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When Teleconferencing was the Future: The 1970 'Medizin Interkontinental' Transmission and West German Medicine in the Space Age

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Abstract

In March 1970, the first ever medical teleconference connected U.S. aeromedical experts in Houston and San Antonio to an audience of 25,000 physicians in congress centres in West Germany, Austria, and Switzerland. As this article shows, the 'Medizin Interkontinental' transmission was a costly demonstration of the latest developments in satellite telecommunications and projection technology as well as a stage for space-age visions of the future of medicine in the aftermath of the moon landing. Audio-visual and space technology became, at one at the same time, the medium and the message of medical futurity. As I argue, the teleconference was an audio-visual techno-spectacle that marked the culmination of the German medical community's infatuation with futurology at the end of the 1960s, but it was also contingent on the concrete interests of the parties involved, which included the German Medical Association, medical futurologists, NASA, the U.S. Air Force, and the Swiss pharmaceutical company Ciba. Decades before teleconferences and telemedicine entered day-to-day medicine, the convergence of new medical and media technology, changes in medical education, Cold War geopolitics, and pharmaceutical sponsorship created a brief glimpse of a technology-based future of medicine that fell apart once these constellations changed in the early 1970s.

Keywords

contemporary history of medicine – aerospace medicine – futurology – medical education – telecommunication – telemedicine – transatlantic history – West Germany

1 Introduction

Half a century ago, medical telecommunications entered a new era. On the evening of 13 March 1970, more than 25,000 physicians had gathered in congress centres and lecture halls in West Germany, Austria, and Switzerland to take part in a novel kind of medical conference. The event 'Medizin Interkontinental' had been advertised as a major moment in the history of medicine and telecommunication technology.[1] Cutting-edge satellite technology and broadcasting equipment would for three hours create a transatlantic "television bridge America-Europe" and bring together physicians in the United States and the German-speaking countries of Europe for the first ever medical teleconference.[2] The audience in Europe watched live lectures and demonstrations from leading U.S. experts in space medicine and oncology in Houston, San Antonio, and Chicago, and local panellists could pose questions directly to their American counterparts. Apart from being a practical demonstration of new communication technologies in medical education, this was a highly symbolic event. 'Medizin Interkontinental' played directly to the sociotechnical imaginaries of the late 1960s and told a story about the future of medicine in the 'space age' (see Fig. 1).[3]

That this first ever medical teleconference in 1970 was as much about the future as about the present was no coincidence, but was reflective of broader trends. Recent advances in medical technology and biomedicine had created a climate of pervasive optimism about the continuing progress of medicine, and by the end of the 1960s, futurology was arriving in medical circles. Medizin Interkontinental was the spectacular highlight of the 18th Continued

1 Josef Stockhausen, "Medizin interkontinental," *Deutsches Ärzteblatt* 67 (1970), 143–144. Parts of the transmission survive in the Novartis AG Company Archives (CIBA_909.1.1: Medizin Interkontinental I / CIBA_913.1.1: Medizin Interkontinental III) as digitised 16mm film records of the projection screened in Davos.

2 Werner Kayser, "Fernsehbrücke Amerika-Europa für ärztliche Fortbildung: Medizin interkontinental mit Eidophor," *Ciba-Blätter* 27 (1970), 14–20.

3 Sheila Jasanoff, "Future Imperfect: Science, Technology, and the Imaginations of Modernity," in *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*, ed. Sheila Jasanoff and Sang-Hyun Kim (Chicago, IL–London, 2015), 1–33; on the history of the 'space age', see Steven J. Dick, ed., *Remembering the Space Age: Proceedings of the 50th Anniversary Conference* (Washington D.C., 2008); for recent historiographic approaches to past futures, see Rüdiger Graf and Benjamin Herzog, "Von der Geschichte der Zukunftsvorstellungen zur Geschichte ihrer Generierung: Probleme und Herausforderungen des Zukunftsbezugs im 20. Jahrhundert," *Geschichte und Gesellschaft*, 42 (2016), 497–515; Zoltán Boldizsár Simon and Marek Tamm, "Historical Futures," *History and Theory*, 60 (2021), 3–22; Armin Grunwald, *Technikzukünfte als Medium von Zukunftsdebatten und Technikgestaltung* (Karlsruhe, 2012).

FIGURE 1 "The satellite transmission starts …".
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Education Congress of the German Medical Association, held in parallel in the Alpine resort towns of Davos and Badgastein. The theme of the congress was 'Medicine 1980', and the transatlantic transmission was framed by talks forecasting the future trajectories of medicine and its specialisms. Moreover, recent events outside of medicine also shed their light on the event. Less than a year after the moon landing, space flight and space technology still were at the centre of many visions of the future. The transmission directly connected European physicians to the centres of U.S. space medicine and used the most advanced space technology to do so. As the emergence of satellite communications, biomedical telemetry, medical computing, and large-scale projection technology converged with widespread enthusiasm about the medicine, science, and technology of the future, visions of telemedicine and teleconferencing dating back to the first half of the century seemed on the verge of becoming a new reality.

Yet, the promised world of telediagnosis, teleconsultation, and teleconferences failed to materialise. Large-scale teleconferences would not enter mainstream use until the COVID-19 pandemic, and most telemedical applications are still experimental in the early twenty-first century. Although contemporaries had celebrated the transatlantic transmission of 1970 as an

event of historical importance and the harbinger of a new era, it soon fell into oblivion, and did not enter the still fragmentary historiography of telemedicine and medical telecommunication.[4] Nevertheless, the spectacle of the Medizin Interkontinental transmission can shed some light on the early history of telemedicine and medical telecommunications, as well as on their present. It is a reminder that the history of medical technologies is not only about realities but also about sociotechnical imaginings, which follow their own long-term trajectories. Medical telecommunications and telemedicine were about medical needs and technological innovations as well as about specific notions of biomedical progress that peaked at the end of the 1960s. But in their core, they remain integral to the project of Western biomedicine, even today. Telemedicine as a form of individualised, curative high-tech medicine emerged against this backdrop and has, through different projects and iterations, remained bound to these particular visions of a medicine of the future. While the recent historiography of telemedicine has mostly been limited to an account of successive technological innovations and improvements leading from experimental applications to mature technologies entering everyday clinical use, the story of Medizin Interkontinental opens up a new and broader perspective on medical telecommunications that is less linear and includes social, cultural, and political dimensions.

This article positions Medizin Interkontinental in the history of medicine, telecommunication technologies, and the socio-technical imaginaries of the space age. As I show, the 1970 transatlantic transmission happened when the advent of specific audio-visual and broadcasting technologies converged with the different interests of actors such as the German Medical Association, medical futurologists, the Swiss pharmaceutical company Ciba, and NASA, and created a short moment in which the realisation of long-standing visions of the medicine of the future seemed not only possible, but imminent. Moreover, even as most of the audience were West German physicians, this eminently transatlantic event played out against the backdrop of cold-war geopolitics. Medizin Interkontinental was made possible by the civilian use of technologies and infrastructures of the U.S. space programme and relied on audio-visual technologies of medical education that, as Kirsten Ostherr and David Serlin have argued, were closely associated with visions of medicine, technology,

4 Rashid Bashshur and Gary William Shannon, *History of Telemedicine: Evolution, Context, and Transformation* (New Rochelle, NY, 2009); Anton Vladzymyrskyy, Malina Jordanova and Frank Lievens, *A Century of Telemedicine: Curatio Sine Distantia et Tempora* (Sofia, 2016); Anton Vladzymyrskyy, Malina Jordanova and Frank Lievens, eds., *A Century of Telemedicine: Curatio Sine Distantia et Tempora. A World Wide Overview – Part II* (Sofia, 2018).

and scientific superiority integral to the superpower status of the United States.[5] The transatlantic 'television bridge' linked West German medicine to the United States and its imaginaries of future biomedical and technological progress. As American physicians demonstrated to their colleagues in Europe the latest advances and the potentials of medical computers and the devices used to monitor astronauts in space, the televisual signal crossed the Atlantic through a telecommunication satellite; U.S. space science and technology became both the message and the medium of medical futurity. Through the history of a singular event, this article explores the broader nexus between medicine, media, and politics and between audio-visual technologies and visions of medical progress in the long 1960s.

2 Medizin Interkontinental

In 1970, the live transmission of medical education lectures from one continent to another required cutting-edge space technology, the foundations for which had only been created during the preceding decade. The first satellite capable of transmitting television signals across the Atlantic, AT&T's experimental Telstar, launched in 1962. After the creation of an International Telecommunications Satellite Organization (INTELSAT) in 1964, the first commercial satellites arrived in geosynchronous orbit during the mid-1960s, and on 25 June 1967, the BBC could broadcast the first international satellite television production, *Our World*.[6] Nevertheless, despite its commercial uses, these satellites still were part of the governmental infrastructure of the space race, and most of the early Intelsat network served as conduits for the NASA Communications Network. From January 1969, the Intelsat III satellites created a global network that could be used for the transmission of live video of the moon landing on 20 July of the same year – the first truly global television event.[7] Global satellite bandwidth was still a scarce and expensive resource, but it now became available for experimental non-state and non-corporate uses such as a medical teleconference.

5 Kirsten Ostherr, *Medical Visions: Producing the Patient Through Film, Television, and Imaging Technologies* (Oxford–New York, 2013), 113; David Serlin, "Performing Live Surgery on Television and the Internet since 1945," in *Imagining Illness: Public Health and Visual Culture*, ed. David Serlin (Minneapolis, MN, 2010), 226.

6 Lisa Parks, *Cultures in Orbit: Satellites and the Televisual* (Durham, NC, 2005), 21–46.

7 Roger D. Launius, "Global Instantaneous Telecommunications and the Development of Satellite Technology," in *NASA Spaceflight: A History of Innovation*, ed. Roger D. Launius and Howard E. McCurdy (Cham, 2018), 57–87.

For the Medizin Interkontinental transmission, live images from the centres of U.S. space medicine in Houston and San Antonio and from U.S. oncologists in Chicago had to cross the Atlantic and arrive at a congress centre in Davos in the Swiss Alps. This was achieved by using AT&T transmission lines installed for the broadcasting of the moon landing, and then sending the signal through a recently launched telecommunications satellite of the Intelsat III series. On the European side, the signal was received by the German Federal Post's *Erdfunkstelle* in Raisting near Munich. For the further transmission to Davos, which went through several relays, the Swiss PTT had positioned two trucks with mobile radiated beam units in the Alps.[8] In Raisting, the audio-visual signal was also branched away to ten connected 'reception venues' in Germany, Austria, and Switzerland, including the halls of the Cologne and Frankfurt trade fairs, the congress hall of Munich's German Museum, Vienna's Hofburg, as well as to other venues in Berlin, Bern, Bochum, Hamburg, Stuttgart, and the Alpine resort town Badgastein.[9] A combined audience of about 25,000 physicians, about 4,000 of whom were participants of the congress in Davos, watched the simultaneous large-screen projection. At a time when television was emerging as the leading medium in Europe, the televised transmission became a media event for a mass audience spanning three countries.[10] However, for this to meet the description of a teleconference, the communication had to be bidirectional. The connection from Europe back to the United States went through a regular telephone line via an old-fashioned undersea cable. Participants could pose their questions through the local organisers at their respective venues, and a switchboard at the congress centre in Davos controlled the telephone line to the American counterparts. The three-hour transmission required a massive mobilisation of high-tech equipment and used a significant portion of the commercial satellite bandwidth available in 1970. The organiser and panellist Emil Graul estimated the overall costs at around 800,000 DM.[11]

Despite its military origins and its strategic role in the cold-war arms race, space technology was closely associated with visions of scientific, technological, and even civilizational progress. As intercontinental ballistic missiles threatened global annihilation, telecommunication satellites promised the

8 Kayser, "Fernsehbrücke," 20.

9 "Medizin interkontinental mit Eidophor," *Monatskurse für die ärztliche Fortbildung*, 20 (1970), 52.

10 Andreas Fickers, "Eventing Europe: Europäische Fernseh- und Mediengeschichte als Zeitgeschichte," *Archiv für Sozialgeschichte*, 49 (2009), 397.

11 Emil Heinz Graul, *Weltraummedizin: Der Mensch in der Zerreißprobe* (Berlin–Frankfurt am Main–Vienna, 1970), 13.

instantaneous international exchange of knowledge and ideas in the 'global village'.[12] The same tension was also inherent to the Medizin Interkontinental transmission. While the Chief Scientist of the Aerospace Medical Division at Brooks Air Force Base in San Antonio presented experiments in space medicine using U.S. soldiers as test subjects, the transmission was construed as an important triumph of science and peaceful international cooperation made possible through space technology. In his announcement of the event in *Deutsches Ärzteblatt*, the managing director of the German Medical Association, Josef Stockhausen, drew a direct line from the scientific and biomedical progress of the past decade to Medizin Interkontinental, and positioned the event at the verge of a new era of medical communication:

> For the exchange of scientific information between physicians, the oft-quoted seventies will begin with an event that will go down in medical history. After the decade of the heart transplant that, ending with the isolation of a human gene, has brought progress and futurity of an almost worrying and yet incalculable kind, follows a decade that for the first time will connect thousands of physicians over the borders of countries and continents through television and Eidophor [large-screen projectors], and via satellite for an intercontinental scientific exchange in sound and image.[13]

This lofty rhetoric of space and telecommunication technology as the basis of a new global community of scientists and, by extension, international cooperation, pervaded the teleconference and the media coverage. Images of satellites also played a prominent part in the visual representation of the event: an image of the (already obsolete) Telstar was used to illustrate the announcement in *Deutsches Ärzteblatt*, while in the advertising material for the event, the Intelsat III was shown as radiating stylised beams while flying over Earth,

12 Marshall McLuhan, *The Gutenberg Galaxy: The Making of Typographic Man* (Toronto, ON, 1962), 31; Hugh Richard Slotten, "Satellite Communications, Globalization, and the Cold War," *Technology and Culture*, 43 (2002), 315–350.

13 Stockhausen, "Medizin interkontinental," 143: "Die vielzitierten siebziger Jahre beginnen für den wissenschaftlichen Informationsaustausch der Ärzte in aller Welt mit einem Ereignis, das in die Medizingeschichte eingehen wird. Dem Jahrzehnt der Herztransplantationen, das mit der lsolierung eines menschlichen Gens endend Fortschritte und Zukunftsaspekte fast bedrückender und in ihrem Umfang noch gar nicht voll zu übersehender Art brachte, schließt sich ein Jahrzehnt an, das erstmals Tausende von Ärzten über Länder und Kontinente hinweg durch Fernsehen und Eidophor via Satellit zu interkontinentalem wissenschaftlichen Austausch mit Wort und Bild 'Verbinden wird." Translations are the author's, unless otherwise stated.

upon which the shadow of a moon-like object was cast, making it resemble a colossal human eyeball.[14] Following an announcement with technical controls and a countdown that mirrored the proceedings of a rocket launch, the first video image that the audience saw was an Apollo lunar landing module standing in front of a modernist NASA building, superimposed with the text 'live from Houston'.

The transmission itself began as part demonstration, part transatlantic summit: the demonstration was of the medical education technology of tomorrow, while the transatlantic summit entailed a meeting of the medical profession. With an intonation that evoked the first half of the twentieth century rather than the second, the off-screen voice of Albert Schretzenmayr, head of the German Senate for Continued Medical Education, ceremoniously declared:

> May our programme 'Medizin Interkontinental', besides paying our tribute to the technological and scientific wonders, also awaken our senses to the spiritual foundations of this age-old dream of humanity, for the communication between the peoples of this earth in peace, liberty, and progress, under an Olympian heaven. In this spirit, I call America![15]

America replied in the form of Gerald D. Dorman, president of the American Medical Association (AMA). Standing next to an American flag, Dorman delivered his entire address in German: "Grüß Gott, as they say in Munich." Delivering the compliments of 200,000 members of the AMA to their colleagues in Germany, Austria, and Switzerland, he reminded his audience of the distance bridged by the satellite transmission: "I speak to you while the sun is up in the sky, and you hear me in the evening after a busy day." In a time when simultaneous communication over continents was rare, the time lag was still a novelty. Dorman's address was answered by Ernst Fromm (1917–1992), president of the German Medical Association. Fromm in turn spoke in English, calling the transmission a "highlight in the very fruitful relationship between doctors of your and my country" and praising modern technology for bringing together "our world-wide family of doctors".

14 Josef Stockhausen et al., "Medizin über Kontinente hinweg: Die erste Live-Fernsehdiskussion via Satellit zur ärztlichen Fortbildung," *Deutsches Ärzteblatt*, 67 (1970), 963–971; "Medizin interkontinental mit Eidophor."

15 "Möge unsere Sendung, Medizin Interkontinental, neben unserem Tribut für das technische und wissenschaftliche Wunder unsere Sinne auch für die geistigen Grundlagen dieses alten Menschheitstraumes wachhalten und erwecken, für die Kommunikation zwischen den Völkern dieser Erde in Friede, Freiheit und Fortschritt, unter einem olympischen Himmel. In diesem Sinne rufe ich Amerika!".

The same narrative of international understanding through technological progress also shaped the broad public reception of the event. "The thirteenth of March 1970 will possibly go down as a defining date into the history of scientific congresses," wrote *Die Welt*; the *Hamburger Tageblatt* noted that "on Friday evening, medicine in the 1970s began with a technological sensation". The *Westfälische Rundschau* saw "a milestone for medicine in the space age" and concluded: "International science has moved closer together".[16] In the United States, the report that featured in *JAMA* was written along similar lines:

> This medicine from continent to continent broadcast was a bold step into international exchange of scientific medical information, on a direct basis and for mass audiences. It may be repeated at other times, to other countries and to other audiences. This may mark the end of isolation of separate scientific communities; indirectly, it may lead to better international understanding, to a feeling of inter-dependence between various national scientific communities, and to a faster progress of medicine and science throughout the world.[17]

Through a space-age teleconference, the scientific community and "worldwide family of doctors" were to become part of Marshall McLuhan's 'global village'. However, these visions of global unity achieved through space technology were hardly exclusive to medicine. To understand why the first transatlantic teleconference was part of a medical congress, and how it was shaped by competing visions of the future of medicine, one has to take into account the specific context of medical debates in which the event unfolded.

3 Medical Futurology

While Medizin Interkontinental was broadcast as a singular soirée in the various connected 'reception venues', it was also part of the programme of a larger congress that took place in parallel in Davos in Switzerland and Badgastein in Austria from 9 to 21 March 1970 (see Fig. 2). To mark the beginning of the new decade, the German Medical Association had made the medicine of tomorrow the topic of its 18th international Continued Education Congress. The theme of the congress, held concurrently in the two Alpine resort towns, was 'Medicine

16 Kayser, "Fernsehbrücke," 18–19.

17 "Satellite Links US Medicine With Europe," *JAMA: The Journal of the American Medical Association*, 212 (1970), 636–637.

FIGURE 2 Audience and panel at the screening in Davos.
REPRODUCED BY KIND PERMISSION OF *DEUTSCHES ÄRZTEBLATT*

1980'. It was the largest meeting devoted to the future of medicine to date, with a twelve-day programme and almost 4,000 registered participants.[18] The venue matched the theme: Davos had only recently completed the construction of a new congress centre, which, in the following year, would host the first World Economic Forum. The brutalist high-tech building was a fitting backdrop, and it provided some of the equipment needed for the transatlantic transmission.

The congress marked the arrival of medical futurology in the mainstream of the German medical community: what had previously been a fringe topic pursued by a small and diverse group of physicians and journalists, the German Medical Association now recognised as a worthy and relevant subject for one of the largest congresses for continued medical education in the world. The idea for Medizin Interkontinental had partly grown out of the rise of medical future studies in the late 1960s, and the transmission served as a practical demonstration of technologies associated with the predicted medicine of the future, so that the congress self-referentially would not only "present a futurology of medicine, but also a futurology of continued medical education".[19] However,

18 Stockhausen, "Medizin interkontinental," 143.

19 Josef Stockhausen, "Die Medizin 1980: Kongreßeröffnung in Davos," *Deutsches Ärzteblatt*, 67 (1970), 974.

the event was also the zenith of the reception of futurological ideas in West German medicine. Soon after 1970, larger economic and cultural trends began to shift against the techno-optimism of the late 1960s and made the high-flying visions of the post-war decades seem increasingly anachronistic.

Initially, the idea of a distinct medicine of the future was a by-product of the rapid advances in late-nineteenth century medicine. The scientific and clinical breakthroughs that began after the 1860s, revolutionised medical theory, diagnosis, and therapy, and lent credence to the view that medical progress would only continue to accelerate.[20] After the Second World War, this belief in biomedical progress gained further momentum. The widespread adoption of antibiotics and the introduction of the first viable psychiatric drugs promised the imminent victory over infectious and mental diseases.[21] The discovery of DNA, new radiological instruments for diagnosis and therapy, endoscopes and ultrasound scanners, the introduction of a polio vaccine, the increasing possibilities for organ transplants due to immunosuppressant medications, and the first successful experiments with artificial organs were just the most prominent medical innovations that in the course of the 1950s and 1960s contributed to a climate of pervasive optimism about the progress of science and medicine.[22] The advances of the present gave rise to high-flying visions of the future. The symposium 'Man and his future' held by the foundation of the Swiss pharmaceutical company Ciba in London in 1962 became a uniquely stark and noticeable example. The twenty-seven scientists who had gathered to explore the biological future of humanity outdid each other with radical ideas about the long-term trajectory of human evolution, population growth, and the possibilities for biological engineering.[23] Even the most egregious failures of modern medicine could be reframed as part of humanity's glorious future in space: The biologist J. B. S. Haldane (1892–1964) proposed the use of thalidomide, a substance that only recently had caused thousands of severe birth defects, to

20 Austin Flint, *Medicine of the Future: An Address Prepared for the Annual Meeting of the British Medical Association in 1886* (New York, 1886).

21 Scott H. Podolsky and Anne Kveim Lie, "Futures and Their Uses: Antibiotics and Therapeutic Revolutions," in *Therapeutic Revolutions: Pharmaceuticals and Social Change in the Twentieth Century*, ed. Jeremy A. Greene, Flurin Condrau and Elizabeth Siegel Watkins (Chicago, IL–London, 2016), 18–42; Nicolas Henckes, "Magic Bullet in the Head? Psychiatric Revolutions and Their Aftermath," in Greene, Condrau and Watkins, *Therapeutic Revolutions*, 65–96.

22 Anne Hardy and E. M. Tansey, "Medical Enterprise and Global Response, 1945–2000," in *The Western Medical Tradition: 1800 to 2000*, ed. William F. Bynum et al. (Cambridge, 2006), 391–403.

23 Gordon Wolstenholme, ed., *Man and His Future: A Ciba Foundation Volume* (London, 1963).

create the astronauts of tomorrow, envisaging cases of non-legged amelia producing astronauts unencumbered by legs – and their cost in terms of space occupied and calories burned with no benefits in zero gravity.[24]

The medical advances of the post-war decades, as spectacular as they were, were not the only reason for the popularity of future visions in medical circles. Even with the Cold War looming in the background and with concerns surfacing about the ecological consequences of the post-war economic boom, utopian visions of progress flourished in the 'long 1960s', fuelled by rising standards of living, the expansion of consumer society, cultural and political liberalisation in the West, the advent of new technologies like microelectronics, and the symbolism of such grand techno-scientific undertakings as the space programme.[25] West German physicians' interest in the future was part of the broader intellectual trends of the decade. Moreover, as Patrick McCray writes, "People have always looked *to* the future. But, in the late 1960s, a growing number of scientists, writers, and other experts were also looking *at* the future."[26] 'The new field of research came to be known as 'futurology', and grew from a variety of different places and approaches, from the United States, Europe, and the Soviet Union, from nuclear strategists as well as from state-critical pacifists. As recent histories of the field have emphasised, futurologists were never a monolithic group; they generated ideologically competing visions of different 'futures', rather than offering a unified common vision of the future.[27] However, the kind of futurology that held the most appeal to West German physicians in the second half of the 1960s were the forecasts and forecasting methods that emerged from the U.S. military-industrial complex.

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24 J. B. S. Haldane, "Biological Possibilities for the Human Species in the Next Ten Thousand Years," in Wolstenholme, *Man and His Future*, 337–361; Patrick Kilian, "Participant Evolution: Cold War Space Medicine and the Militarization of the Cyborg Self," in *Militarizing Outer Space: Astroculture, Dystopia and the Cold War*, ed. Alexander C. T Geppert, Daniel Brandau and Tilmann Siebeneichner (London, 2021), 221–223.

25 Arthur Marwick, "The Cultural Revolution of the Long Sixties: Voices of Reaction, Protest, and Permeation," *The International History Review*, 27 (2005), 780–806; Alexander C. T. Geppert, "Die Zeit des Weltraumzeitalters, 1942–1972," *Geschichte und Gesellschaft*, 25 (Special Issue: Obsession der Gegenwart: Zeit im 20. Jahrhundert) (2015), 218–250.

26 Patrick McCray, *The Visioneers: How a Group of Elite Scientists Pursued Space Colonies, Nanotechnologies, and a Limitless Future* (Princeton, NJ, 2012), 15.

27 Jenny Andersson, "The Great Future Debate and the Struggle for the World," *The American Historical Review*, 117 (2012), 1411–1414; on futurology in Germany, see also Elke Seefried, *Zukünfte: Aufstieg und Krise der Zukunftsforschung 1945–1980* (Berlin–Boston, MA, 2015); Achim Eberspächer, *Das Projekt Futurologie: Über Zukunft und Fortschritt in der Bundesrepublik 1952–1982* (Paderborn, 2019).

So-called 'Delphi' studies, which used the statistical evaluation of questionnaires and feedback techniques to elicit opinions about future trends from the collective knowledge of experts, had their origin in the war-gaming tools developed in late 1950s by researchers at the RAND Corporation.[28] In the mid-1960s, the use of Delphi forecasts had moved beyond the USAF-sponsored 'estimate of bombing requirements' to the prediction of much broader developments, which also included future medical developments.[29] A much-noticed 1964 'long-range forecasting study' conducted by RAND researchers Theodore Gordon and Olaf Helmer (1910–2011) examined topics such as expected scientific breakthroughs, population trends, automation, space exploration, and war and weapons systems into the twenty-first century. In the field of medicine, the expert consensus predicted the ability to replace organs through transplants and prosthetics by the early 1970s, the creation of artificial organs and a general immunisation against bacteria and viruses in the early 1980s, the growth of new organs and limbs in the early 2000s, and a fifty-year lifespan extension by the year 2020.[30] The U.S. pharmaceutical company Smith Kline & French conducted a similar study focused solely on forecasting medical developments in 1969.[31] The expected breakthroughs, which in retrospect ranged from the highly accurate to highly inaccurate space-age pipe dreams, were roughly the same as in the earlier RAND study, with the main difference being that the timeframes had become even more optimistic. Regardless of their predictive acuity, Delphi studies document the shared 'horizon of expectations' of U.S. medical experts, and the future medicine that emerged from them was powerful high-tech biomedicine, driven by predicted breakthroughs in biological science and cutting-edge technology, aided by computers, and able to treat and prevent illness ever more efficiently.[32]

28 Olaf Helmer, "Analysis of the Future: The Delphi Method" (Santa Monica, 1967); Theodore J. Gordon, "The Current Methods of Futures Research," in *The Futurists*, ed. Alvin Toffler (New York, 1972), 164–189; Jenny Andersson, *The Future of the World: Futurology, Futurists, and the Struggle for the Post Cold War Imagination* (New York, 2018), 85–97.

29 Norman Dalkey and Olaf Helmer, "An Experimental Application of the Delphi Method to the Use of Experts," *Management Science*, 9 (1963), 458.

30 Theodore J. Gordon and Olaf Helmer, "Report on a Long-Rage Forecasting Study" (Santa Monica, 1964).

31 A. Douglas Bender et al., "Delphic Study Examines Developments in Medicine," *Futures*, 1 (1969), 289–303.

32 Reinhart Koselleck, "'Erfahrungsraum" und "Erwartungshorizont': Zwei historische Kategorien," in *Vergangene Zukunft: Zur Semantik geschichtlicher Zeiten*, ed. Reinhart Koselleck (Frankfurt am Main, 1989), 349–375; for another contemporary Delphi on medicine, see George Teeling-Smith, "Medicines in the 1990's: Experience with a Delphi Forecast," *Long Range Planning*, 3 (1971), 69–74.

Yet, apart from documenting views that were already prevalent among experts, futurological studies created feedback loops that reinforced and spread specific visions of the future. The proceedings of the 1962 Ciba symposium and the 1964 RAND Delphi fell on fertile ground in West Germany in the late 1960s, where they became important and oft-quoted references in a growing discourse about the future of medicine.[33] Attempts to extrapolate sociological trends to forecast future developments in medicine were made by German physicians as early as 1962,[34] but it was the rise of U.S. and European futurology that pushed the medicine of tomorrow into the limelight of the medical community. Around 1970, it had clearly become a fashionable topic, expounded in numerous journal and newspaper articles, books, reports, and TV documentaries. The Davos congress marked the moment when medical futurology entered the mainstream, but it had already been circulating some years earlier.

One important focal point of medical futurology in West Germany emerged in Heidelberg and Stuttgart in 1967, when the regional medical council convened a commission to survey "prospective developments in medicine until the year 2000".[35] The commission, which became more widely known as 'Medicine 2000', centred around the physiologist Hans Schaefer (1906–2000) and the medical historian Heinrich Schipperges (1918–2003), whose perspective on the medicine of tomorrow was less focused on technology, was more sociological, and more ambivalent, but nevertheless shared the common futurological infatuation with cybernetics.[36] Schaefer was a fierce critic of expensive high-tech who saw the more desirable future of medicine in a fundamental reorientation towards prevention and community medicine[37] – even if that meant using forms of compulsion that "we, degenerate as we already are, casually

33 Fritz Hartmann, "Die Entwicklung der Medizin in den kommenden dreißig Jahren: Voraussagen und Hoffnungen," in *Medizin Heute und Morgen, Schriftenreihe der Gesellschaft der Freunde der Medizinischen Hochschule Hannover* 4 (Hannover, 1968), 10; Heinrich Schipperges, *Entwicklung moderner Medizin: Probleme, Prognosen, Tendenzen* (Stuttgart, 1968), 80; Emil Heinz Graul and Herbert W. Franke, "Futurologie und Medizin: I. Allgemeine Gesichtspunkte der Zukunftsforschung," *Deutsches Ärzteblatt*, 66 (1969), 713; Paul Lüth, *Ansichten einer künftigen Medizin* (Munich, 1971), 34; Josef Stockhausen, "Arzt und Medizin - Strukturen und Tendenzen: Wissensexplosion auch in der Medizin," *Deutsches Ärzteblatt*, 66 (1969), 2248.

34 Karl Eduard Rothschuh, "Medizin auf neuen Wegen: Zur Situation der Medizin zwischen gestern und morgen," *Hippokrates*, 33 (1962), 641–648.

35 Hans Schaefer, Heinrich Schipperges and Gustav Wagner, *Die Medizin im Jahre 2000: Aktivitäten einer Stuttgarter Studienkonferenz* (Heidelberg, 1990).

36 Schipperges, *Entwicklung moderner Medizin*.

37 Hans Schaefer, "Gedanken über die Zukunft der Medizin," *Die Sozialversicherung*, 14 (1959), 265–268.

denounce as 'eastern' or 'communist'".[38] However, the initial commission also included computer scientists from the German branch of IBM in nearby Sindelfingen.[39] After 1970, the focus shifted towards environmental medicine and 'medical ecology' as the future of medicine, with a broadly defined notion of 'environment' that drew on increasing concerns about pollution and the depletion of natural resources, as well as on social and preventive medicine and cybernetic systems thinking. In changing compositions, 'Medicine 2000' remained active into the early 1990s.

Of more direct importance to the history of the Medizin Interkontinental transmission, however, was another prominent voice in West German medical futurology: the radiologist Emil Graul (1920–2005) of the University of Marburg.[40] Graul had been deeply involved in the conception and the planning of the event and was one of the discussants onstage in Davos and a keynote speaker at the larger congress. In the years prior to the congress, he had emerged as the most recognisable representative of space medicine in West Germany and the most prolific transmitter of U.S. futurology into the German medical discourse. As a radiologist and pioneering researcher in nuclear medicine, Graul was part of a medical field shaped by the technological progress of the post-war years, and he saw an interstellar future for humanity and medicine. From 1965 to 1968, he was president of the German Association of Aviation and Space Medicine; in 1965, he visited NASA's Manned Spacecraft Center in Houston during Project Gemini and began writing regular dispatches from the frontiers of U.S. space medicine for the readers of *Deutsches Ärzteblatt*.[41] In Vienna in August 1968, he attended the UNO conference on the Peaceful Uses of Outer Space as a member of the German delegation and he chaired the sessions about biology and medicine in space and the "problems

38 Idem, *Die Medizin heute* (Munich, 1963), 346: "In einer so veränderten Sozietät entwickeln sich also Tendenzen eines sozialen Zwanges, welche wir, entartet wie wir bereits sind, leichtfertig als 'östlich' oder 'kommunistisch' brandmarken, ohne ihre funktionale Notwendigkeit einzusehen."

39 Manfred Wolfgang Gall, *Computer verändern die Medizin*, 2nd ed. (Stuttgart, 1969).

40 Dieter Loew, "Laudatio: Prof. Dr. med. Dr. rer. nat. E.H. Graul," in *Medicenale XV Iserlohn 1985: Environtologie - Mensch und Umwelt - Fakten, Spekulationen, Szenarios*, ed. Emil Heinz Graul and Sigurd Pütter (Iserlohn, 1986), 755–761; Norbert Jachertz, "Gestorben: Prof. Dr. med. Dr. rer. nat. Emil Heinz Graul," *Deutsches Ärzteblatt*, 102 (2005), 690–691. Some details of Graul's biography are surprisingly difficult to verify. The few published accounts of his life are contradictory and occasionally outright false, and Graul himself was prone to embellishment and self-aggrandisement.

41 Emil Heinz Graul, "Bemannte Raumfahrt: Technik und Medizin - I. Mitteilung," *Deutsches Ärzteblatt*, 62 (1965), 1789–1798.

of terrestrial and cosmic biotelemetry".[42] In July 1969, Graul became known to the West German public as an in-studio expert answering audience questions about space medicine during the live transmission of the moon landing – an experience with international television events that probably inspired the 1970 satellite transmission.

Visions of technological futures, sometimes directly inspired by contemporary science-fiction films, were a prominent part of Graul's writings even before he became explicitly interested in futurology. Starting in March 1969 he published a fifteen-part article series in *Deutsches Ärzteblatt*, co-authored with the Austrian science-fiction author Herbert Franke (b. 1927), which set out to familiarise the West German medical community with the key forecasts and concepts of the scientific study of the future.[43] In substance and style, the article series was representative of late-1960s popular futurology, with breathless forecasts of looming global crises overcome by the technologies of the future, replete with flowcharts, exponential curves, and images of prototypes and cyborgs. Apart from the future, another characteristic space-age concept that Graul eagerly adopted was the 'environment'. As Sabine Höhler has shown, the confluence of a range of factors, including the space race, new technologies for travelling and communications, an increasing consciousness of global interdependence, cybernetics, the nascent environmental movement and New Age ideas, at the end of the 1960s led to new understandings of the environment as a complex system in a state of precarious homeostasis.[44] As an aviation and space physician, Graul was used to thinking about human bodies in hostile, artificially created and controlled environments and effortlessly transitioned from real spaceships to the metaphorical Spaceship Earth. The attempt to establish 'environtology' as new medical speciality situated "in the area between medicine and futurology" and using the "results of many disciplines such as cybernetics and sociology", nevertheless failed.[45] Despite its grandiose name, the International Center for Medical Environmental Sciences and Future Research (MEDICEF) probably was never much more than a doorplate at the clinic for nuclear medicine at the University of Marburg.

Graul was close to the zeitgeist of the early 1970s, but not quite close enough. He continued to publish about medicine, the future, and the environment, but

42 Idem, "Experimentierfeld Weltraum: Bericht von der ersten UN-Weltkonferenz über 'Erforschung und friedliche Nutzung des Weltraums'," *Deutsches Ärzteblatt*, 65 (1968), 2164–2169.

43 Graul and Franke, "Futurologie und Medizin I."

44 Sabine Höhler, *Spaceship Earth in the Environmental Age, 1960–1990* (London, 2015).

45 Emil Heinz Graul, "'Medizinische Environtologie' (Umweltmedizin)," *Münchner Medizinische Wochenschrift*, 113 (1971), 1176.

the high-tech-focused kind of futurology that he represented quickly fell out of vogue as post-Club of Rome future studies reoriented the field towards more critical views of technology, more sociological approaches, and towards grassroots community participation in the shaping of the future.[46] From the transatlantic teleconference and the pages of *Deutsches Ärzteblatt*, Graul's medical futurology was demoted to self-organised conferences funded by a small pharmaceutical producer mostly known for a homeopathic cold remedy.[47] For Graul's career as medical futurologist as well as for the trajectory of futurology in West German medicine more broadly, the year 1970 and the congress in Davos were an inflection point.

Some of the tensions surrounding medical futurology and its technological optimism were already on display at the 'Medicine 1980' congress. In his introductory lecture as president of the German Medical Association, Ernst Fromm polemically rejected many of the usual futurological predictions about the future of medicine as vague or wrong. Tracing the doctor-patient relationship from antiquity to the present and into the future, Fromm dismissed utopian visions of inevitable biomedical progress through techno-scientific advances, of unlimited treatment possibilities, and the automation of medicine. The physician of the future would not become an "animated punch card" in a computerised medical machine, but would have to retain a role as trusted translator between medical science and patient: as the role of technology in medicine grew, the "age of the family doctor" was only beginning.[48] Fromm's apprehensions about the encroachment of technology on medicine were widely shared among West German physicians,[49] and framed the ambivalence with which futurological forecasts were often received. At the reception venue in Stuttgart, the eminent internist Hans Erhard Bock (1903–2004) struck a different note:

> Medicine is poised to fraternise with the computer. It does not hurt that this now goes a little too far. […] Prophecies of doom against technology are out of place. […] There is no doubt that we have to make up giant

46 Elke Seefried, "Bruch im Fortschrittsverständnis? Zukunftsforschung zwischen Steuerungseuphorie und Wachstumskritik," in *Vorgeschichte der Gegenwart: Dimensionen des Strukturbruchs nach dem Boom*, ed. Anselm Doering-Manteuffel, Lutz Raphael and Thomas Schlemmer (Göttingen, 2016), 426–449.

47 Emil Heinz Graul and Sigurd Pütter, eds., *Medicenale XV Iserlohn 1985: Environtologie - Mensch und Umwelt - Fakten, Spekulationen, Szenarios* (Iserlohn, 1986).

48 Ernst Fromm, "Arzt und Patient in Vergangenheit, Gegenwart und Zukunft," *Deutsches Ärzteblatt*, 67 (1970), 1585–1590, 1604–1609.

49 Karl Jaspers, "Der Arzt im technischen Zeitalter," *Klinische Wochenschrift*, 36 (1958), 1037–1043.

> leeway, and no wonder that a technological chain reaction has begun from which bedside medicine can and must greatly benefit. A field of experimentation with manifold biotechnical possibilities has opened. The medical soul will not wither, howsoever the extended sphere of action be integrated in our biosphere.[50]

Even at the height of its influence, medical futurology was not a unified field with a common methodology and outlook. The lecturers interpreted the theme of the congress very differently, from sober presentations about recent clinical advances to sweeping cultural criticism,[51] the use of forecasting methods for specific medical fields,[52] and the unadulterated futurology of Emil Graul, who at the end of his keynote lecture circulated machine-readable questionnaires for a Delphi study.[53] Despite the popularity of the topic, in 1970 there was no consensus about the future development of medicine.

4 Space-Age Medicine

Medizin Interkontinental was a space-age event. Space technology created the possibilities for simultaneous, audio-visual communication across continents, but space was much more than just the conduit for the signal – it also was central to the message that the organisers wanted to send. Less than a year after the Apollo 11 mission had first brought humans to the moon, space was a pervasive part of the event – before, during, and after. When the proceedings of the 'Medicine 1980' congress in Davos were published, the covers of three

50 Hans Erhard Bock, "Herausforderung für ärztliches Zusammenarbeiten," *Deutsches Ärzteblatt*, 67 (1970), 972: "Die Medizin ist im Begriffe, mit dem Computer zu fraternisieren. Es schadet nicht, wenn das jetzt etwas zu weit geht. […] Alle Kassandrarufe wider die Technik sind fehl am Platze. […] Kein Zweifel, daß wir hier einen gewaltigen Rückstand aufzuholen haben, und kein Wunder, daß eine technische Kettenreaktion in Gang gekommen ist, aus der auch die krankenbettnahe Medizin größten Nutzen ziehen kann und muß. Ein Ex- perimentierfeld vielfältiger biotechnischer Möglichkeiten ist eröffnet. Die ärztliche Seele wird darob nicht verdorren, wie weit auch immer der erweiterte Aktionsradius in unsere Biosphäre einbezogen wird."

51 W. Birkmayer, "Der Verlust der humanen Integration," *Monatskurse für die ärztliche Fortbildung*, 20 (1970), 54–57.

52 W. Pöldinger and W. Sutter, "Futurologie und Psychiatrie," *Monatskurse für die ärztliche Fortbildung*, 20 (1970), 107–112.

53 H. Müller and K. Arnold, "Bewältigte Zukunft - geplante Zukunft? Fortbildungskongresse der Bundesärztekammer Badgastein/Davos," *Deutsches Ärzteblatt*, 67 (1970), 1147; Emil Heinz Graul and A. Habermehl, "Die unbewältigte Zukunft der Mediziner: Enquete im Dialog mit dem Arzt," *Zeitschrift für Allgemeinmedizin*, 47 (1970), 1163–1168.

consecutive issues of *Monatskurse für die ärztliche Fortbildung* were adorned with copperplate prints from Jules Verne's 1870 novel *Autour de la lune* showing the manned projectile en route to the moon, Verne's fin-de-siècle space travellers on the lunar surface, and the recovery of the projectile by a U.S. Navy corvette after splashdown. This was more than a retro-futurist allusion to the recent moon landing and a celebration of the centenary of the publication of Verne's novel. It also sent a bold message: after multiple generations of waiting for a future promised first by science fiction, then by science and technology, that future had now finally arrived and West German medicine was part of it.

Medicine in the space age, however, was about more than the direct contribution of medicine to human spaceflight: it also touched on the political identity of 1960s West Germany. In the wake of the Sputnik crisis and against the backdrop of a debate raging in political circles, the press, and academia after the philosopher Georg Picht (1913–1982) in 1964 had warned of an impending "education catastrophe", closing the technological gap with the space-faring nations became a matter of national importance.[54] When Emil Graul began introducing the German medical community to the advances of U.S. space medicine in 1965, he framed his contribution in political terms:

> In the future, there will be no prosperity without active participation in space travel on an international and national level. Who does not recognise that the atomic age, cybernetics, electronic data processing, space research, university reform as well as science and education policy are closely correlated, yes even different aspects of the current situation of our civilizational problem, does not have any claim to leadership in our modern industrial society.[55]

By 1970, structural reforms of the Federal Republic's education system were in full swing, and during the Medizin Interkontinental transmission, overtly political motives were mostly subsumed into the subtext. Nevertheless, the

54 Wolfgang Lambrecht, "Deutsch-deutsche Reformdebatten vor 'Bologna': Die 'Bildungskatastrophe' der 1960er-Jahre," *Zeithistorische Forschungen/Studies in Contemporary History*, 4 (2008), 472–477.

55 Graul, "Bemannte Raumfahrt I," 1789: "Künftig wird es keine Prosperität ohne aktive Teilnahme an der Weltraumfahrt sowohl auf internationaler als auch auf nationaler Ebene geben. Wer nicht erkennt, daß Atomzeitalter, Kybernetik, elektronische Datenverarbeitung und Automation, Weltraumforschung, Hochschulreform sowie Wissenschafts- und Bildungspolitik eng miteinander korrelieren, ja letzten Endes nur verschiedene Aspekte der gegenwärtigen Situation unseres Zivilisationsproblems sind, hat keinen Führungsanspruch in unserer modernen Industriegesellschaft."

"television bridge America-Europe" was also about bringing West Germany closer to the United States at a time when the political, economic, and scientific integration with the West was a key element of the country's political identity, and when American science and technology were widely perceived as a model for West German medical and research institutions.[56]

Political motives, however, were also at play on the other side of the Atlantic. Apollo 11 had been an historic achievement, but NASA soon experienced a legitimacy crisis. Now that the agency's primary technological and political mission of "landing a man on the Moon and returning him safely to Earth" had been accomplished, lingering doubts about the cost and the scientific uses of human spaceflight surfaced, and the initial euphoria gave way to disillusionment.[57] Mounting political pressure would soon lead to funding cuts and the cancellation or downsizing of planned missions of the Apollo programme. To show that the massive expenditures for the space programme could yield more than only fleeting symbolic successes, NASA reoriented towards Earth.[58] Presenting the medical experiments and technologies developed for the space programme to European physicians and demonstrating how present-day space medicine would provide the knowledge and the appliances of the terrestrial medicine of tomorrow offered a way to prove NASA's worth in the beginning of the post-Apollo period.

In the first of the five lectures in the transatlantic transmission, the task of presenting the prowess of U.S. space medicine fell to Charles A. Berry (1923–2020), Director of Medical Research and Operations at NASA's Manned Spacecraft Center in Houston.[59] Known as the 'astronauts' doctor', Berry was a central figure in U.S. space medicine, who had already participated in the

56 Carsten Timmermann, "Modell Amerika? Amerikanische Vorbilder in Klinik und Forschung, untersucht am Beispiel des Kerckhoff-Institutes in Bad Nauheim," *Medizinhistorisches Journal*, 45 (2010), 24–42; Stefan Paulus, *Vorbild USA? Amerikanisierung von Universität und Wissenschaft in Westdeutschland 1945–1976* (Munich, 2010).

57 "NASA History: Excerpt from the 'Special Message to the Congress on Urgent National Needs'," www.nasa.gov/vision/space/features/jfk_speech_text.html, accessed 2 March 2022.

58 Erik M. Conway, "Bringing NASA Back to Earth: A Search for Relevance during the Cold War," in *Science and Technology in the Global Cold War*, ed. Naomi Oreskes and John Krige (Cambridge, MA, 2014), 251–272; Alexander C. T. Geppert, "The Post-Apollo Paradox: Envisioning Limits During the Planetized 1970s," in *Limiting Outer Space: Astroculture After Apollo*, ed. Alexander C. T. Geppert (London, 2018), 3–26.

59 I focus in this article on the first and last lectures of the transmission – those by Berry and Hans-Georg Clamann respectively. The other three of five lectures were held by medical researchers from the University of Illinois, Chicago, and dealt with advances in the early detection of cancer: George L. Wied (1921–2004), a German-born pioneer of computer-aided cytological research, spoke about cytology in present and future cancer diagnosis,

medical evaluation of the first American astronauts for Project Mercury in 1958 and monitored and supervised the monitoring of astronauts' health during the Mercury, Gemini, and Apollo programmes.[60] Standing in front of the iconic photo of Apollo 11 astronaut Buzz Aldrin on the lunar surface, Berry spoke about the present state of space medicine and NASA's plans for the future, including Skylab and an unnamed space station for even longer missions. He covered the full range of space medicine, including topics such as atmospheric conditions, nutrition, on-board emergency medication, waste disposal, radiation protection, biomedical in-flight monitoring, cardiovascular strains, and the physical effects of zero gravity. At the same time, his half-hour lecture showcased the possibilities of audio-visuals in medical education and the satellite transmission technology, using pre-recorded footage from NASA missions and medical labs, mock-ups of equipment, a plethora of charts and graphs, and cuts to other NASA medical experts and their experiments. The voiceover into German by a translator was the only female presence in the presentation (except for a silent nurse with a beehive, and a pin-up tattooed on a test subject's arm) in this very masculine world of 1960s space medicine.

Yet, the event which was to be the highlight of Berry's lecture and the teleconference did not even take place. Initially, Apollo 13 was to launch on 12 March 1970, so that the flight phase of the mission would have coincided with the congress in Davos and the teleconference on 13 March. The time slot for Medizin Interkontinental was set to allow for a direct transmission to Davos and the connected venues of the biomedical in-flight telemetry of the astronauts on their way to the moon, using the satellite transmission to put the audience in the seat of the NASA physicians.[61] The rescheduling of the launch to 11 April thwarted this plan,[62] which in the earlier announcement had been described as a particularly educational element of the programme:

Paul H. Holinger (1906–1978) about the early detection of lung cancer through endoscopy, and Eugene F. Lutterbeck (1909–1973) about the early detection of breast cancer through xeroradiography. No audio-visual records exist of these three lectures.

60 Scherraine Mack, "'Astronauts' Doctor' Leaves NASA," *Science*, 184 (1974), 146; Charles A. Berry et al., "History of Space Medicine: The Formative Years at NASA," *Aviation, Space, and Environmental Medicine*, 80 (2009), 345–352.

61 Stockhausen, "Medizin interkontinental," 144: "Telemetrische Meßdaten von Raumfahrten aus dem Weltall und interkontinentale medizinische Diskussionen mögen heute noch spektakuläre, in bezug auf ihre Erstmaligkeit außerordentliche Ereignisse sein. Entscheidend ist aber nicht das bisher nicht dagewesene 'Spektakulum', sondern das Ziel, dem dieses dient: Die technischen Möglichkeiten sollen aufgezeigt werden, die der Verbreitung des mediznischen Fortschrittes auf seinem Wege zum Patienten über den Arzt schon heute offenstehen."

62 NASA news release MSC 70–79, 8 January 1970, www.nasa.gov/centers/johnson/pdf/83122main_1970.pdf, accessed 2 March 2022.

> Telemetric data from space flight and transcontinental medical discussions may today still be spectacular events that are exceptional for being firsts. Nevertheless, what is crucial is not the unprecedented spectacle, but the purpose it serves: to display the technical possibilities that the dissemination of medical progress on its way to the patient via the physician already has today.[63]

The assumption that the technologies used for the biomedical in-flight monitoring of astronauts would soon find their way into everyday medical practice was part of a nexus between new media and visions of future telemedicine that predated the advent of space medicine by several decades. Even as early as 1886, the physician Austin Flint speculated about the changes that the recent invention of the telephone would bring for medicine and envisioned the potentials of this new medium for telediagnosis.[64] From then on, the introduction of new media technologies and the medicine of the future would go hand in hand.

By the mid-1920s, new technologies had become available and early visions of diagnosis from afar coalesced into a comprehensive telediagnostic apparatus. The October 1924 issue of Hugo Gernsback's (1884–1967) popular scientific journal *Science and Invention* contained the illustration of a physician who, through a set of screens and display devices at his desk, could track patients' temperature, respiration, blood pressure, heart tones, radiography and electrocardiogram, and promised that with "the aid of electrical indicating devices, it is easily possible to transmit the findings of any disease over wires from one place to another with almost absolute accuracy".[65] In the following year, the German physician Fritz Kahn (1888–1968) used an almost identical image to illustrate his vision of the 'physician of the future', only a few weeks after the first radio transmission of heart tones over a distance of more than 800 kilometres.[66] Teleconsultation using the full range of diagnostic technologies seemed like a real possibility. Kahn predicted that the doctor-patient relationship would become untethered and global, with the same physician treating different patients anywhere in the world. The country doctor (*Landarzt*)

63 Stockhausen, "Medizin interkontinental," 144.

64 Flint, *Medicine of the Future*, 12–13; "The Telephone as a Medium of Consultation and Medical Diagnosis," *British Medical Journal*, 2 (1879), 897; Sidney H. Aronson, "The Lancet on the Telephone 1876–1975," *Medical History*, 21 (1977), 69–87.

65 "Specialist Brought to Every Town," *Science and Invention*, 12 (1924), 561.

66 Fritz Kahn, "Der Arzt der Zukunft," *Berliner Illustrirte Zeitung*, 23 (1925), 733–735; Leo Jacobsohn, "Der Arzt der Zukunft," in *Das Wissen im Rundfunk: Eine Auswahl von Rundfunkvorträgen*, ed. Funk-Stunde (Berlin, 1927), 220.

of old would become a 'world doctor' (*Weltarzt*). In the process, the doctor-patient relationship was transformed into a doctor-machine-patient triad. In the future, Kahn wrote, the doctor would become a "bioengineer, who sees the human body as an organism whose functioning he controls with methods and instruments similar to those that the engineer uses for his machines".[67] Gernsback, however, was already one step ahead. In 1925 he contrived to restore a more intimate dimension to the telemedical encounter of the future by using two-way television and an implausible contraption – a "radio teledactyl" – to convey tactile perceptions over a distance.[68] By 1955, the teledactyl had matured into the more capable atomic-age 'teledoctor' with mechanical arms, claw-like manipulators, and an array of camera lenses attached to a bedside TV device.[69] Kahn, Gernsback, and many others envisioned a future in which significant parts of the doctor-patient encounter would be mediated by audio-visual and other technologies over any distance.

The telemedical experiments of the inter-war period continued after the Second World War and incorporated new technologies as they became available. The first transmission of X-ray pictures through telephone wires took place in 1947, and electrocardiograms followed in the early 1950s. In 1964, the same year in which AT&T unveiled its Picturephone at the New York World's Fair, two-way television entered medicine when a TV link between the Nebraska Psychiatric Institute and Norfolk State Hospital was used for lectures, remote patient examinations, and group psychotherapy.[70] The advent of telecommunication satellites in the mid-1960s made the first transatlantic transmissions possible – in 1967, an electrocardiogram sent via satellite from Tours in France was analysed by a computer in Washington D.C.[71]

By the time of the Davos congress, earlier visions of telemedicine were becoming a reality. The first operational telemedical system using live television was set up in 1968 between a medical station at Logan International Airport and Massachusetts General Hospital, 2.7 miles apart. The system consisted of a two-way CCTV and diagnostic tools such as an electronic stethoscope and ECG, devices for measuring blood pressure, pulse, and respiration rate, and a computer terminal used for automated anamnesis. As imagined by

67 Kahn, "Der Arzt der Zukunft," 733.

68 Hugo Gernsback, "The Radio Teledactyl," *Science and Invention*, 12 (1925), 978.

69 Idem, "The Teledoctor," *Radio-Electronics*, 26 (1955), 54–55.

70 Kenneth Liparito, "Picturephone and the Information Age: The Social Meaning of Failure," *Technology and Culture*, 44 (2003), 50–81; Jeremy A. Greene, "When Television Was a Medical Device," *Humanities*, 38 (2017), www.neh.gov/humanities/2017/spring/feature/when-television-was-medical-device, accessed 2 March 2022.

71 Stanley Joel Reiser, *Medicine and the Reign of Technology* (Cambridge, 1978), 201.

Gernsback, the hand movements of the physician could be remotely transmitted, albeit only to sign prescriptions. The set-up was operational, but its main purpose was to function as a testbed for future telemedicine – as a model for the delivery of state-of-the-art medical care to remote and rural locations.[72] The station played a prominent part in Michael Crichton's 1970 non-fiction book *Five Patients*, who ascribed to it a "science-fiction quality", as well as in a 1972 German TV documentary about the medicine of the future, where the station was used to show how 'patient 2000' would be treated.[73] Charles Berry's demonstration of NASA's biomedical in-flight monitoring and the planned transmission from Apollo 13 were built on an already well-established trope in medical futurology. It also added to the prestige and the promises of human spaceflight and satellite technology at the height of the space age.

However, even when searching for the future in space, German medicine was caught up in its past. Just like the Saturn rockets developed by Wernher von Braun (1912–1977), the futuristic marvels of U.S. space medicine had roots in the Third Reich. After the Second World War, leading aeromedical specialists had been relocated from Germany to the United States as part of the larger Operation Paperclip and assigned as researchers to the Air Force School of Aviation Medicine.[74] When space emerged as a new domain for superpower competition and potential military conflict in the early stages of the Cold War, these Germans formed the nucleus of U.S. space medicine: Hubertus Strughold (1898–1986), formerly director of the Aeromedical Research Institute of the German Air Ministry in Berlin became celebrated as the "father of space medicine".[75] This transition, however, required that inconvenient facts were brushed aside. Aviation medicine, in Nazi Germany and elsewhere, was inextricably linked to the interests of the state and the military, and even when they had technically been civilians, these researchers had been part of a machinery of war that had devastated European cities. Beyond that, German aeromedical researchers were directly implicated in Nazi medical crimes. At

72 Kenneth T. Bird, "Tele-Diagnosis: A New Community Health Resource," *Educational Instructional Broadcast*, 4 (1969), 18–21. Ronald S. Weinstein, Michael J. Holcomb, Elizabeth A. Krupinski and Rifat Latifi, "First Trainees: The Golden Anniversary of the Early History of Telemedicine Education at the Massachusetts General Hospital and Harvard (1968–1970)," in *Telemedicine, Telehealth and Telepresence*, ed. Rifat Latifi, Charles R. Doarn and Ronald C. Merrell (Cham, 2021), 3–18.

73 Michael Crichton, *Five Patients: The Hospital Explained* (London, 1995), 127; Alfred Schmitt, "Richtung 2000: Die Prothesengesellschaft" (ZDF, 31 October 1972).

74 Annie Jacobsen, *Operation Paperclip: The Secret Intelligence Program That Brought Nazi Scientists to America* (New York, 2014).

75 Mark R. Campbell et al., "Hubertus Strughold: The 'Father of Space Medicine'," *Aviation, Space, and Environmental Medicine*, 78 (2007), 716–719.

the Dachau concentration camp, *Luftwaffe* physicians conducted hypothermia and high-altitude experiments that led to the deaths of hundreds of involuntary test subjects.[76] While not personally involved, Strughold certainly knew about this research after attending a conference in Nuremberg in 1942, where details of the hypothermia experiments had been discussed.[77]

Another attendee of the same conference was Hans-Georg Clamann (1902–1980), who twenty-eight years later presented the latest research in U.S. space medicine and its potential for everyday clinical use to the German physicians assembled on the other side of the Atlantic.[78] Clamann had joined Strughold's institute in 1935 and became deputy director in 1943. Following a post-war stint as a general practitioner in his native village of Groß Schwülper near Brunswick, he came to the United States in 1947 through Paperclip and was assigned to the USAF as an aeromedical researcher. After heading several research departments, he succeeded Strughold as Chief Scientist of the Aerospace Medical Division at Brooks Air Force Base in San Antonio in 1968.[79] Not having been accused of medical crimes himself, Clamann had close ties to two defendants of the Nuremberg Doctors' Trial, Hermann Becker-Freyseng (1910–1961) and Siegfried Ruff (1907–1989) and he testified in favour of both.[80] Internationally, the Nazi history of German aeromedical research was no secret: in 1961 and 1965, international aeromedical congresses which were planned to take place in West Germany had to relocate due to objections to the presence of Ruff, who had been acquitted in 1947.[81] There was no such opposition to Clamann's participation in the Medizin Interkontinental transmission, and he did not attempt to conceal his origins when he jovially addressed the audience in fluent German.

76 Karl-Heinz Roth, "Tödliche Höhen: Die Unterdruckkammer-Experimente im Konzentrationslager Dachau und ihre Bedeutung für die luftfahrtmedizinische Forschung des 'Dritten Reichs'," in *Vernichten und Heilen: Der Nürnberger Ärzteprozeß und seine Folgen*, ed. Angelika Ebbinghaus and Klaus Dörner (Berlin, 2001), 110–151; Katharina Trittel, *Hermann Rein und die Flugmedizin: Erkenntnisstreben und Entgrenzung* (Paderborn, 2018), 242–252.

77 Trittel, *Hermann Rein*, 258–264.

78 Jacobsen, *Operation Paperclip*, 357–358.

79 John P. Marbargern, "Hans-Georg Clamann, M.D. 1902–1980," *Acta Astronautica* 9 (1982), 19; Maura Phillips Mackowski, *Testing the Limits: Aviation Medicine and the Origins of Manned Space Flight* (College Station, TX, 2006).

80 Harvard Law School Library Nuremberg Trials Project, Items 981 http://nuremberg.law.harvard.edu/documents/981 and 2628 http://nuremberg.law.harvard.edu/documents/2628, accessed 2 March 2022.

81 "Ruff: Tadel verpflichtet," *Der Spiegel*, 48 (1965), 77–78.

While Charles Berry was mostly concerned with the concrete medical technology of past and future NASA missions, Hans-Georg Clamann spoke about research in space medicine more generally. He presented experiments on human and animal subjects, and an array of new devices. These included smaller gadgets like miniaturised ECG electrodes for long-term monitoring, electric thermometers, stethoscopes for noisy environments, and a tool for ultrasonic blood flow measurement, as well as larger machines such as a full-body exercise machine for use in zero gravity, a manned centrifuge with a nine-metre arm, and a computerised immunobiological tele-diagnosis terminal. The latter, TAMIS (short for 'telemetric auto-analytic micro-identification system'), was a room-filling machine that would not have seemed out of place in the late-1960s *Star Trek* TV series and that could remotely diagnose infections in blood samples. In a live demonstration, Clamann showed the system analysing a sample from a laboratory in Tokyo. Like the cancelled transmission of the Apollo 13 biotelemetry, TAMIS was a particularly effective example for the essential message and promise of the two lectures about space medicine: the devices currently developed to monitor and treat astronauts in space would in the near future create the technological foundation of terrestrial telemedicine. Aviation and space physicians like Berry, Clamann, and their colleagues were the first of the 'world doctors' and the first of the remotely monitoring bioengineers that Fritz Kahn had imagined in 1925.

5 Eidophor

The satellite transmission and the devices of U.S. space medicine were only two of the three elements central to the Medizin Interkontinental technospectacle. The third was the simultaneous screening of the transmitted lectures in Davos and the connected venues (see Fig. 3). Like the satellite transmission itself, this required a sizeable and costly use of high-tech equipment, and it brought in a third party besides the German Medical Association and the U.S. aeromedical experts: the Swiss pharmaceutical company Ciba and its 'Eidophor-Equipe'.[82] While educational, scientific, symbolic, and geo-political goals motivated the former actors, the involvement of Ciba was based on concrete commercial interests and reflected the growing role of pharmaceutical sponsorship in continued medical education in the post-war decades.[83] For

82 Kayser, "Fernsehbrücke," 15.

83 Jean-Paul Gaudillière and Ulrike Thoms, eds., *Development of Scientific Marketing in the Twentieth Century: Research for Sales in the Pharmaceutical Industry* (London, 2017).

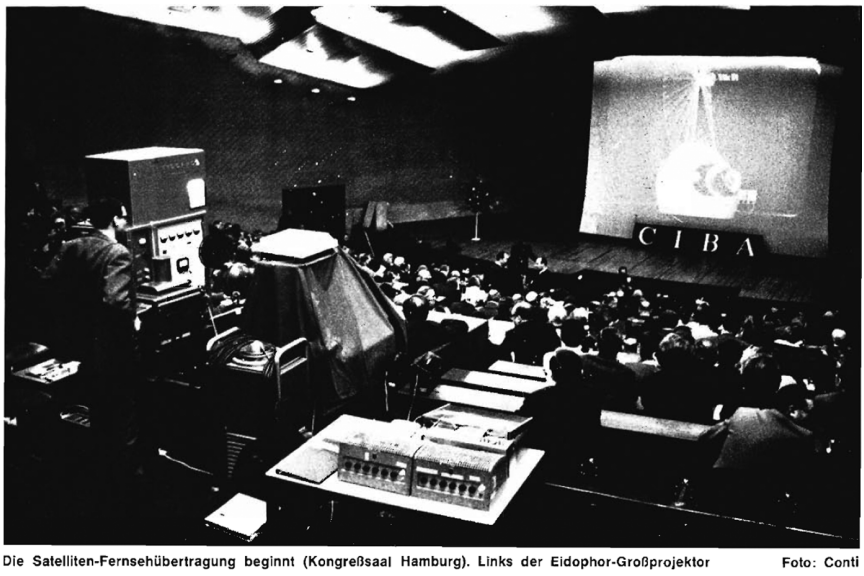

FIGURE 3 Eidophor projection at the local transmission in Hamburg
REPRODUCED BY KIND PERMISSION OF *DEUTSCHES ÄRZTEBLATT*

the company headquartered in Basel, which had organised, produced, and financed most of the transmission, and had provided the equipment and the technical staff for the local screenings, the transatlantic teleconference was a lavish publicity event.

The advertised product, however, was not pharmaceuticals, but the projection technology itself. The Eidophor, developed in Switzerland on the eve of the Second World War, was the first functional large-screen projection system for television signals and used electrostatic charges in an oil surface to create projectable moving images.[84] When the device entered the commercial market in the post-war period, it was initially intended to bring cinemas into the television age. This strategy proved unsuccessful, and when Ciba acquired the rights for the Eidophor in 1958, the company changed course. Ciba promoted the system for universities and for uses such as flight simulations, sports events, and congresses. Among other customers, NASA purchased 34 projectors for its mission control centres prior to the moon landing. Medical education soon became the main market. Of the 250 programmes screened between 1958 and 1969, most were for medical audiences.[85] At large congresses, the system was

84 Caroline Meyer, *Der Eidophor: Ein Grossbildprojektionssystem zwischen Kino und Fernsehen 1939–1999* (Zürich, 2009).

85 Albert Schretzenmayr, "Eidophor in der ärztlichen Fortbildung," *Ciba-Blätter*, 26 (1969), 14.

used to show both live images and pre-recorded footage and in modern hospitals like West Berlin's new high-tech university clinic, Eidophor units were permanently installed and directly projected colour images from operating theatres into large lecture halls.[86] As student numbers grew and congresses became larger, Eidophor brought medical education and medical images to the large screen and thereby closer to the audience.

The market for medical audio-visuals into which Ciba introduced the Eidophor was already crowded. Film had been present in medical research and education early in the twentieth century, and in the post-war era, medical films circulated globally and were routinely shown in medical training and for general health education.[87] Soon after the Second World War, television was integrated into U.S. medicine in the form of CCTV systems used to televise surgical procedures.[88] As television became a mass medium, medical knowledge was widely disseminated both through fictionalised medical soap operas and information programmes, and a growing number of medical schools adopted television for medical education.[89] With rapid advances in virtually every field of medicine and the post-war 'information explosion', continued medical education beyond the medical school gained in importance and television offered a way to reach large numbers of resident physicians.[90] Special broadcasts for continued medical education began in the United States in 1952, and in France and the United Kingdom in the first half of the 1960s.[91] In West Germany, however, the reaction to the use of mass media for specialised education was more guarded. In 1965, the German Medical Association bluntly rejected a proposal by the West German Broadcasting Corporation because the broadcasts would also be available to laypeople. They wanted to restrict laypeople's access to this kind of programming not because of graphic depictions of medical conditions and surgery, but due to paternalist concerns about the adverse effect of superficial medical knowledge on non-specialists: "The relationship of trust between doctor and patient could be significantly compromised. […] Many people will

86 Heinz Goerke and Gerhard Müller, "Das Klinikum Steglitz der Freien Universität Berlin," *Medizinal-Markt - Acta Medicotechnica*, 17 (1969), 20.

87 Ostherr, *Medical Visions*, 81–112.

88 Ibid., 115–116; Susan Murray, "The New Surgical Amphitheater: Color Television and Medical Education in Postwar America," *Technology and Culture*, 61 (2020), 772–797.

89 Ostherr, *Medical Visions*, 113–151.

90 Stockhausen, "Arzt und Medizin," 2149–2153.

91 "Television for the Doctor," *British Medical Journal*, 5428 (1965), 137–138; Georg Schreiber, "Telekolleg für Ärzte: Neue Wege für die medizinische Fortbildung," *Die Zeit*, 8 (24 February 1967).

be at risk of becoming hypochondriacs or psychopaths."[92] With Ciba's projection system, televised medical education could reach mass audiences while medical knowledge was contained in the domain of medical experts.

As important as the large-screen projection was to the Eidophor's appeal, equally important was the fact that the images were transmitted live. Combining the spectacle of the cinema and the directness of television promised a particularly immersive experience. As head of the German Senate for Continued Medical Education who had overseen numerous Eidophor transmissions at medical congresses, Albert Schretzenmayr wrote that the participant "is right there, weightless in a fluid of information".[93] With medical congresses turning into mass events, media technology would restore an affective connection between speaker and audience through the inevitable imperfections of the live transmission that would make cold electronics "more attractive, warm, human, and instructive".[94] Schretzenmayr conceded, nevertheless, that initial attempts to use live projections as naturalistically as possible had failed. Surprisingly, direct transmissions from the operating theatre had neither been effective nor particularly interesting. Instead, information had to be edited down in order to hook its audience: "A black-and-white animation of the individual phases of an operation is more instructive than the restless and tedious red of a televised surgery that becomes boring after only a few minutes".[95]

The projection of televised images also offered a way to bridge distances. While most programmes were pre-recorded or sent from in-house studios, Ciba's Eidophor team also explored the potential of long-range transmissions in medical education. At earlier continued education congresses in Davos, the audience had seen live images from a psychiatric ward in Basel and images from the university children's clinic in Bern transmitted via a series of ground relays (one of which was toppled by a snowstorm and re-erected by a "brave ski patrol").[96] The space age created the possibilities for live transmissions over far greater distances. As early as May 1966, the Warner-Lambert Pharmaceutical Company combined the Eidophor and the first commercial telecommunication

92 Schreiber, "Telekolleg für Ärzte": "Das Vertrauensverhältnis Arzt–Patient kann in erheblichem Umfange beeinträchtigt werden … Viele Menschen geraten in Gefahr, zu Hypochondern und Psychopathen zu werden."

93 Schretzenmayr, "Eidophor," 15: "Beim Vortrag, beim Lesen muß er sich meist zwingen, beim Eidophor ist er dabei, ist er schwerelos mitten drin in einem Fluidum von Informationen."

94 Ibid., 19.

95 Ibid., 16: "Eine Trickzeichnung in Schwarz, die die einzelnen Phasen der Operation darstellt, ist instruktiver als das unruhige und schon nach wenigen Minuten langweilige, ermüdende Rot der live gesendeten Operation."

96 Ibid., 20.

satellite Intelsat I ('Early Bird') to hold a transoceanic shareholder meeting simultaneously in New York and London.[97] Medizin Interkontinental continued these experiments, but significantly increased the distance, audience size, and duration. As Hans Erhard Bock told the audience at the reception venue in Stuttgart, "what we already could see at other Eidophor transmissions at congresses in Berlin or Karlsruhe will now be raised to a global and cosmic scale". While the projectors had already functioned as an extension of the microscope by magnifying details of medical procedures to the large screen, they acquired telescopic properties when connected to satellite telecommunication. They could, Bock said,

> bring what is furthest into closest view, where the giant space shrinks into microscopic frames, and where like in Malraux's "imaginary museum" a kind of imaginary space of continued education is newly created.[98]

Ciba's motives were less poetic and more commercial. New possibilities for audio-visual education had appeared with the advent of video tape recorders during the 1960s. Formerly ephemeral television and CCTV images could now be recorded, stored, reproduced, and sold, and as the systems became better and smaller, the time and cost for producing copies dropped. The pharmaceutical company Roche, also based in Basel, had launched the 'Network for Continued Medical Education' (NCME) to distribute Ampex tapes with medical education contents to medical training centres and hospitals in the U.S. on a biweekly basis. When Roche planned to extend its distribution network to Europe in 1968, this was considered as a direct threat to the Eidophor at the nearby Ciba headquarters. To divert attention from Roche's foray into European markets, Ciba's public relations department proposed a massive publicity event that emphasised qualities of the Eidophor system that Ampex tapes could not compete with, namely the use of the large screen and live transmission to create a techno-spectacle, collectively experienced:

> To counter a loss of CIBA's prestige, the global transmission of a medical programme is to be planned. For example, a programme about space

97 Meyer, *Der Eidophor*, 280.

98 Bock, "Herausforderung für ärztliches Zusammenarbeiten": "Hier, wo uns das Fernste in die nächste Sicht kommt, wo der Riesenraum zum mikroskopischen Einzelbild schrumpft, wo wie im 'imaginären Museum' von Malraux eine Art imaginärer Fortbildungsbereich neu geschaffen wird – hier sollten wir auch Einsatz und Hingabefähigkeit von Tausenden im Team der Astronautik als ein leuchtendes Beispiel und als eine Herausforderung für unser ärztliches Zusammenarbeiten empfinden."

> medicine could be sent to Europe via a telecommunications satellite and simultaneously shown to physicians and authorities in different cities by rented Eidophor projectors. An action like this would require a great effort by our Eidophor department but would result in the necessary media success.[99]

In an apparent win-win situation for the pharmaceutical producer and the medical establishment, the German Medical Association, already a frequent customer of Eidophor, gladly supported Ciba's publicity campaign. In 1969, Schretzenmayr announced that the next congress, to be held in the newly opened congress centre in Davos, would also include a satellite transmission using Eidophor projectors. The topics that he envisioned were still more terrestrial than the final programme: Schretzenmayr contemplated televised visits to joint practices and to renowned U.S. centres for medical research and treatment, such as the Mayo Clinic and the Sloan Kettering Institute, and tried to minimize the geopolitical implications of this westward orientation, describing them as a result of technology, not politics: "I would like to add that we would also like to go to Russia with the same questions. But as of yet, there is no friendly satellite on the horizon that could relay our questions."[100]

While the German Medical Association nominated the panellists in Davos and the presenters in the United States and set the topics, the concrete logistics remained firmly in Ciba's hands. The company provided the equipment and the staff for the projection, but also booked the reception venues, selected local chairs, sent invitations, facilitated the communication between European and American interlocutors, and flew a team consisting of Swiss TV director and Emmy winner Jean-Jacques Lagrange (b. 1929), Ciba's Eidophor production manager Erhard Hauswirth, and assistant director Evelyn Bovard to Houston to realise the transmission.[101] Meanwhile, Ciba's PR department designed promotional material, set up an information centre for the audience in Davos, and conducted the "oral and written orientation of the press organs".[102] The press duly delivered and spoke of a "technological sensation", "a milestone for medicine in the space age", "a defining date in the history of scientific congresses", "a step into uncharted medical territory", "a captivating experiment", and noted that "international science has moved closer together".[103] The leading medical

99 Meyer, *Der Eidophor*, 281–282.
100 Schretzenmayr, "Eidophor," 21–22.
101 Kayser, "Fernsehbrücke," 20; Meyer, *Der Eidophor*, 285.
102 Kayser, "Fernsehbrücke," 20.
103 Ibid., 18–19.

journals in Germany and the United States echoed the same narrative. As much as a technological sensation, Medizin Interkontinental also was a large-scale publicity event by a pharmaceutical company that used the technological imaginaries of the space age to advertise its proprietary projection system. And yet, the message was only partly received. For visions of the future in an age of television, the Eidophor's large-screen projection mattered less than the global transmission of live images. Even at the congress in Davos, panellist Emil Graul casually undermined the intended advertisement message when he presented his vision of medicine in the year 1985: satellite links and audio-visual media would be common, he maintained, not as public large-screen spectacles, but as "domestic club chair congresses", delivered through television to the comfort of one's own living room.[104]

6 Conclusion

The first medical teleconference happened when the different interests of several actors converged. The German Medical Association wanted to begin the 1970s with a continued education congress that would herald the modernity of German medicine through cutting-edge technology and transatlantic cooperation. Medical futurologists like Emil Graul saw a chance to bring their expertise and their forecasts into the mainstream of the German medical community at a time when the belief in technological and scientific progress shaped the sociotechnical imaginaries. For NASA, the transmission offered the possibility of highlighting the terrestrial and civilian uses of space technology at a moment when the agency had to prove that the enormously expensive Apollo programme had more to bring back to Earth than moon rocks and lofty symbolism. The USAF aeromedical researchers in San Antonio had a similar, but not identical, argument to make by showing that their research, which primarily served the needs of the U.S. military in the cold war, actually benefitted the whole of humanity by advancing clinical medicine. Finally, the Swiss pharmaceutical company Ciba had a fitting product to advertise and used the themes of medical progress and transatlantic telecommunication in the space age to bolster its sales message. These different motives were also brought together by already existing contacts, between medical futurologist Emil Graul and the U.S. aeromedical experts, between Albert Schretzenmayr as head of the German Senate for Continued Medical Education and Ciba's

104 Emil H. Graul, "Naturwissenschaften, Technik und Medizin im Blickfeld der Zukunftsforschung," *Monatskurse für die ärztliche Fortbildung*, 20 (1970), 163.

Eidophor department, and between Ciba and NASA as an Eidophor customer. Together, they created an elaborate demonstration of the potentials of space-age communication technology and a techno-spectacle for a mass audience of about 25,000 physicians. Organisers, participants, and the press promised the beginning of an era of teleconferencing and telemedicine based on interconnected technologies.

This vision of the future would not become reality, however. Just as Medizin Interkontinental was the result of a specific constellation of interests and technologies, it remained a singular event. This was partly due to overly optimistic assumptions about technological progress. Setting up a transatlantic teleconference by satellite as a large event in 1970 required considerable resources, and when the novelty had worn off, the Eidophor equipment was still too bulky and expensive for everyday use outside of university clinics and the large congresses of the German Medical Association.[105] More decentralised and individualised forms of teleconferencing like the "domestic club chair congresses" imagined by Emil Graul were forestalled by the lack of the necessary technology and corresponding infrastructure: although it was touted as the future of telecommunication since its introduction in 1964, AT&T's Picturephone was technologically immature and failed commercially.[106] Even when broadband networks that could carry audio-visual signals arrived in West Germany in the late 1980s, videophones did not revolutionise medicine.[107] It was not until the early twenty-first century when broadband internet and the improved performance of personal computers made audio-visual communication much more effortless; the COVID-19 pandemic became the catalyst that quickly pushed many of the available videoconferencing and telemedical technologies into mainstream use.[108]

Moreover, bringing telemedicine from space to Earth was difficult: the devices that Hans-Georg Clamann had presented were not quite ready for civilian use, and there were fundamental differences, moreover, between the usage scenarios for telemedicine in aerospace and for its use in clinical medicine. Instead of specifically trained young and healthy astronauts, terrestrial medicine concerned itself with the sick and elderly who could hardly be expected to operate advanced biotelemetry equipment. Geography was

105 Meyer, *Der Eidophor*, 287–288.

106 Liparito, 'Picturephone', 52.

107 W. Flohrer and H.-J. Mosel, "Vom Telefon zum multifunktionalen Bildtelefon," *it - Information Technology*, 31 (1989), 196–204.

108 Devin M. Mann et al., "COVID-19 Transforms Health Care through Telemedicine: Evidence from the Field," *Journal of the American Medical Informatics Association*, 27 (2020), 1132–1135.

another impediment: unlike the United States, where telemedicine promised to fill regional gaps in the delivery of health care, West Germany was a small and far more densely populated country with a tight-knit medical infrastructure. Instead of bringing medical technology to the patient, it was usually easier to bring patients into hospitals. Costly medical high-tech remained centred mostly in large hospitals.[109] After 1970, the telemedical and medical telecommunication projects conducted by NASA – such as the ATS-6 experiments, SITE, HET, and STARPAHC – used telecommunication satellites to address national and global health disparities in rural and remote areas of the United States or the Indian subcontinent.[110]

Finally, the future changed. Medizin Interkontinental had been emblematic for an imaginary of future medicine in which medical progress and techno-scientific advances went hand in hand. This optimistic outlook crumbled in the early 1970s, partly due to broader economic and cultural trends. With the faltering of the post-war economy, the oil crisis, rising ecological concerns, and the Club of Rome's 1972 warning about the 'limits to growth', the optimism of the 1960s quickly fell out of fashion and was often replaced by an equally strong current of pessimism. Inside the medical field, technology was perceived more critically, with concerns about the 'medicalisation of life', the 'industrialisation of death', and 'medical colonisation' and increasing doubts about the actual benefits of curative high-tech medicine. Tellingly, in March 1975, five years after the futurological 'Medicine 1980' congress, another conference in Davos discussed the 'limits to medicine' and the recently published *Medical Nemesis* by Ivan Illich (1926–2002).[111] Against the backdrop of shifting socio-technical imaginaries, visions of space-age telemedicine soon appeared

109 Robert Wischer, "Das Großkrankenhaus - gestern, heute und morgen - aus der Sicht des Architekten," *Historia Hospitalium*, 16 (1985), 11–18.

110 Robert O. Wales, "ATS-6 Final Engineering Performance Report: Volume IV - Television Experiments," *NASA Reference Publication* (NASA, November 1981), https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19820008277.pdf, accessed 2 March 2022; Dennis Foote, Edwin Parker and Heather Hudson, "Telemedicine in Alaska: The ATS-6 Satellite Biomedical Demonstration. Final Report" (Institute for Communication Research, Stanford University, February 1976), https://files.eric.ed.gov/fulltext/ED119675.pdf, accessed 2 March 2022; Romesh Chander and Kiran Karnik, *Planning for Satellite Broadcasting: The Indian Instructional Television Experiment* (Paris, 1976); Gary Freiburger, Mary Holcomb and Dave Piper, "The STARPAHC Collection: Part of an Archive of the History of Telemedicine," *Journal of Telemedicine and Telecare*, 13 (2007), 221–223.

111 Renée-Marie Croose Parry, "The Limits to Medicine: Held at Davos, 24–26 March 1975," *Futures*, 7 (1975), 351–354; Flurin Condrau and Carsten Timmermann, "Ivan Illichs Medical Nemesis und die Medizingeschichte," in *Nach Feierabend 8: Gesundheit*, ed. David Gugerli et al. (Zürich, 2012), 179–188.

less like a desirable future and more like the dystopian embodiment of dehumanised and alienated high-tech biomedicine in which technology threw up a barrier between doctor and patient. Medizin Interkontinental was the product of a convergence of medical, geo-political, and economic motives and cultural trends, and depended on specific technological expectations, usage scenarios, and the social acceptance of medical technology. Once this constellation changed after 1970, the futurological narrative fell apart.