture.

From this, I conclude that the stability of a progressively perfecting and highly developed technical world whose inventions are, as technical inventions, both highly sensitive and short-lived—that is, a technical world of the highest categorical level—is extremely fragile and brittle, susceptible even to material degradation. In fact, these inventions of the highest technical stage share this quality with the most refined and aesthetically developed compositions [*Gebilde*] and entities. It almost seems like those most developed sociological structures [*Strukturen*] that fundamentally mark the technical world and its technical existence are distinguished by this same functional fragility. If one realizes the sensitivity of our contemporary sociological structure to the effects of power in either a constructive or destructive sense, then one can easily imagine the degree of suspiciousness [*Suspektabilität*] that the sociological structures of the technical world's higher stage of perfection would display toward revolutions and renaissances.

In this sense, I should point out that our *aesthetic* formation [*Bildung*] is fundamentally broader and deeper than our *ethical* formation. The modern intellectual [*Intellektuelle*] is more subtle, more cultivated, more certain, and more unequivocal in questions of taste than in questions of morality. Our aesthetic tradition is more durable than our ethical tradition. Indeed, the greatly sophisticated style evident in art since the Renaissance was an achievement that shaped Europe . . . right down to the masses. Conversely, there has been no great ethical achievement since the Renaissance. Even the moral imperatives of the Enlightenment have not succeeded to educate us or become popular, and we know what little remains of Christian teaching in the moral life of the individual. Moreover, it seems that two enormous, continental wars have brought about no concrete ethical reckoning. As a result, ethical thought remains retarded behind rational and technical thought. The existential paradoxes of the technical world that have erected themselves between intellect and morality must be sublated through a change in our self-conception. This is possible. We are still historical beings. The historical is, by definition, that which allows variation. Radical change of the sociological world-structure at both a social and individual depth will then be the precondition for sublating the paradoxes of the technical world.

If there is a technical ethos that would be salvageable from the idea of technical formation, then it must be related to the possibility of our technical self-destruction and to the borders of a reality conditioned by technics. Only then will we find ourselves compelled to assume an attitude of normative radicality toward technical structures and their world, a radicality that, serving as a new kind of transcendentality, will one day prescribe what can be constructed or industrialized. Within the growing process of perfection that is our technical world, our ethical impulse will act as a technical barometer that reigns in our realization of technical ideas, alongside its function as the moral barometer that sets the limits to our actions. And again, the fragility and sensitivity of both technical structure and technical existence will impel us to follow this limiting ethos. In this way, we will proceed to perfect the technical world. But knowledge of the real, ontological principles of being [*der realontologischen Seinsprinzipien*] is a prerequisite; the acquisition of a precise theory for the categories of all technical forms must be the precondition for any normative, technical existence. So long as this world constitutes a completely realized, intelligible world of pure matter, there is no possibility for intellect [*Intelligenz*] to exist outside of a theory of the world that it inhabits.

15.

At the end of this excursus into the tradition and existence of technical forms, I return to my original question: What is the meaning of intellect [*Geist*] in a technical world? I have emphasized that the role of intelligence [*Intelligenz*] in this world means first of all the role of functional rationality, a rationality that governs, regulates, and preserves. It must play the role of necessity. Yet the possession of intellect is that old, marvelous, suspect luxury of culture that we mistrust most fiercely when we do not possess it. This luxurious role of the intellect in the technical world does not serve a functional reason in possession of the theorems of its own governance but rather a creative rationality possessing the theorems of augmentation, multiplication, and progressive perfection.

Only a creative rationality rooted in theorems of progressive perfection mitigates the efficacy of this world's aporias. Here, I mean the efficacy of all aporias, big and small, from Pascal's old aporia of mankind's misery and grandeur to the modern aporia of the incompatibility of humanity and ideology. These two fundamental aporias of society are related. And they still relate to one another in the technical world. The misery and grandeur of human life in the technical world continuously produce a call for both greater humanity as well as ideological dogmas. But what we gain in ideology we lose in humanity, whether we like it or not. Human beings never cease to create ideologies in order to assuage misery, and it never ceases to become clear that these ideologies endanger the survival of humanity.

We should do away with the frivolous luxury of ideologies in order to grant the mistrusted luxury of intellectual freedom its rightful place, even in the technical world. For technical existence—which has become reality and in which we now participate—is more severely threatened in an imperfect technical world than in a perfected one. Ideologies hinder the progressive perfection of the technical world with the promise of a fundamentally unattainable happiness. The suspect luxury of the free intellect in the technical world means nothing other than ensuring that creative rationality remains in possession of the theorems of the world's perfectibility: that is, in possession of the theorems that could fundamentally sublate the aporias of this world. This luxury is priceless. It is an existential luxury. It is the luxury of an intellect that has rejected ideologies in order to win back existence, the luxury of an intellect that keeps technics from ossifying into an ideology and from finally destroying the fragile vessel of our thoughts and actions.

Notes

Originally published as Max Bense, "Technische Existenz," in *Technische Existenz: Essays* (Stuttgart: Deutsche Verlags-Anstalt, 1949), 191–231. I am indebted to Zeynep Çelik Alexander, Moritz Hiller, Sebastian Klinger, and especially Eric C.H. de Bruyn, whose insightful remarks greatly improved this translation. All notes are my addition.—*Trans.*

1. *Intelligenz* appears frequently throughout the essay. The general sense is of society's collective intelligence, not unlike the "general intellect" in Karl Marx's *Grundrisse der Kritik der politischen Ökonomie*, though for Bense this is embodied by "intellectuals" (*der geistige Mensch*) who enact that intelligence in the form of technics. Depending on linguistic constraints, *Intelligenz* is translated here variously as "intelligentsia," "intelligence," or "intellect." To avoid ambiguity, Bense's original German has been supplied in brackets as a gloss.

2. *Geist*, too, is a favored concept of Bense's and equally challenging to translate. The overdetermination by the long philosophical, theological, and metaphysical traditions burdening the term is well known. This translation employs several related words to render *Geist* and its derivatives, including "mind/mental," "theory/theoretical," and "concept/conceptual." Chief among them, however, are "intellect" and "intellectual," as it is *Geist* that ultimately underlies society's *Intelligenz*. In Bense's case, the connotation of *Geist* is always rational, scientific, and mathematical. In the same volume in which "Technical Existence" first appeared, Bense declares, "Der Geistige ist Rationalist. Das heißt, er ist ein Wahrheitszeuge der Wissenschaft" (To be a person of *Geist* is to be a rationalist. That is, a witness to the truth of science; 85). Two years later, in his "Manifest des existentiellen Rationalismus," Bense offers this even more succinct formulation: "Mathematik ist immer Geist" (Mathematics is always *Geist*). Max Bense, "Manifest des existentiellen Rationalismus" (1951), in *Ausgewählte Schriften in vier Bänden*, vol. 1, *Philosophie*, ed. Elisabeth Walther (Stuttgart: J.B. Metzler, 1998), sec. 17; 4.

3. Bense appears to be alluding to the New Testament and Paul's epistle to the Romans: "Ihr aber seid nicht im Fleische, sondern im Geiste, wenn anders Gottes Geist in euch wohnt; wer aber Christi Geist nicht hat, der ist nicht sein" (Römer 8:9, Schlachter-Bibel). Compare Romans 8:9 (KJV): "But ye are not in the flesh, but in the Spirit, if so be that the Spirit of God dwell in you. Now if any man have not the Spirit of Christ, he is none of his."

4. Friedrich Georg Jünger (1898–1977), German essayist, political activist, novelist, and poet. The younger brother of writer Ernst Jünger, Friedrich Georg cut a complicated political profile in the decades after World War I, agitating for a socialist nationalism, opposing the ineffectual parliamentarianism of the Weimar Republic, and ultimately adopting a Leninist anti-imperialism that advocated a technocracy of soviets to rearm Germany for what he foresaw as the impending, inevitable continuation of the war against Europe's imperialist heritage. Associated in the interbellum period with prominent figures of the German Left such as Bertolt Brecht, Georg Lukács, and Ernst Niekisch, Jünger was a target of Gestapo suppression while the National Socialists held power. Jünger reoriented his politics after his encounters with the National Socialists, whom he viewed as a symptom of society's surrender to extreme rationality and technology. He articulated this critique in the 1939 essay "Illusionen der Technik," though it was hindered from publication in 1940 due to its political untenability; printed but destroyed by a British bombing raid in 1942; printed again and again destroyed by a British bombing raid in 1944; and finally released in 1946 under the ironic title *Die Perfektion der Technik*, translated into English by F.D. Wieck as *The Failure of Technology: Perfection without*

Purpose (Hinsdale, IL: H. Regnery, 1949). Although the text advances a critique of techno-optimism, a valorization of "nature," and an admonition for environmentalism, its positions are not identical with the shibboleths of the Left that would emerge under the same signs after the war. The thrust of Jünger's argument bears a decidedly reactionary, culturally conservative flair. In this neoromantic return to nature as homeland, with all its racial and ethnic overtones, Jünger is comparable to his brother Ernst as a representative of the "reactionary modernism" identified in Jeffrey Herf, *Reactionary Modernism: Technology, Culture, and Politics in Weimar and the Third Reich* (London: Cambridge University Press, 1984). Jünger's theory of *Technik* also greatly influenced Martin Heidegger and the similarly reactionary lens applied in the latter's 1954 "The Question Concerning Technology." In 1948, Bense published a review of *Die Perfektion der Technik* in the journal *Merkur*, criticizing Jünger for failing to "speak the language" of technics and grasping nothing of technics' essence, "das 'Sein der Technik.'" Bense attacks Jünger's notion of the technical as merely that of the mechanical, and his understanding of perfection as failing to adequately capture the ambiguity of the term. As Bense's review ends with a demand for an analysis of "technical humanism," "Technical Existence" is in one sense an extension of the response to Jünger's work. See Max Bense and Helmut Günther, "Die Perfektion der Technik: Bemerkungen über ein Buch von F.G. Jünger," *Merkur* 2, no. 2 (February 1948): 301–10.

5. Here Bense invokes a well-worn twentieth-century interest in the dynamics of insect societies, one that focused in particular on ant and termite colonies. A key concept in this discourse is that of polymorphic differentiation, which suggested the insects' capacity for "technical" expression. See, for example, Niels Werber, *Ameisengesellschaften: Eine Faszinations-geschichte* (Frankfurt: S. Fischer, 2013). I am grateful to Geoffrey Winthrop-Young for helping to decode this passage.

6. Bense alludes here to a passage from Friedrich Engels's *Anti-Dühring*: "Das Eingreifen einer Staatsgewalt in gesellschaftliche Verhältnisse wird auf einem Gebiete nach dem andern überflüssig und schläft dann von selbst ein. An die Stelle der Regierung über Personen tritt die Verwaltung von Sachen und die Leitung von Produktionsprozessen. Der Staat wird nicht 'abgeschafft,' *er stirbt ab*. Hieran ist die Phrase vom 'freien Volksstaat' zu messen, also sowohl nach ihrer zeitweiligen agitatorischen Berechtigung wie nach ihrer endgültigen wissenschaftlichen Unzulänglichkeit; hieran ebenfalls die Forderung der sogenannten Anarchisten, der Staat solle von heute auf morgen abgeschafft werden." Friedrich Engels, "Herrn Eugen Dühring's Umwälzung der Wissenschaft," in *Karl Marx, Friedrich Engels—Werke*, ed. Institut für Marxismus-Leninismus beim ZK der SED, vol. 20 (Berlin: Dietz, 1962), 262. See Friedrich Engels, *Herr Eugen Dühring's Revolution in Science* [1876–1878], trans. Emile Burns, vol. 25, *Marx and Engels Collected Works* (London: Lawrence and Wishart, 1987), 268: "State interference in social relations becomes, in one domain after another, superfluous, and then dies out of itself; the government of persons is replaced by the administration of things, and by the conduct of processes of production. The state is not 'abolished.' *It dies out.* This gives the measure of the value of the phrase 'a free people's state,' both as to its justifiable use at times by agitators, and as to its ultimate scientific insufficiency; and also of the demands of the so-called anarchists for the abolition of the state out of hand." In some English translations, "dies out" is rendered as "withers away."

7. For a longer consideration of this transliteration and its latent persistence in English-language discussions of *Technik*, see Eric Schatzberg, *Technology: A Critical History of a Concept* (Chicago: University of Chicago Press, 2018), 97.

8. Martin Wackernagel (1881–1962), Swiss art historian. Wackernagel began his career with studies of the Apulian sculpture of the High Middle Ages and German architecture of the seventeenth and eighteenth centuries. His best-known work, *The World of the Florentine Renaissance Artist: Projects and Patrons, Workshop and Art Market* (1938), examines the social, political, and economic dynamics conditioning Florentine art in the fourteenth and fifteenth centuries, including systems of patronage, religious-artistic complexes, and workshop production.

9. Hermann Weyl, *Space-Time-Matter*, trans. Henry L. Brose (London: Methuen, 1922), 174.