The sound of justice

By November 21st, 1945, Adolf Hitler was dead, but the Nazi chain of command he left behind was sitting in court. In the ruins of the German city of Nuremberg, inside the Palace of Justice, Room 600, they faced charges of conspiracy, waging aggressive war, war crimes, and crimes against humanity. Behind the Nazis stood a line of American military police in gleaming white helmets. The Nazi defendants picked up translation headphones from the armrests beside them and placed them on their heads. In the center of the courtroom, Robert Jackson, an American, walked up to a lectern and placed his opening prosecution statement in front of him. Jackson had skipped college and spent only a year at law school, but he nonetheless went on to become an associate justice of the United States Supreme Court. Now, he was chief prosecutor in the world's fragile first experiment in international justice, which was made possible, in part, by an unprecedented audio system.

Every tale of atrocity, every victim's raw testimony, and every revelation that exposed the upside-down logic of the Nazi system flowed through the headphones of a man along the wood-paneled wall of the courtroom. He rested his fingers lightly on a volume dial, as audio from the trial was filtered through a dozen language interpreters. His name was Philip C. Erhorn, and as the chief technician at Nuremberg, he cobbled together a sound system that relayed and recorded the voices in the courtroom. He did it mostly on his own, despite the team of technicians that was assembled to help him. "They didn't know what end of the screwdriver to use," he later told his wife.

no one had attempted to record the audio for such a complicated court case

Erhorn was an audio specialist hired by the US Army Signal Corps who grew up fascinated with hand-crank radios. When he

went to Lehigh University, he got special access to a room of music records, which touched off a lifelong obsession for recording things. Sometimes when he babysat his neighbor's kids, he raided their tape collection for even more music to record.

As Erhorn listened on the first day, a judge pushed himself toward a microphone on the bench and beckoned Jackson to begin the prosecution's opening statement. Someone coughed, then there was silence. "The privilege of opening the first trial in history for crimes against the peace of the world poses a grave responsibility," Jackson said into his microphone on the lectern. Erhorn sat in his green officer's uniform, intensely focused, listening, as the microphone sent the sound through his mixer and into a maze of wires and recorders. What followed was what some consider to be one of the most important speeches of all time. It entered Erhorn's audio system, to be saved forever.

General Rudenko from Russia made the final prosecutor's statement after the British and French took their turns. Interpreters translated on the spot. The system fed the translation audio into a now-antique recorder called a recordgraph, which looks more like an old movie projector than an audio device. Meanwhile, the prosecutor, witnesses, and defendants were recorded in whichever language they spoke, verbatim. The words of their native tongues were relayed to a hi-fidelity gramophone recorder, and a stylus etched the sound waves into the surface of circular black disc records. The grooves the stylus traced contained the voices of the Nuremberg trials.

The plan had always been to preserve these moments so that the crimes of the defendants would never be repeated. But in the years ahead, the record collection fell through the cracks.

In 1945, no one had attempted to record the audio for such a complicated court case, nor had anyone tried to translate a

multilingual meeting in real time. For centuries, Western diplomacy was conducted solely in French. Nuremberg, however, required English, German, Russian, and French to be translated simultaneously. To keep things simple, anyone listening in the courtroom needed to be able to find their native language simply by flipping between four channels. The end product, a simple audio record of each speaker, took an extraordinarily coordinated effort to produce.

Photo: Keystone / Hulton Archive / Getty Images

Erhorn and his fellow technicians bought a new IBM machine called “the Translator,” which was shipped by plane from New York to Nuremberg. It was based on an experimental system that had been used in a court case in South America. When the Translator arrived in Nuremberg, the technicians had to wire the court. The whole production started at the point where the human voice went into the system: the microphone. The eight judges had four microphones to share, the prosecution had one, the witness stand had a microphone, another sat at the front of the courtroom, and then there was a “roving microphone” for the Nazis to pass around their court dock.

The sound traveled from the microphones to Erhorn’s amplifier, which he carefully monitored for the translators. There were four teams of translators separated by glass partitions who were deeply focused, listening to every word. Each team had three to four interpreters specializing in a single language. They could take Russian, for example, and translate it accurately into English, French, and German immediately. When anyone spoke into the microphones too quickly and the court got too far ahead of the translations, the interpreters raised a yellow card in distress, signaling “slower.” If the translators were totally overwhelmed, they raised a pleading red card, signaling “stop.” A red card meant the entire trial, no matter the gravity of the moment, came to a halt. A

complete backup team of translators waited on standby, should a rescue be needed. The entire system used at least 500 headphones, half used by the technicians, and the other 250 for listeners in court. In a two-month scramble, Erhorn and his team of technicians invented the translation system the United Nations still uses to this day.

In the weeks before Erhorn assembled the system, he and his colleagues heard classical music echoing through the rubble nearby Nuremberg. They followed the sound and could soon discern that it was Wagner. When they found the source, it was a tape player, which Erhorn had not seen before, possibly because it was developed by the Americans for "clandestine telephone tapping purposes" during the war. Immediately, Erhorn decided to use the technology in the trial to record the translators. The interpreters' voices were recorded onto embossed tape for the stenographers to match their court transcripts against and argue over the quality of the translation.

Embossed tape, a clear-colored film also known as Amertape (as in "America"), was a precursor to 1980s-style magnetic cassette tape. Soundwaves of a recording were carved directly into the Amertape with a needle. One Amertape collector said his tapes from the D-Day invasion in 1944 are still playable, but it's unclear how gracefully the Nuremberg translation Amertapes aged. "It can decompose into a nasty jelly," one expert says. Some archives preferred to transfer embossed Amertape recordings onto magnetic tape, which has its own problems: it degrades after 30 years. Today, these tapes are likely irretrievably expired, and their location is unknown.

Then there was the verbatim audio, which skipped the translation phase and went off in a wire outside the courtroom to a studio. There, the original voices were recorded onto black disc gramophone records with a cellulose trinitrate lacquer surface and aluminum core made by the Presto Recording Corporation. Nitrate-based films and lacquers also have

problems: they’re flammable. Luckily, the aluminum core of the gramophone record “acts as a heat sink if the record catches fire,” one archiving expert says. But if the nitrate lacquer has deteriorated into a reddish powder, “tiptoe away and call the bomb disposal squad.”

The longer the records sat, forgotten in The Hague, the less likely they could be preserved

When the trial ended and Hermann Göring and several other Nazis were sentenced to hang to death, 1,942 Presto gramophone discs with at least 775 hours of the trial recorded on them were packed into wooden crates. What exactly happened to these crates is subject to debate. They may have become an overlooked line item in an archive in The Hague, Netherlands, or they may have been forgotten. The International Court of Justice, which is located in The Hague, says the collection was part of the Nuremberg archive and is so physically large that they would be impossible to lose track of. But the cellulose trinitrate lacquer on the Presto records put them at risk. The lacquer can shrink over time and crack, destroying the record. The longer the records sat, forgotten in The Hague, the less likely it became that Erhorn and his team’s recordings could be preserved.

In Switzerland, there is a city of red roofs built along stone cliffs and woods where the Schiffenensee River runs. It’s an old city called Fribourg, and it’s where Ottar Johnsen, a silver-haired Swiss professor of signal processing lived and worked for most of his career. He specialized in the electronic transfer of images and audio technology. In the event that the Nuremberg records were remembered and pulled out of their archive, the trajectory of his research could save them from deterioration. Johnsen is imaginative and willing to try any idea. His Swiss-French accent curls Rs in his throat when he speaks his very fluent English. As he likes to jest, “I perfected it in New Jersey.”

Johnsen’s career really took off when he joined the Bell

Laboratories research complex in rural New Jersey. The place was a centrifuge of scientific innovation. It pulled from various fields and theories to invent things like transistors, lasers, the Unix computer operating system, and programming languages like C, C++, and S. At Bell Laboratories in the 1980s, Johnsen discovered new ways to compress images so they could quickly be sent electronically. Soon after, he returned to Switzerland to work at the University of Fribourg, which was when, in the twilight of his career, a colleague from the Swiss National Sound Archives approached him with "a completely strange idea."

Photo: Central Press / Getty Images

The colleague was Stefano Cavaglieri. The premise of Cavaglieri's idea was that when you look at a vinyl record, the sound is etched into the physical surface of the grooves. Cavaglieri wondered, why not photograph the physical surface and try to extract the sound from the image? "It will never work," Johnsen thought, "but it is a very interesting project to do with a student."

Johnsen found an enthusiastic PhD student named Sylvain Stotzer who wanted to research the idea. In only a few months, they had already extracted their first sounds from a picture of a record. It sounded bad. "Then, we discovered we needed to reverse it," Johnsen says. The sound they extracted was backward, but it worked. After it was fixed, Johnsen and Stotzer knew they had something. They called the technology Visual Audio. Right away, archivists pointed out that the technology could make crucial rescues. Records that were too delicate or damaged to be read with a conventional record player needle could have their sound extracted visually.

Then, serendipity. "In 2006, I got a call from Radio Netherlands [Worldwide]," Johnsen says. The radio producer had talked to a librarian at the International Court of Justice,

and they had found the Nuremberg recordings. “They had, in a way, been forgotten, not lost, but forgotten somewhere in the archive,” Johnsen says. “So I was astonished when I heard about it.” Employees of the International Court of Justice arranged to meet Johnsen at the University of Fribourg to do a test run on the records using his Visual Audio process. They had no idea if the recordings were any good.

The discs were forgotten, but miraculously well-preserved
They met Johnsen with a box. He pulled a disc from one of its waxy paper sleeves and inspected it, finding them “forgotten but very well-preserved.” Johnsen and Stotzer began the process. First, they took film pictures in a dark room. Inside the dark room, they developed the negative of the first photo of the first record. Then, they took the negative and placed it inside a specially-designed high-resolution scanner. As the scanner prepared to take an image, it spun the negative like a top. They put the image on a computer and used an algorithm that Stotzer had written to read the sound in the picture. “The sound is contained in the depth of the groove or the position of the groove. At the microscopic level, you can see how the groove is moving,” Johnsen explains. The sound output “will look like a sine wave.” The wobbly undulations in the surface were captured in Johnsen’s pictures of the disc. The priceless record was untouched.

It worked. He listened to Erhorn’s recording of Chief Prosecutor Jackson delivering his opening statement on the first day of the trials. “It was very, very clear,” Johnsen says. Compared to the transcripts of the trial, there was something different in hearing it, the momentousness of the moment imbued Jackson’s voice. “It was important for him to get the message out about the bad things they did. It was as important as the procedure of judging the criminals,” Johnsen says. He could hear both, and he couldn’t wait to digitize the entire collection.

Photo by Fred Ramage / Getty Images

But things did not go as expected. Johnsen did a sample Visual Audio extract of 10 records and gave the International Court of Justice an estimate of $190,000 to digitize the entire collection. The archives found it difficult to cut a check to Johnsen if he didn't have a company assembled to do the work. There are very strict procurement procedures. They went back and forth over the course of hundreds of emails. Johnsen started to get nervous. Things went quiet. For years, he heard nothing. He retired from his university before any final word came in. When he left, he gathered all of the samples of the Nuremberg recordings that he made and brought them home for safekeeping. "So many things disappear when people retire," he says. He even made up his mind that he would come out of retirement to digitize the recordings if it was necessary. Johnsen continued to worry about it.

Cost is a constant problem among international organizations. The public tends to imagine institutions like the United Nations as incredibly wealthy and far-reaching. But some run on a relative shoestring budget. Take the International Criminal Court, for example. In 2013, the prosecutor's office that was tasked with hunting down war criminals anywhere in the world and building credible cases against them ran on about $150 million. It may sound generous, but it's roughly equivalent to the combined budget of the District Attorney's office in New York City and Washington, DC.

We have the technology to preserve the records, but not the budget

No action was taken on Johnsen's offer. Back when Johnsen inspected the records for the first time, he had suggested they test a recording needle on the first few seconds of quiet at the beginning of each record when it's only people walking into the courtroom and shuffling chairs. Those moments weren't as important, and they could be played to test the discs'

durability under a record needle, even if they got damaged. That was good advice, it seems. In 2017, the archives at the International Court of Justice decided to use a company in France that uses a record needle to play the records and digitize them. Johnsen thinks it should work. But as Johnsen points out, “It’s like painting a wall: some of the paint comes off with the brush.” The needle will work, but it also might damage the records. “When there are more than a thousand records, maybe a few of them would be damaged or difficult to play again,” Johnsen says. If that’s the case, Johnsen’s technology is always available to perform a rescue. The International Court of Justice hopes to have the records digitized in 2019, but they may not be made available to the public yet. Employees of the International Court of Justice describe the institution as “a very deliberate organization.”

One of the reporters in Nuremberg covering the trials for the Stars and Stripes military daily was Norbert Ehrenfreund. He was deeply affected by what he saw. Years later, he became a federal judge in California and wrote a book about Nuremberg. In it he wrote, “Soon all of the survivors of the Holocaust will be gone. Then there will be no human voice to tell the authentic story of the genocide, the tortures, the gas chambers, the concentration camps.” With what seems to be relief, he also wrote: “But the authentic, official record is the trial transcript.” It appears he, like many others, sees the transcript of the trials and the voices of the victims as two separate documents that cannot be merged. This is the power of Nuremberg recordings: it’s both.

Erhorn and Johnsen saw the power of the sound and resolved to preserve it for future generations. “When you have the sound, you feel you are in the middle of it,” Johnsen says, his voice conjuring a world suddenly accessible to the imagination. Then, his tone hardens. “When you have just the transcript, you are outside it.”

https://www.theverge.com/2019/4/25/18514298/nazi-germany-holoc

aust-records-audio-lost-saved-hitler-nuremberg-trials