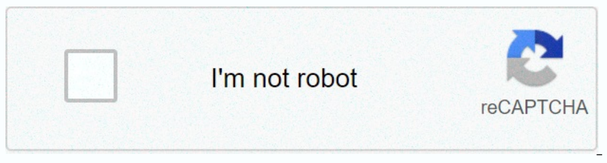

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Supporto app Norme sulla privacy I've got to be free (Devo essere libero) è la traccia numero three part quinto album degli Scorpions, Taken by Force, pubblicato il 4 dicembre del 1977. Formazione Scorpions (1977) Klaus Meine – voce Rudolf Schenker – chitarra Ulrich Roth – chitarra Francis Buchholz – basso Herman Rarebell – batteria Traduzione I've been allowed to be free – Scorpions Testo trad dio tto I must be free (Roth) degli Scorpions [RCA] You burn my heart you burn my mind you destroy my art you waste my time No taste in your actions no taste in your line no truth or direction no true love to me You say you want to be a superstar don't give a damn how to get as far as you say you want to ride a diamond car but I don't like your fat cigar. Hey, hey, hey, hey, you don't want to see I'm not your springboard hey, hey, hey, hey I have to be free so leave my life alone You're in love with success you spill my wine not follow my tracks, babe you way is not my Main God is money you're wasting my life I'm not your Bugs Bunny and you're not my wife You say you just do it for our best but you want to don't see what I hate you think I'm crack-brained that I'm going to leave your show but you can't see what I see so let me go. Stai bruciando il mio cuore Stai bruciando la mia mente Stai deturpando la mia arte Stai sprecando il mio tempo Nessun garbo nelle tue azioni Nessun garbo nella tua linea Nessuna verità o direzi Nessone Nessun vero amore di me Dici che vuoi essere una superstar Non hai una idea di come arrivare tanto lontano Dici che vuoi guidare una macchina di diamanti Ma non mi piace il tuo grosso sigaro. Hey, hey, hey, hey, hey, hey non lo vedi Non sono il tuo trampolino hey, hey, hey, hey devo essere libero Lascia la mia vita Sei innamorata del tuo successo Stai bevendo il mio vino Non seguire le mie tracce, bimba la tua strada it's my your god is the coin he's destroying my life not il tuo Bugs Bunny e tu non sei mia moglie Dici che fai tutto per il nostro bene ma non vedi che cosa odio pensi che io sono schizzato perché voglio lasciare il tuo spettacolo ma non puoi vedere cosa vedo io quindi lasciami andare. Traduzione letta 777 volte • Tag: 1977 I base al termine ricercato questi esempi potrebbero contenere parole volgari. I base al termine ricercato questi esempi potrebbero contenere parole colloquiali. I know it's not a normal season for climbers over there but Kevin and Matt put the trip together and I got the free flight, courtesy of The North Face, so I wasn't about to miss the opportunity. So che non è la stagione giusta, ma Kevin e Matt hanno organizzato il viaggio e The North Face mi ha regalato un biglietto gratis, quindi non volevo perdere questa opportunità. Nessun risultato trovato per questo significato. Parole frequenti: 1-300, 301-600, 601-900, AltroEspressioni brevi frequenti: 1-400, 401-800, 801-1200, AltroEspressioni lunghe frequenti: 1-400, 401-800, 801-1200, Altro In base al termine ricercato questi esempi potrebb conteeronere parole volgari. I base al termine ricercato questi esempi potrebbero contenere parole colloquiali. I got rid of Ho subito infortuni tutta la vita, poi nei primi anni dei miei 40, mi sono liberato delle scarpe e i miei acciacchi sono spariti assieme a loro. I was injured all my life, and then in my early 40s I got rid of my shoes and my running creams have passed away as well. Il sistema di trattamento dell'aria al suo interno, mi sono liberato dell'aria condizionata, perché ho pensato che consumava troppo. The air treatment system inside it – I got rid of air conditioning because I thought there was too much consumption going on there. Nessun risultato trovato per questo significato. Parole frequenti: 1-300, 301-600, 601-900, AltroEspressioni brevi frequenti: 1-400, 401-800, 801-1200, AltroEspressioni lunghe frequenti: 1-400, 401-800, 801-1200, Altro The richest explanation to date on how the arrival of MP3 upended almost everything about how music is distributed, consumed and stored. It's a story you might think you know, but Mr. Witt brings new reporting to bear, and complicates things in amazing ways. . . . [How Music Got Free] has the clear writing and brisk reportorial acumen of a Michael Lewis book. Dwight Garner, The New York TimesTense, perceptive. . . . . Witt, a first-time writer, comes from the financial world, and his old-fashioned, connect-the-dots reporting presents a nuanced depiction of an issue usually reduced to emotional absolute. . . . [A] complex, groundbreaking story. — The New York Times Book Review[W] hip-smart, superbly reported and indispensable. —The Washington PostA lucid, mordantly funny account of the rise of digital music piracy, begins with the story of a in a North Carolina CD-pressing facility that personally personally more than 2,000 albums over eight years. Wittmagazine's book is more than just a simple story – or defense – of file sharing, a development that most people associate with Napster, but which, according to Witt, involved a much broader – and fascinating– story. The Seattle TimesA must-read about the rise of privacy. . . . Suspenseful, entertaining. . . . . Important reading for all students in the music industry. BillboardIncredible, possibly canonical. . . . . A story that's too bizarre to make up, but that needed to be told. . . . . Even if you're not a music geek, How Music Got Free is one of the most poignant investigative books of the year. —ViceHow Music Got Free Doubles as a detailed ode to MP3 as it tells the story of three men grappling with digital compression technology and its widespread fallout. . . . According to Witt's account, these three relatively unknown figures spurred on tectonic changes in the music industry in recent decades and changed the way we listen to and consider music today. . . . How Music Got Free talks about supreme innovation and stubborn hardliners, and although its trio of principled characters never actually cross paths in real life, it's tempting to consider what would have happened if they did, what crises might have been avoided. - Pitchfork.com the story of the music industry's epic struggle with technological development that quickly and irrevocably changed it forever. . . . Narrated by Witt with the clarity and drive of some fictional page-turner. — The FaderWitt reveals the largely untold history of people like the German entrepreneur who invented the mp3 file and Dell Glover, the compact disc factory worker who leaked some of the great of the aughts, leaving record label execs frustrated and scared —Business InsiderBrilliant written. . . . Fascinating.... Very entertaining. . . . . Full of surprises. —The GuardianA compelling account of how technology has turned the music industry upside down . . . This is a fantastic, timely, informative book. – Nick Hornby, The Sunday Times (UK)Convincing . . . A perfect first book. – The Economist [Witt] organizes his story around alternating chapters that each focus on a separate protagonist: an engineer, an executive and a criminal: Universal Chairman Doug Morris and two nemeses Morris didn't even know he had: German engineer Karlheinz Brandenburg, and music pirate Dell Glover, a Polygram/Universal employee at the Tennessee CD manufacturing facility. —The Daily BeastHow Music Got Free is the result of five years of tunnel-vision focusing on the history of digital music. - The Village Voice [An] excellent history of MP3 and its effect on the recording industry. . . . An important reading for musicians. Colpitts, The Talkhouse The captivating story of post-millennial technology, piracy, and corporate futility. —Los Angeles Review of BooksA captivating new book that reveals the story of MP3s, pirates and a recalcitrant music store. —Lincoln Journal Star[A] fascinating account of the rise of music piracy. . . . A captivating story. . . . . Most important music book of the year. —The Independent (UK)A virtuoso, briskly readable account of when the music industry briefly, seemingly, got on its knees. . . . There's a lot to learn from the music industry's antagonistic relationship with the technology that defined it, and Witt puts it all on the page. —The Portland MercuryStory of how the Internet brought the impenetrable music industry to its knees has never been told more succinctly and readably than it is here. . . . How Music Got Free cries out for a film treatment like The Social Network. BookPageA fascinating behind-the-scenes look at a worldwide cultural phenomenon that blew up the music business structure while creating a new one in which no company holds all the cards (although some of them still have plenty). . . . An engaging account of how the music industry had to change to survive, thanks to the efforts of a few tech-savvy people from different backgrounds. —Shelf Awareness for readersA captivating detective story . . . Witts exposé of the business of mainstream music will intrigue fans and critics of pop culture and anyone who has purchased a CD, downloaded an MP3, or used a streaming music service. -Library Journal A forward and fascinating portrait of the people who helped upend an industry and challenge how music and media are consumed. —Kirkus ReviewsAs Bond meets 28 days later . . . Witt tells an intriguing story, with a cast of music biz bigwigs, arduous German boffins, and pirates and petty thieves. Witt's writing reminded me of all my favorite modern essayists: Remnick, Franzen and John Jeremiah Sullivan. I loved it. — Colin Greenwood, Radiohead How Music Got Free is as much a tale of greed, friendship, genius and stupidity as it is about music piracy. And it tells a great story about a part of the Internet (not to mention the criminal underground) that I took for granted. I burned through it--you'll come too. — Christian Rudder, author of Dataclysm --This text refers to an out of print or inaccessible edition of this title. IntroductionI'm a member of the pirate generation. When I got to college in 1997 I had never heard of an mp3. By the end of my first semester I had filled my 2 gigabyte hard drive with hundreds of bootlegged songs. At graduation, I had six 20-gigabyte drives, all full. In 2005, when I moved to New York, I had collected 1,500 gigabytes of music, nearly 15,000 Worth. It took an hour just to queue up my library, and if you ordered the songs alphabetically by artist, you would have to listen for a year and a half to get from ABBA to ZZ Top.I pirated on an industrial scale, but told no one. It was an easy secret to keep. You never saw me at the record store and I didn't dj parties. The files were procured in chat channels, and through Napster and BitTorrent; I haven't bought an album of my own money since the turn of the millennium. Vinyl collectors of old had filled entire basements with dusty album jackets, but my digital collection could fit in a shoebox. I never listened to most of this music. I actually hated ABBA, and although I owned four ZZ Top albums, I couldn't tell you the name of one. What really drove me, I wonder? Curiosity played a role, but now, years later, I can see that what I really wanted was to belong to an elite and rare group. This was not a conscious impulse, and if you had suggested it to me, I would have denied it. But it was the perverse lure of underground piracy, the point that almost everyone missed. It wasn't just a way to get the music; it was its own subculture. I was in the very prime of the digital download trend. Had I only been a couple of years older, I doubt I would have gotten so involved. My older friends viewed piracy with skepticism, and sometimes pure hostility. This was true even for those who loved music -in fact it was especially true for them. Record collecting had been a subculture as well, and to disappear the race, finding albums proved to be an exciting challenge, one that involved scouring garage sales, sifting through bargain boxes, attending mailing lists for bands, and Tuesday visits to the record store. But for me, and the younger ones, the gathering was effort: the music was simply there. The only hard thing was figuring out what to listen to. As I browsed through my huge list of albums one day a few years ago, a basic question struck me: where did all this music come from, anyway? I didn't know the answer, and as I researched it, I realized that no one else did either. There had been heavy coverage of the mp3 phenomenon, of course, and of Apple and Napster and Pirate Bay, but there had been little talk of inventors, and almost none at all of them actually pirated the files. I became obsessed, and as I researched more, I began to find the most wonderful things. I found the manifesto from the original mp3 piracy click, a document so old I needed an MS-DOS emulator just to view it. I found the cracked shareware demo for the original mp3 encoder, which even its inventors had considered lost. I found a secret database that tracked thirty years of leaks-software, music, movies-from every major piracy crew, going until 1982. I found secret websites in Micronesia and Congo, Congo, to shell companies in Panama, the true holder is anyone's guess. Buried in thousands of pages of court documents, I found wiretapping transcripts and FBI surveillance logs and testimonies from associates where the details of insidious global conspiracies had been laid bare. My assumption had been that music piracy was a crowdsourced phenomenon. That is, I thought mp3s I had downloaded had been sourced from scattered uploaders around the world and that this diffuse network of rippers was not organized in any meaningful way. This assumption was wrong. While some of the files were indeed untraceable artifacts from random denizens of the Internet, the vast majority of pirated mp3s came from just a few organized dropping groups. By using forensic data analysis, it was often possible to trace these mp3s back to their place of primary origination. Combining the technical approach with classic investigative reporting, I found that I was able to limit this further. Many times it was possible to not only trace the pirated file back to a general origin, but actually to a certain time and a certain person. That, of course, was the real secret: the Internet was made by people. Piracy was a social phenomenon, and once you knew where to look, you could start ursysa individuals in the crowd. Engineers, managers, employees, investigators, convicts, even burnout—they all played a role. I started in Germany, where a team of ignored inventors, in a blithe attempt to make a few thousand dollars from a struggling business venture, had accidentally crippled a global industry. In this way, they became extremely rich. In interviews, these men dissembled, and tried to distance themselves from the chaos they had unleashed. Sometimes they were even dishonest, but it was impossible to begrude them their success. After cloistering themselves for years in a listening lab, they had emerged with a technique that would conquer the world. Then to New York, where I found a powerful music executive in his early 70s who had twice cornered the global market in rap. Nor was it his only achievement; as I researched more, I realized that this man was popular music. From Stevie Nicks to Taylor Swift, there had been almost no major action from the last four decades that he had in no way touched. Faced with an unprecedented onslaught of piracy, his company had suffered, but he had fought valiantly to protect the industry and the artists he loved. To my eyes, it seemed indisputable that he had outdone all his competitors; for his problems, he would become one of the most vilified executives in recent memory. From the high-rises in Midtown Manhattan, I turned my attention to Scotland Yard and FBI headquarters, where stubborn teams of investigators had the thankless task of tracking this digital samizdat back to its source, a process process often took years. After their trail to an apartment in the north of England, I found a hifi obsessive who had overseen a digital library that would have impressed even Borges. From there to Silicon Valley, where another entrepreneur had also designed a mind-bending technique, but one that he had completely failed to make money from. Then to Iowa, then to Los Angeles, back to New York again, London, Sarasota, Oslo, Baltimore, Tokyo, and then, for a long time, a series of dead ends. Until finally, I found myself in the strangest place of all, a small town in western North Carolina that seemed so far from the global confluence of technology and music that could be. This was Shelby, a landscape of clapboard Baptist churches and faceless franchises, where a man, acting in almost total isolation, had for a period of eight years cemented his reputation as the most fearsome digital pirate of all. Many of the files I had pirated— perhaps even a majority of them — originated with him. He was patient Zero of Internet music piracy, but almost no one knew his name. Over the course of more than three years I tried to gain his trust. Sitting in the living room of her sister's ranch house, we often talked for hours. The things he told me were amazing- sometimes they seemed almost incomprehensible. But the details checked out, and once, at the end of an interview, I was moved to ask: Dell, why haven't you told me any of this before? Man, no one ever asked. CHAPTER 1The death of mp3 was announced in a conference room in Erlangen, Germany, in the spring of 1995. For the last time, a group of supposedly impartial experts snubbed the technology, favoring its eternal rival, mp2. This was the end, and mp3's inventorknew it. They were on government funding, their corporate sponsors were abandoning them, and after a four-year sales push, the technology had yet to secure a single long-term customer. Attention in the conference room turned to Karlheinz Brandenburg, the driving intellectual force behind the technology and leader of the mp3 team. Brandenburg's work as a PhD student had pointed the way to technology, and for the past eight years he had worked to commercialize his ideas. He was ambitious and intelligent, with an infectious vision for the future of music. Fifteen engineers worked under him, and he oversaw a million-dollar research budget. But with the latest announcement, it looked as if he had led his team to a cemetery. Brandenburg did not possess a commanding physical presence. He was very tall, but he bent over, and his body language was erratic. He constantly rocked his heels, lurching his gangly body back and forth, and as he talked, he nodded his head in soft circles. His hair was dark and held too long, and his nervous, eternal smile exposed teeth that were His wire-frame glasses sat over dark, narrow eyes, and stray hairs protruding like whiskers from his scraggly beard. He spoke quietly, in long, grammatically perfect sentences, punctuated with short, sharp breaths. He was polite, and overwhelmingly kind, and he always did his best to put people at ease, but this just made things more awkward. As he spoke, he tended to dwell on practical issues, and perhaps sensing boredom on the part of the listener, he would sometimes pepper this rambling technical discourse with weakly delivered, unfunny jokes. In his personality, two powerful antiseptic forces were united: skepticism of the engineer, and the stuffy, nation-specific conservatism they called typisch Deutsch.He was brilliant, however. His mathematical talent surpassed, and he kept his contemporaries in thrall. These were men who had excelled in difficult academic disciplines and who had spent their lives near the top of competitive areas. As a rule, they were not given to intellectual modesty, but when they talked about Brandenburg, their arrogance waned and they returned to silent, confessional tones. He's very good at math, said one. He's really pretty smart, said another. He solved a problem I couldn't say a third, and this, for an engineer, was the most terrible recognition of all. When challenged at one point, Brandenburg would pause, then squint, then expose contrasting claims of a piercing scientific dismissal. In disagreement, his voice became almost imperceptible, and in his response he was guarded in the extreme, careful never to make a claim without data to back it up. In the conference room then, when he submitted his last objection to the committee, mp3 went out with a whisper. The defeat was always bitter, but this one was more so because, after 13 years of work, Brandenburg had solved one of the major open issues in the field of digital sound. The body of the research committee was dismissing went back decades, and engineers had been theorizing about something like mp3 since the late 1970s. Now from this murky scientific backwater something beautiful had arisen, the refined product of a line of inquiry that went back three generations. Only the costumes in the room didn't care. Brandenburg's thesis adviser, a bald, stentorian computer engineer named Dieter Seitzer, had started him on this path. Seitzer himself was indebted to his own thesis counselor, an obsessive investigator named Eberhard Zwicker, the father of an obscure discipline known as psychoacoustics—the scientific study of how people perceive sound. Seitzer had been Zwicker's protégé, his experimental sound subject, and, most importantly, his deadly adversary. For almost a decade, the two had met every weekday after lunch for a game of table tennis, during which, over the course of an hour, would school his pupil on the liminal contours of human perception while blasting ping-pong balls on his head. Zwicker's main finding, gathered over decades of research with real subjects, was that the human ear did not act like a microphone. Instead, it was an adaptive body, one that natural selection had decided on 1) would hear and interpret language and 2) provide an early warning system against huge carnivorous cats. The ear was only as good as it needed to be to achieve these goals, and not better. Thus, it had inherited a legacy of anatomical flaws, and Zwicker's research had revealed the no-perceived breadth of these errors. For example, anyone could distinguish two simultaneous tones separated by half a ton or more, but Zwicker had found that by moving the notes closer together in pitch, he could trick people into hearing only one. This effect was especially true when the lower pitch was higher than the higher. Similarly, all listeners could distinguish between two clicks spaced half a second apart, but Zwicker had found that, by shortening that interval to just a few milliseconds, he could trick his ear into combining them. Even here, increasing the relative loudness of one of the clicks made the effect more pronounced. The combined effect of these psychoacoustic masking illusions meant that reality, as people heard it, was something of a fiction. Over time, Seitzer began to play out the champion. Zwicker was an anatomist, and his insights were products of the analog era. Seitzer, by contrast, was a computer scientist, and he expected the coming era of digitization. In particular, he suspected that by taking advantage of Zwicker's research on the ear's inherent flaws, it might be possible to record high-fidelity music with very small amounts of data. This unique training gave him an unusual perspective. When the CD debuted in 1982, the engineering community celebrated it as one of the most important achievements in the area's history. Seitzer, practically alone, saw it as a ridiculous exercise in overkill. Where the promised sales literature promised Perfect Sound Forever, Seitzer saw a maximalist repository of irrelevant information, most of which were ignored by the human ear. He knew that most of the data from a CD could be discarded—the human auditory system already did. In the same year, Seitzer applied for a patent for a digital jukebox. Under this more elegant model of distribution, consumers were able to dial into a centralized computer server, then use the keypad to request music over the new digital phone lines that Germany had just begun to install. Rather than pushing millions of discs into jewel cases and distributing them through stores, everything would be saved in a single electronic database and accessed as needed. A subscription-based service of kind could skip the manifold inefficiency of physical distribution by hooking the stereo directly to the phone. The patent was rejected. The earliest digital phone lines were primitive business, and the huge amount of audio data on the CD could never fit down such a narrow tube. For Seitzer's system to work, the files on the disc would have to be shrunk to one twelfth its original size, and no known approach to data compression would get you anywhere near this level. Seitzer struggled with the patent examiner for a couple of years, citing the importance of Zwicker's performance, but without a workable implementation it was hopeless. Eventually he withdrew his application. Yet the idea stayed with him. If the limitations of the human ear had been mapped by Zwicker, then the remaining task was to quantify these limitations with mathematics. Seitzer himself had never been able to solve this problem, nor had any of the many other researchers who had tried. But he directed his own protégé against the problem of enthusiasm: the young electrical engineering student named Karlheinz Brandenburg was one of the smartest people he had ever met. Privately, Brandenburg wondered if a decade of table tennis with an eccentric otological experimenter had driven Seitzer crazy. Information in the digital age was stored in binary devices at zero or one, called bits, and the goal of compression was to use as few of these bits as possible. CD audio used more than 1.4 million bits to store a single second of stereo sound. Seitzer wanted to do it with 128,000.Brandenburg thought this goal was preposterous—it was like trying to build a car on a budget of two hundred dollars. But he also thought it was a worthy goal for his own ambitions. He worked on the problem for the next three years, until in early 1986 he saw a path of inquiry that had never been investigated. Dubbing this insight analysis of synthesis, he spent the next few sleepless weeks writing a set of mathematical instructions on how these precious pieces can be assigned. He started by chopping up the sound. With a sampler, he divided the incoming sound into fractional slivers of a second. With a filter bank, he then sorted the sound into different frequency lots. (Filter banks worked on sound way a prism worked on light.) The result was a grid of time and frequency, consisting of microscopic snippets of sound, sorted in narrow bands of pitch-sound version of pixels. Brandenburg then told the computer how to simplify these sound pixels using four of Zwicker's psychoacoustic tricks: First, Zwicker had shown that human hearing was best at a certain range of pitch frequencies, roughly equivalent to the tonal range of the human voice. When registering beyond that, hearing deteriorates, especially as you higher on the scale. This meant that you could fewer pieces to the outerends of the spectrum. Secondly, Zwicker had shown that tones that were close in the pitch tended to interrupt each other. In particular, lower tones are higher, so if you digitize music with overlapping instrumentation—say a violin and a cello at the same time—you could assign fewer pieces to the violin. Thirdly, Zwicker had shown that the hearing system interrupted noise after a loud click. So if you digitize music with, say, a cymbal crash with a few actions, you can assign fewer pieces to the first millim customers after the pace. Fourth-and that's where it gets weird-Zwicker had shown that the hearing system also interrupted noise before a loud click. This is because it took a few milliseconds for the ear to actually process what it was sensing, and this treatment can be disrupted by a sudden onrush of louder sounds. So, going back to the cymbal crash, you can also assign fewer pieces to the first millipedes before the pace. Relying on decades of empirical auditory research, Brandenburg told me the pieces were to go. But this was only the first step. Brandenburg's real achievement was figuring out that you can run this process iteratively. In other words, you can take the production of his bit-assignment algorithm, feed it back to the algorithm, and run it again. And you can do this as many times as you wanted, each time reducing the number of bits you spend, making the audio file as small as you wanted. It was degradation of course: as a copy of a copy or a fourth-generation cassette dub, with each successive pass of the algorithm, sound quality got worse. In fact, if you ran the process a million times, you'd end up with nothing but a single piece. But if you found the right balance, it would be possible to both compress the sound and preserve fidelity, with only the pieces you knew the human ear could actually hear. Of course, not all musical work employed such complex instrumentation. A violin concerto can have all sorts of psychoacoustic layoffs; a violin solo would not. Without cymbal crashes, or an overlapping cello, or high registry information to be simplified, it was just a pure tone and nowhere to hide. What Brandenburg could do here, however, was dump the production pieces from his compression method to a second, completely different. Dubbed Huffman coding, this approach had been developed by the pioneering computer scientist David Huffman at MIT in the 1950s. Working at the beginning of the information age, Huffman had observed that if you wanted to save on pieces, you had to look for patterns, because patterns, by definition, are repeated. Which meant that instead of assigning bits to the pattern every time it occurred, you just had to do it once, then refer back to those pieces as needed. And from the point of was all a violin solo was: a vibrating string, cutting predictable, repetitive patterns of sound in the air. The two methods complemented each other perfectly: Brandenburg's algorithm for complicated, overlapping noise; Huffman's for clean, simple tones. The combined result combined decades of research on acoustic physics and human anatomy with basic principles of information theory and complex higher mathematics. By mid-1986, Brandenburg had even written a rudimentary computer program that provided a working demonstration of this approach. It was the signature achievement of his career: a proven method of capturing audio data that can stick to even the stingiest budget for pieces. He was 31 years old. He got his first patent before he had even defended his thesis. For a PhD student, Brandenburg was unusually interested in the dynamic potential of the marketplace. With a mind like his, a tenure-track position was guaranteed, but academia had little interest in him. As a child, he had read biographies of the great inventors, and at an early age had internalized the importance of the practical method. Brandenburg-as-Bell, like Edison-was an inventor first. These ambitions were encouraged. After escaping

from Zwicker, Dieter Seitzer had spent most of his own career at IBM, collecting basic patents and developing keen commercial instincts. He directed his phD students to do the same. When he saw the progress brandenburg made in psychoacoustic research, he pushed him away from the university and toward the nearby Fraunhofer Institute for Integrated Circuits, the newly founded Bavarian technology incubator that Seitzer oversaw. The institute was a division of the Fraunhofer Society, a massive state-run research organization with dozens of campuses across the country—Germany's response to Bell Labs. Fraunhofer awarded taxpayers' money for promising research in a variety of academic disciplines, and, as research matured, mediated commercial relationships with large consumer industry companies. For a share in the future proceeds of Brandenburg's ideas, Fraunhofer offered state-of-the-art supercomputers, high-end acoustic equipment, professional intellectual property expertise and skilled engineering. The last one was critical. Brandenburg's method was complex, requiring several computationally demanding mathematical operations to be performed simultaneously. 1980s computer technology was barely up to the task, and algorithmic efficiency was key. Brandenburg needed a virtuoso, a caffeine-addled superstar who could translate graduate-level mathematical concepts into flawless computer code. At Fraunhofer he found his husband: a 26-year-old programmer named Bernhard Grill.Grill was shorter than Brandenburg and his manner was much calmer. His face was wide and and he carried bar sandy hair a little long. He spoke louder than Brandenburg, with more passion, and conversations with him were composed and natural. He told jokes, too, jokes that were-yes, not all the fun either, but certainly better than Brandenburg's. In the world of sound, Grill stood out, for it was possible to imagine him as something other than an engineer. Like Brandenburg, he was Bavarian, but his attitude was more bohemian. He had a relaxed, wonkish nature to him, and was the sort of person who, had he lived in America, may have favored sandals and a Hawaiian shirt. Maybe it was his background. While Brandenburg's father himself was a professor, and most of the other Fraunhofer scholars came from the upper middle class, Grill's father had worked in a factory. For Brandenburg, a university education had been a given, practically a birthright, but for Grill it had real significance. In his own way, he had rebelled against the typisch Deutsch mentality. His original passion had been music. At a young age Grill had raised the trumpet, and in his teens he practiced six hours a day. For a short period in his 20s, he had played professionally in a nine-man swing band. When the economic reality of this career choice became apparent, he had returned to technology, and stopped studying computers. But the music remained close to his heart, and over the years he gathered a huge, eclectic collection of recorded music from a variety of obscure genres. His second hobby was building speakers. Brandenburg and Grill were joined by four other Fraunhofer researchers. Heinz Gerhäuser supervised the institute's audio research group; Harald Popp was a hardware specialist; Ernst Eberlein was a signal processing expert; Jürgen Herre was another phD student whose mathematical skills competed with Brandenburg's own. In recent years this group would refer to themselves as the original six. Starting in 1987, they took on the full-time task of creating commercial products based on brandenburg patents. The group saw two potential avenues for development. First, Brandenburg's compression algorithm could be used to stream music—that is, send it directly to the user from a central server, as Seitzer had intended. Alternatively, Brandenburg's compression algorithm can be used to store music—that is, create replayable music files that the user would hold on a personal computer. Either way, size mattered, and getting the compression ratio to 12 to 1 was key. It was slow. Computing was still on its way out of its homebrew origins, and the team built most of their equipment by hand. The lab was a sea of cables, loudspeakers, signal processors, CD players, woofers and converters. Brandenburg's algorithm must be encoded directly on programmable chips, a process that can take days. Once a chip was created, would use it to compress a ten-page sample from a CD, then compare it to the original to see if they could hear the difference. When they could — which in the beginning almost always was — they refined the algorithm and tried again. They started at the top, with the piccolo, then worked down the scale. Grill, who had obsessed over acoustics since childhood, could see at once that the compression technique was far from marketable. Brandenburg's algorithm generated a lot of unpredictable errors, and sometimes that was all Grill could do to inventory. Sometimes the coding was muddy, as if the music was playing underwater. Sometimes hoisted, as static from an AM radio. Sometimes it was double-speak, as if the same recording had been overlaid twice. Worst of all was the pre-echo, a strange phenomenon in which ghostly remnants of musical phrases appeared several milliseconds early. Brandenburg's mathematics was elegant, even beautiful, but it could not fully account for the messy reality of perception. To really model human hearing, they needed human subjects. And these subjects required training to understand vocabulary failure as well as Grill did. And once this expertise was established, it would have to be handed over to thousands upon thousands of controlled, randomized, double-blind trials. Grill approached this time-consuming endeavor with enthusiasm. He was what they called a golden ear: he was able to distinguish between microtones and pick up on frequencies normally only available to children and dogs. He approached the sense of hearing as a perfumer approached the sense of smell, and this sharpened sense allowed him to name and grade certain sensory phenomena—certain aspects of reality, really—that others could never know. Accused of choosing reference material, Grill combed his massive CD archive for all sorts of forms of music: funk, jazz, rock, R&; B, metal, classic-every genre except rap, which he disliked. He wanted to throw everything he could find on Brandenburg's algorithm, to make sure it could handle every case imaginable. Funded by Fraunhofer's generous research budget, Grill went beyond music to become a collector of exotic noise. He found recordings of fast-paced speakers with difficult accents. He found recordings of bird calls and crowd noise. He found recordings of clacking castanets and mistuned harpsichord. His personal favorite came from a visit to Boeing's headquarters in Seattle, where he found in the gift shop a collection of audio samples from roaring jet engines. Under Grill's leadership, Fraunhofer also bought several pairs of thousand dollar Stax headphones. Made in Japan, these electrostatic ear peaks were the size of bricks and required their own dedicated amplifiers. They were impractical and expensive, but considered Stax to be the finest equipment in the history of sound. They revealed every imperfection with grid clarity, and the ability to isolate these digital bugs spurred a cycle of continuous improvement. As a shrinking beam, the compression algorithm can target different output sizes. At half size, the files sounded decent. At quarter size, they sounded OK. In March 1988, Brandenburg isolated a recording of a piano solo, then dialed the encoding ratio as low as he dared—all the way down to Seitzer's crazy stretch of goal of the one-twelfth CD size. The resulting coding was lousy with errors. Brandenburg would later say that the pianist sounded drunk. But still, this experiment in anxious listening gave him confidence, and he began to see for the first time how Seitzer's vision can be achieved. Increases in processing power spurred progress. Within a year Brandenburg's algorithm handled a variety of recorded music. The team hit a milestone with 1812 Overture, then another with Tracy Chapman, then another with a song by Gloria Estefan (Grill was on a Latin kick). In late 1988, the team made its first sale, and sent a hand-built decoder to the first ever end user of mp3 technology: a small radio station run by missionaries on the remote Micronesian island of Saipan.But an audio source showed intractable: what Grill, with its imperfect command of English, called the lonely voice. (He meant alone.) Human speech could not, isolated, be psychoacoustically masked. Nor could you use Huffman's pattern recognition approach—the essence of the century was its dynamic nature, its plosives and sibilants and glottal stops. Brandenburg's shrinking algorithm was able to handle symphonies, guitar solos, cannons, even Oye Mi Canto, but it still couldn't handle a newscast. Stuck, Brandenburg isolated samples of lonely voices. The first was a recording of a difficult German dialect that had plagued sound engineers for years. The second was an excerpt of Suzanne Vega singing the opening bars of Tom's Diner, her 1987 radio hit. You may remember the a cappella intro to Tom's Diner. It goes like this:Dut dut duh dutDut dut dutDut dut dutDut dut duh dut dutVega had a beautiful voice, but on the early stereo encodings it sounded as if there were rats scratching on the tape. In 1989 Brandenburg received his PhD. He then took voice samples with him at a community to AT&; T's Bell Labs in Murray Hill, New Jersey. There he worked with James Johnston, a specialist in voice coding. Johnston was the Newton to Brandenburg's Leibniz-independent, he had suffered an identical mathematical approach to psychoacoustic modeling, at almost exactly the same time. After an initial period used to mark territory, the two decided to cooperate. Whole listening tests continued in parallel in Erlangen and Murray Hill, but the American subjects proved to be less patient than the Germans. After listening to the same rat-eaten, four-second sample of Tom's Diner several hundred times, the volunteers at Bell Labs revolted, and Brandenburg had to finish the experiment on its own. He was there in New Jersey listening to Suzanne Vega when the Berlin Wall fell. Johnston was impressed with Brandenburg. He had spent his life around academic scholars and was used to brilliance, but he had never seen anyone work so hard. Their collaboration spurred several breakthroughs, and soon scratchrats were banished. In early 1990 Brandenburg returned to Germany with an almost finished product in hand. Many compressed samples now showed a state of perfect transparency: even for a discriminating listener like Grill, using the best equipment, they were indistinguishable from the original CDs. Impressed, AT&; T officially graced the technology with its imprimatur and a minimum of corporate financing. Thomson, a French consumer electronics concern, also began to provide money and technical support. Both companies sought an edge in psychoacoustics, because this long-ignored academic discipline was suddenly white hot. Research teams from Europe, Japan and the United States had been working on the same problem, and other large companies were jockeying for position. Many had thrown their weight behind Fraunhofer's better established competitors. Seeking to mediate, the moving image experts Group (MPEG)-the standards committee that even today decides which technology makes it to the consumer marketplace-convened a contest in Stockholm in June 1990 to conduct formalized listening tests for the competing methods. When the 1990s opened, MPEG was preparing for a decade of disruption, shaping technical standards for near-future technologies such as HD TVs and the digital video disc. Being a moving image expert, the committee had first focused exclusively on video quality. Audio coding problems were an afterthought, one they had tackled only after Brandenburg pointed out that there was no longer much of a market for silent films. (This was the kind of joke brandenburg liked to make.) An MPEG endorsement may involve a fortune in licensing fees, but Brandenburg knew it would be difficult to obtain. The Stockholm competition would be graded against ten sound benchmarks: an Ornette Coleman solo, the Tracy Chapman song Fast Car, a trumpet solo, a glockenspiel, a recording of fireworks, two separate bass solos, a ten-second castanet sample, an excerpt of a newscast and a recording of Suzanne Vega performing Tom's Diner. (The last one was proposed by Fraunhofer.) The judges were neutral participants, selected from a group of Swedish doctoral students. And MPEG needed undamaged ears that could still hear high-frequency frequencies, the evaluators skewed young. Fourteen different groups submitted records to the MPEG trials—the high-stakes version of a middle school science fair. On the eve of the competition, the competing groups held informal demonstrations. Brandenburg was sure his group would win. He believed that access to Zwicker's innovative research, still untranslated from German, gave him an insurmountable edge. The next day a room full of light-haired, ready-eared Scandinavian virgins spent the morning listening to Fast Car ripped 14 different ways. Listeners scored the audio quality results on a five-point scale. After tabulating the responses, MPEG announced the results-it was a tie! At the top was Fraunhofer, locked in a statistical dead heat with a rival group called MUSICAM. No one else was close. Fraunhofer's strong performance in the competition was unexpected. They were a dark horse candidate from a research institution, a bunch of graduate students competing against established business players. MUSICAM was more representative of the typical MPEG competition winner—a well-funded consortium of inventors from four different European universities, with deep ties to the Dutch company Philips, which kept the patents on the CD. MUSICAM also had several German researchers on staff, and Brandenburg suspected that this was not a coincidence. They had had access to Zwicker's untranslated research as well. MPEG had not anticipated a tie, and had not made provisions to break one. Fraunhofer's approach improved sound quality with less data, but MUSICAM's required less processing power. Brandenburg felt this difference worked in his favor, as computing speed improved with each new chip cycle, and doubled every 24 months or so. Improving bandwidth was more difficult, as it required digging up the city streets and replacing thousands of miles of cable. Thus, Brandenburg felt, MPEG should make sure to preserve bandwidth rather than processing cycles, and he repeatedly made this argument to the audio committee. But he felt he was being ignored. After Stockholm, the team waited for months for a decision from MPEG. In October 1990, Germany reunited, and Grill kept himself busy by applying Brandenburg's algorithm to his new favorite song: Scorpions Wind of Change. In November, Eberhard Zwicker, a hearing scientist and table tennis enthusiast, died at the age of 66. In January 1991, the Fraunhofer team rolled out its first commercial product, a 25-pound transmission hardware rack. It made an early sale to bus shelters in a reunited Berlin.Finally, MPEG approached Fraunhofer with a compromise. The Committee would make several endorsements. Fraunhofer would be included, but only if they agreed to play by certain rules, dictated by MUSICAM. I they would need to adopt a gangrenous piece of proprietary technology called a polyphase quadrature filter bank. There were no uglier words. Some kind of filter bank was necessary—this was the technology that shared sound in component frequencies, in the same way a prism made to light. But the Fraunhofer team already had its own filter bank, which worked well. Adding another would double the complexity of the algorithm, without increasing the sound quality. Worse, Philips had a patent on the code, which meant giving a financial stake in Fraunhofer's project to its main competitor. After a long and heated internal debate, Brandenburg finally agreed to this compromise, because he did not see a way forward without MPEG's approval. But to others in the project, it looked like Fraunhofer had been fleeced. In April 1991, MPEG made its endorsements public. Of the 14 original contenders, three methods would survive. The first was called Moving Picture Experts Group, Audio Layer I, a compression method optimized for digital cassette tape that was obsolete practically the moment the press release was distributed. Then, with a name scheme that could only have come from a committee of engineers, MPEG announced the other two methods: the MUSICAM method, which would henceforth be known as the moving picture experts group, Audio Layer II-better known today as mp2 and Brandenburg's method, which henceforth would be known as moving picture experts group, Audio Layer III-better known today as mp3. Instead, the MPEG had tried to create a unified framework for cooperation and triggered a format war. The mp3 had the technical edge, but mp2 had name recognition and deeper business support. The MUSICAM group was really just a proxy for Philips, and Philips was a visionary. The company made a fortune in licensing from the CD, but already, in 1990, with CD sales just starting to outperform vinyl, it was looking to check the market for its possible replacement. This far-sighted strategic planning was complemented by a certain gift for low cunning. At this time, both Brandenburg and Grill began to suspect that the suits at Philips influenced MPEG's decision by lobbying behind the scenes. Johnston, the American, shared these suspicions of favoritism, and mocked the ridiculous three-tiered stock system, a last-minute rule change MPEG had made only when its favored team looked likely to lose. Brandenburg, Grill, and Johnston all used the same words to describe this emerging phenomenon: politics—a hateful situation in which personal relationships and business considerations overdrum scientific data.MPEG defended their decisions and denied any accusations of bias. MUSICAM researchers were outraged by the proposal. Still, the story showed that, from the AC/DC Current Wars of the late century to the VHS-Betamax battle of the 1980s, the victory did not necessarily go to the best, but to the most sinister. From Edison to Sony, the spoils were won by those who not only promoted their own standards, but who cleverly undermined competition. There was a reason they called it a shaped war. The Fraunhofer team, made up of young, naïve academics, were unprepared for such a battle. Over the next few years, in five straight head-to-head races, they got swept. Standardization committees chose mp2 for digital FM radio, for interactive CD-ROM, for Video Compact Disc (the precursor to DVD), for Digital Audio Tape, and for the soundtrack to over-the-air HDTV broadcasts. They chose mp3 for nothing. In discussions with other engineers, the team kept hearing the same criticism: that mp3 was too complicated. In other words, ate up too much computer processing power for what it spit out. The problem can be traced to the Philips baneful filter bank. Half the work the mp3 did was just getting around it. In the technical diagrams explaining the mp3 technology, the flowchart showed how Brandenburg's algorithm completely circumvented the filter bank, like a detour around a car accident. The Fraunhofer team began to see how they had been outmaneuvered. Philips had convinced Fraunhofer to adopt its own ineffective method, then pointed to this exact inefficiency to lower them with standards committees. Worse, engineers there seemed to have started a whisper campaign, spreading the word about these failures to the audio technology community at large. It was commendable sabotage. They had tricked Fraunhofer into wearing an ugly dress to the pageant, then made fun of them behind their backs. But Brandenburg was not one to cry in the corner-ugly dress or not, he was determined to win. In July 1993 he was given a board position in Fraunhofer. Although he had zero business experience and struggled from a losing position, he drove his team all the time. Around this time a gang of thieves broke into the Erlangen campus in the middle of the night, spending tens of thousands of dollars in computer equipment. Each division was hit, given the floor that housed sound research. There, at some dead hour of night, long after everyone else had gone home, two mp3 researchers were still in the listening lab, deaf to the world in their expensive Japanese headphones. This devotion paid off. By 1994, mp3 offered significant improvements in audio quality across mp2, although it still took slightly longer to encode. Even at the aggressive 12 to 1 compression ratio, the mp3 sounded decent, if not completely stereo quality. Twelve years after a patent examiner told Seitzer that it was impossible, the ability to stream music over digital phone lines was almost at hand. Plus, there were growing home PC market, and the prospect of locally stored mp3 media applications. They just had to get that far. In early 1995, the mp2 again beat mp3 in a standard competition, this time for a massive market: the soundtrack for home DVD players. After watching Brandenburg's team go zero for six, budget directors at Fraunhofer began asking difficult questions. Type: why haven't you won a standard competition yet? And: why do you have fewer than 100 customers? And: do you think we might be able to borrow some of your engineers for another project? And: remind me again why the German taxpayers have sunk millions of deutsche mark in this idea? So in the spring of 1995, when Fraunhofer entered his last competition, for a subset of multicast frequencies on the European radio band, winning was all. This was a small market, certainly, but one that would provide enough revenue to keep the team together. And for once, there was cause for optimism: the group's meetings rotated through its membership base, and this time Fraunhofer was scheduled to host. They would be at home, and the final decision on mp3 would be hashed out in a conference room just down the hall from the laboratory where, seven years earlier, work on piccolo had begun. For months in advance, the sending group strung Fraunhofer together. They promised to review the decisions of the past and encouraged them to continue the development of mp3. They welcomed Brandenburg's presence at committee meetings and told him that they understood the funding difficulties his team faced. They urged him to hold out a little longer. In the run-up to the meeting, the Committee's specialised audio subgroup even formally recommended the adoption of the MP3 group. Yet Brandenburg wanted nothing left to chance. He put together an engineering document that revealed the complexity myth in detail. Fifty pages long, it included a chart showing how, over the past five years, processing speed was faster than bandwidth gains, just as he had predicted. The meeting started late in the morning. The conference room in Erlangen was small and the working group was large, so Grill and the other non-representative members of the team had to wait outside. Brandenburg was optimistic when he took his place. He distributed bound copies of his fifty-page presentation, then worked through his talking points with quiet precision. The mp3 could encode higher quality audio with less data, he said. When planning standards, it was important to look to the future, he says. Computer processing speed would catch up with the algorithm, he said. The complexity argument was a myth, he said. Throughout, he referred to the presentation. When he was done, it was MUSICAM's turn. They handed out a presentation as well. It was two pages long. Their spiel was just as short: a clever reminder of simplicity of mp2. The committee then began its discussions. Brandenburg quickly realized that, despite the subgroup's official recommendation, mp3 was guaranteed nothing. Deliberations continued over the next five hours. The talks turned violent, and once again Brandenburg felt behind the scenes intrigues of a political nature. An increasingly agitated Grill repeatedly stopped at the conference room, then left to pace the hall with his colleagues. Finally, a representative from Philips took to the floor. His argument was succinct: two separate radio standards would lead to fear, uncertainty and doubt. The whole point of standards was that you only needed one. After a subtle dig at mp3's processing power requirements, he concluded with a direct appeal to the working group's voting members: Don't destabilize the system. Then the Steering Committee-in the interest of stability, probably-voted to abandon mp3 forever. This was the end. There was nothing left to hope for. MPEG had blocked them from the video disc and the broadcasting committees had kicked them off the airwaves. In head-to-head contests against mp2, Fraunhofer was now zero for seven. The mp3 was Betamax.Bernhard Grill was crushed. He had been working on this technique for the better part of a decade. Standing in the crowded conference room, his back to the wall, he considered challenging the verdict. He was emotional, and he knew that when he started speaking, he might lose control and unleash an angry harangue, driven by the incurred frustration he felt toward this group of know-nothing corporate big shots who had been stringing him together for years. Instead, he remained silent. Typisch Deutsch, after all. Grill's failure to speak up right now would haunt him for years to come. The budget vultures smelled like blood, and he knew that mp3's corporate insurers would now pull the plug. The German state was happy to sponsor a technique with a chance, but now the format war was simply lost. Grill was stubborn, and determined to go down swinging, but he foresaw tough calls ahead: the closure of a dead-end project, the dissolution of the team, patronizing commiseration over years of work spent for nothing. Even Karlheinz Brandenburg was devastated. He had handled the previous losses with equanimity, but this time they would let him get his hopes up. The Philips delegate hadn't even made a real fight. He had just exercised his political muscles, and that was it. The whole experience seemed sadistic, a deliberate attempt to crush his spirits. For years to come, when he spoke of this meeting, the nervous smile would fade, his lips would tighten, and a distant gaze would appear on his face. Nevertheless, this technique, in which verified results should necessarily triumph over human emotions. After the meeting gathered his team for a short pep talk, during which—the forced smile has returned—he explained how the standards of people had simply made a mistake. Again. The team was puzzled by this optimistic attitude, but Brandenburg was able to point to a binder full of technical data, full of double-blind tests, that consistently showed his technique was better. Political dickering aside, that's all that mattered. Somehow, mp3 had to win in the end. They just had to find someone to listen. CHAPTER 2On a Saturday morning later that year, in 1995, two men commuted to work at the PolyGram CD-disc manufacturing facility in Kings Mountain, North Carolina. They traveled in a black Jeep Grand Cherokee four times four with heavily tinted windows. The men were both part-time workers at the facility, and their weekend gigs complemented the income they earned from other job moving furniture and serving fast food. The passenger's name was James Anthony Dockery, but everyone called him Tony. The driver's name was Bennie Lydell Glover, but everyone called him Dell. The men had met a few months earlier on the factory floor, where Dockery, a speaker, had convinced Glover, a listener, to give him a standing trip to work. They both lived in Shelby, a small town of 15,000 people located about twenty minutes to the northwest. Glover was 21 years old. Dockery was 25. None of them had graduated from college. They both practiced Baptists. None of them had lived more than a few kilometres from where he had been born. Glover was black, wore a chinstrap beard and a well manicured fade, and dressed in T-shirts and blue jeans. His physique was cunning and muscular, and the corners turned down into a grimace. His heavy eyelids gave his face a look of eternal indifference, his body language was slow and intentional, and there was a stillness in his presence that approached the torpor. When he spoke, which was not often, he would first take several moments to gather his thoughts. Then his voice emerged, extremely deep and drenched in syrupy tones in the small-town South, the means of delivery for a pithy sentence, perhaps less. Dockery was white, with close cropped sandy blond hair and bloated, glassy eyes. He was shorter than Glover, and his weight was vacillating between mere girth and positively obese. He was a fast-talking jokester, emotional and volatile, and although he could be quick to anger, he tended to laugh when he cursed you. He made his opinions available to anyone who would listen, and also to many who would not. - This text refers to an out of print or inaccessible edition of this title. Title.