EDITORS: Chris Johnson, crj@sci.utah.edu
Dave Kasik, dave.kasik@gmail.com
Mary C. Whitton, mcwhitton@gmail.com

DEPARTMENT: VISUAL COMPUTING: ORIGINS

From Holocaust Hidden Child to Computer Animation Laboratory

Marceli Wein ⓘ, *National Research Council of Canada, Ottawa, ON, K1A 0R6, Canada*

The article describes my long journey as a Jewish-born hidden child who was handed over to a Catholic family before the Krakow ghetto was eliminated in 1943. My father survived and I was reunited with him. We traveled to Germany in 1950 and were accepted as Canadian refugees in 1952. After an undergraduate and graduate program at McGill University, I was married in an Episcopalian/Anglican ceremony. My good fortune continued when I joined a research group at the National Research Council in the 1960s. The group worked on computer graphics and computer animation and won a Technical Academy Award for technology for the animated short Hunger/La Faim.

I am writing my story starting with my childhood in World War II as a Jewish *hidden child* raised as a Roman Catholic. Five years after the war, my father and I left Poland and ended up in Canada. I went through graduate school there where my Ph.D. project involved remote delivery of the weather radar images.[2] It was based on prior work by Tom Legg and produced CAPPI weather radar maps at selected altitudes. My work consisted of scan-converting constant altitude planar position indicator images to slow-scan raster images using 35-mm film as intermediate storage. Later I was fortunate to join a small group working on computer graphics and computer animation at the National Research Council of Canada. I worked with a Nestor Burtnyk-written program[2] that interpolated between hand-drawn key frames. The National Film Board of Canada sent Peter Foldes to create the art for the key frames. Our result, *Hunger/La Faim*, was nominated for an Academy Award as the first computer-animated film.

BACKGROUND

I am thinking back to my pre-SIGGRAPH days and recalling how I started in computer animation through a series of lucky incidents. I was born in 1934 in the historic Polish city, Krakow, into a Jewish family. My father was a tailor. He had a prosperous business before World War II. I discovered later that we lived in one of Krakow's Jewish districts.

My parents were not religious. Since my father was a successful tailor, we lived comfortably. I even had a nanny who took me to the park.

WORLD WAR II

I was four years old when World War II started. On 1 September 1939, Poland was invaded by Germany from the west and by the Soviets from the east. The invasion of Poland was very quick and very brutal but it left no impression on me—there was no fighting in my part of Krakow. In 1941, we were forced to move to a smaller walled-in ghetto called Podgorze (German for "bottom of a hill"). By then my father worked in a factory in which he probably made uniforms for the German army. Every morning he went with other workers in a group out of the ghetto to the factory. At various stages, the ghetto was reduced in size and people were more crowded.

This is the setting for my first lucky break. In the spring 1943, when I was eight years old, I was sent to a hospital in the Krakow ghetto with scarlet fever. My father heard that the hospital was being shut down and everyone in it would be killed. He visited me that night, wrapped me in a blanket, and smuggled me out.

The next day, I was smuggled out of the ghetto in Krakow. I remember walking out with my father and a group of Jewish workers as they went from the ghetto to a slave labor factory. On the way, he handed me to a woman along the route. The person to whom I was

FIGURE 1. This photograph of me was given to the German officer. My father had it at the end of the war.

FIGURE 2. My first communion. I am on the left.

handed over was a fine lady, Zofia Jezierska. I called her my aunt. We went to a flat in Krakow. After a few days I moved with her to her flat in Warsaw. I was now a "hidden child with a new name."
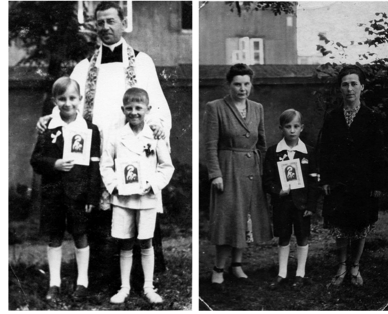
My father had thought that my 14-year-old brother Jerzy was old enough to manage with adults. Jerzy walked with a polio-induced limp and was shot. I learned of his death while I was still in Krakow, on the "outside" with Zofia Jezierska. I was devastated.

When my new aunt and I arrived in Warsaw, we heard that the Krakow ghetto was being liquidated and everyone was being shipped to camps. I saw fires about a kilometer away; the Warsaw ghetto was being liquidated by the Nazis.

I had no news about my parents during the war. Later I found out that both parents went to a series of concentration camps. My father was sent to Plaszow and survived Auschwitz as number 5 on Schindler's List. My mother did not survive.

My aunt made me a "hidden child" with the assumed "nom-de-guerre": Marek Czach. There happened to have been an available birth certificate of a child who had died in infancy. For reasons of expediency and safety, I was then raised as a Roman Catholic. In addition to me, Ciocia (aunt) Zofia Jezierska also hid a Jewish man, a pharmacist named Jozef Feiner. She later married Feiner.

While I was with Ciocia Zofia, a German officer came to the door and enquired if a Jewish boy lived there. The officer brought money from my father who was earning a little in the worker camp and trusted the officer. The same officer brought some photos of me

back to my father. My father had those photos at the end of the war. I still have one (see Figure 1). The event terrified me. I never discovered the officer's identity.

Soon thereafter, I said something I should not have and was immediately handed to another "aunt," Ciocia Szczepanska. I was sent to Grodzisk, about 30 km southwest of Warsaw. I stayed there for a few months. In Warsaw, I did not go to school but did in Grodzisk. I also prepared for my First Communion (see Figure 2).

In July 1944, I went back to Ciocia Zofia in Warsaw. The August 1944 Warsaw uprising gave me even more impressions of the cruelty of war. As the uprising set in, we spent most of the time in the basement. There were connecting holes broken through adjoining buildings that connected entire blocks. I can remember that there was very little to eat. The only food we had was made up of staples like flour and barley. As our part of the city was about to surrender, we had to crawl behind a barricade of sandbags across the street to a different area.

The 1944 uprising lasted until October 1944. Everyone was marched with few belongings to a sorting camp in Okecie on the Warsaw outskirts.

When the marchers stopped overnight, most slept on the road. That night, Ciocia Zofia, Jozef, and I entered a house where the residents hid us in the attic. When we woke in the morning, everyone on the road was gone. We went to a farm in the area and spent the next few months there. On 17 January 1945, the Soviets took over.

The war ended on the 9th of May 1945. I was located by a cousin, Leon Stach. My cousin was a Captain and doctor in the Polish army who came from the east with the Soviets. I learned from him that only my father survived. Figure 3 is a photograph of me in his staff car. For the month before my father came, I went to scout camp in the Grodzisk area.

AFTER THE WAR

Between 1945 and 1948, I lived in Chorzow in Upper Silesia with my (real) Aunt Helena Krenicer. She had

FIGURE 3. My photograph on Leon Stach's staff car after he found me in 1945.

FIGURE 4. B.Eng. 1958 with chaplain of newman club.

reopened her dentistry practice and we lived comfortably. I remember the Auschwitz prisoner number tattooed on her forearm. From 1948 until 1950, I lived with my father in Bytom (formerly Beuthen) in Upper Silesia.

After World War II, my father married a German from Silesia! From then on, I had a new family: a German stepmother (Elisabeth Stein Wein) and a stepbrother, Elisabeth's son (Horst Lempka). While I did not resent Elisabeth as my stepmother per se, I did resent for a few years the fact that she was German.

My stepmother and stepbrother were allowed to leave Poland in 1950 as Germans who did not want to take Polish citizenship. My father arranged for the rest of the family to be designated as Jews and received permission to travel abroad. We visited several countries to find a place we could go to live. None would accept us. We went to Munich and lived with my stepmother and stepbrother from 1950 until the end of 1951. I learned English by listening to the U.S. Armed Forces Radio Network. It was in Munich that my father applied to emigrate to Canada. Canada accepted us as refugees.

My father and I came to Montreal in January 1952. We were sponsored by the Canadian Jewish Congress. On the ship, we were given a choice to go to Montreal or to Winnipeg. Fortunately, we chose Montreal.

The desolate view of the bay entering the harbor in January shocked me. Going to Baron Byng High School (almost all Jewish) as a tenth grader shocked me almost as much as French Canadian culture and the bay. My stepmother and stepbrother arrived in Canada a few months later.

After high school, I received a small Seagram's scholarship and a McGill University Scholarship. In 1958, I got my degree in engineering physics with honors in electrical engineering. During my McGill career, I was a member of the McGill Catholic Newman club (see Figure 4) and no Jewish organizations.

All the graduating students were accompanied by large families except I was not. I was accompanied only by my father, stepmother, and stepbrother but I was soon to discover my large surviving Jewish family.

FINDING FAMILY

It was not until there was publicity around the film *Schindler's List* (1993) that I realized the significance of my family background. That is when I discovered the original Schindler's list and that my father, Wolf Wein, was on the list as Number 5. He was recorded as being a master tailor. He may have made uniforms for Schindler.

I regret deeply that I did not question my father about wartime events. As is the case with many, he was reluctant to talk about wartime.

Some years ago, I located one cousin on my father's side and several cousins on my mother's side in England and in Germany. I learned that my grandmother was Taube Ruchel Hofstadter Nachman. Through her, I discovered that my second cousin was the historian, Richard Hofstadter. I am thrilled that I have many more relatives of different religious persuasions who survived and are scattered around the world. This family history sets the stage for my long, successful, professional career.

EVOLVING TO *HUNGER*

My first engineering job after graduating from McGill (1958) was in manufacturing magnetrons that could be used in rockets and in radars. But after a few months, production was stopped and I was transferred to designing television sets.

In 1959, I had another lucky break. On 24 June (the St. Jean Baptiste Quebec holiday), I went to the McGill campus with the intention of asking a girl whom I knew and who worked in the Physics Department to have lunch with me. As I entered the building and before I met her, I was met by one of my physics professors. The professor thought I had come to see him, so he gave me a guided tour of the Stormy Weather Group, headed by J. Stewart Marshall. By the end of the afternoon, I was accepted into the M.Sc. program.

FIGURE 5. Weather radar image as transmitted to a facsimile.

FIGURE 6. Peter Foldes at the IDI display.

MY PH.D. WORK IN WEATHER RADAR

I learned about transferring images to film, critical to my work in computer animation, while pursuing my Ph.D.

After my 1961 M.Sc., I continued to complete my Ph.D. in physics. My Ph.D. project under J. Stewart Marshall dealt with weather radar and how to send the radar images over a telephone line to a distant weather office.[2] First, the images had to be generated. The radar image appears like a modern radar image because of three factors. First, the image was created at a specified altitude by capturing rings as the antenna was raised at angle increments. Second, the stepping logarithmic amplifier created the image. Third, another process prepared the image for scan conversion. These steps were developed at McGill University by my predecessor in the group, Tom Legg.

My work on the image transmission involved scan conversion and was entirely analog. I had access to a rapid film processor that consisted of a series of three gates for 35-mm film and two 5-inch flat CRTs. The radar image was a planned position indicator radial scan, the same format still used today for weather radar displays. The image was produced on the first CRT and was captured on 35-mm film in the first gate. The film was then advanced to the second gate where it was sprayed with the developer, then fixer, and then dried. The film was advanced to the third gate where it was scanned with a slow rectangular raster scan on the second flat CRT. The analog signal was captured through an optical system by a photomultiplier tube, processed by stepping circuitry, and then transmitted over a telephone line via an analog facsimile protocol to a standard weather office facsimile machine. Figure 5 shows an example.

Scan conversion required image storage. We used 35-mm film. Digital storage was totally impractical at that time because of large memory requirements and steep cost. These activities were well before the RS232 digital data transmission standard existed. As a result, I gained a lot of experience capturing gray scale radar images on 35-mm film.

The radar project was part of activities in the Stormy Weather Group in the Physics Department that was funded by United States Air Force Cambridge Research Center (AFCRL).[1] The AFCRL had a much larger program on weather radar than Canada. I recall the two leading scientists: David Atlas, the head of the program, and Ed Kessler. About the time I completed my Ph.D., Ed Kessler went to Norman Oklahoma and started the National Severe Storm Laboratory, where he introduced Doppler radar that used klystrons. Klystrons became the basis of modern weather radars.

EARLY DAYS AT NATIONAL RESEARCH COUNCIL

After a year in the Physics Department, I accepted a job at the National Research Council of Canada. I started as a Research Officer in computing, an activity that NRC was trying to start. I was lucky again because I became a junior staff member and got to work in interactive computer graphics with brilliant colleagues, Nestor Burtnyk and Ken Pulfer.

We were interested in how nontechnical people could interact with computers. We intended to investigate human–computer interaction, especially for nontechnical people. That was in 1966. We acquired a minicomputer from Systems Engineering Laboratories, a model SEL840A. The computer was the size of two refrigerators but was still called a "Mini." It had 8K 24-bit words, hence 24K bytes.

Ken Pulfer designed and built the controller for an Information Displays Inc. (IDI) point-plotting display that Carl Machover sold us. Although the IDI display (see Figure 6) came with a lightpen, we did not use it. Pulfer copied the mouse Doug Engelbart designed at Xerox in 1963 for input interaction. For animation drawing and digitization, we used a Computek tablet, which provided 10-bit x and 10-bit y packed into a single 24-bit input word.

There was no compiler for any high-level language for the computer, only an assembler for assembly language programs. Programs were entered on a teletype

**FIGURE 7.** Peter Foldes and Marceli Wein at the Computek tablet.

FIGURE 8. Record of how the sequence of strokes in a cel was recorded.

that produced paper tape. The computer had a high-speed paper tape reader and produced the machine language "object" version of the program. A loader accepted all the relevant object programs to build a runtime version of the program.

We learned assembler language programming by experimenting and created a program that would display something on the IDI screen. We then wrote a program that would read the mouse pulses to increment or decrement screen position. Eventually, we had enough to build more complex programs.

Nestor Burtnyk attended a conference in Los Angeles in 1969 at which the guest speaker was an artist from Disney Studios. The speaker suggested that computers could be used to generate the in-between cels in film animation. Upon return, Burtnyk wrote a program that generated the in-between frames for beginning and ending two-dimensional (2-D) images that were drawn on the tablet.[3] Somewhat later we defined an image as a series of strokes. Each stroke was a series of short, interconnected line segments that were drawn from pencil-down to pencil-up. Frame-to-frame interpolation was between strokes.[4] We improved the interpolation software to make it accelerate and decelerate near the end points. We used algorithms from my undergraduate textbook by Slater and Frank.[5] All the implementation was done on the SEL840A using assembly language, paper tape, the Computek tablet, and the IDI display.

MAKING *HUNGER/LA FAIM*

A visiting producer, Rene Jodoin from the French Animation Section of the National Film Board of Canada, thought that the line animation style was suitable for a script that had been submitted by Peter Foldes. Foldes was an animator in France who had submitted a script for *Hunger/La Faim* to the Film Board in Montreal. The script was reviewed and approved but was waiting for a suitable technical support and funding. Jodoin arranged for Foldes to travel to NRC in Ottawa in 1970.
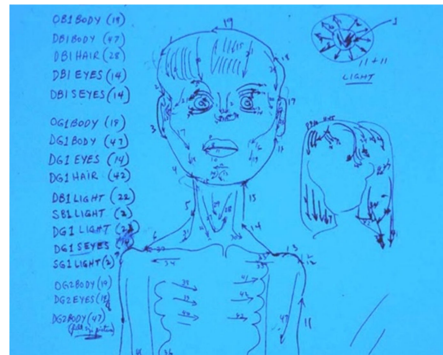
Foldes experimented with the interpolation software (see Figure 7). He liked it enough to use it to produce an experimental film called *Metadata*. We recorded *Metadata* on 16-mm film from images displayed on a small, flat display-screen, separate from the IDI display. The Film Board released *Metadata* as a film in 1971 that is still listed in the NFB catalog (https://www.nfb.ca/film/metadata_en/).

We learned that we needed a pin-registered 16-mm camera so that the film could be backed up (in the sense of reversed) accurately for multiple exposures. We could not compose an entire frame at once because of limited processor memory. Our workaround was physical compositing on film. Also, we had to record the foreground and background separately. The pin-registered camera ensured that when the film was projected the image was steady on screen.

Jodoin arranged for Foldes to make trips from Paris to Ottawa to work on the drawings. Foldes stayed with my family for a week at a time. In preparation, we installed a set of animation registration pins on the Computek tablet so that standard, prepunched drawing sheets could be used.

While Peter Foldes stayed at our house, we made plans for multiple exposures and multiple film sequences, including raster scanned mattes for the foreground. We discussed the sequences that would be drawn the following day. Peter would input sketches with the tablet the following day. He worked on the studies in the evening at my house on each trip. For each cel, he made a separate sketch and numbered all the strokes in groups (see Figure 8). Peter then drew the cels (see Figures 9 and 10) the following day and preserved the group order.

He completed the drawing phase after a few visits. We then recorded all the parallel sequences on rolls of 16-mm film, commercially processed the film in

FIGURE 9. Cels from the film *Hunger/La Faim* by Peter Foldes, National Film Board 1974.

FIGURE 10. Film strips: Foreground line, foreground 1 matte, foreground 2 matte combined in the optical printer.

FIGURE 11. Technical Academy Award, 1997 with Helen Hunt.

Ottawa, and then had it sent to the National Film Board in Montreal.

Once the film material was sent for processing, we had time to update the drawing program. This allowed the artist to see the previous cel in low brightness while the new cel was being drawn. The stroke that corresponded to the one to be drawn was shown in full brightness. The bright stroke advanced as soon as the pen was raised. However, there was not enough storage to establish a database of cels. The database was stored on seven-track digital tape and cels had to be selected manually.

At the National Film Board, Rene Jodoin supervised the work on the optical printer. (An optical printer consisted of a film frame projected using 1:1 optics onto a fresh film frame. Both film gates were pin registered to maintain accuracy. A color filter could be inserted to add color.) The 16-mm film was enlarged to 35-mm film and color was applied to the background. The completed short film featured music by Pierre F. Brault. *Hunger/La Faim* was released in 1974[6] and submitted to the Academy of Motion Pictures without mentioning the computer role in its production. The film was nominated for an Academy award in the Animated Shorts category. Peter Foldes and Rene Jodoin attended the Academy Awards Ceremony in Los Angeles.

It was only a couple of years later that Unix and C were published by (then) Bell Telephone Laboratories.

They were available on a Digital Equipment Computer minicomputer NRC purchased to replace the SEL. We were now old timers and had to learn how to program in C to feel comfortable with newly minted and hired computer science graduates. The programming language C felt comfortable because it was close enough to the Assembler language yet high enough to be quite structured. It represented a real breakthrough for Brian Kernighan and many more advanced languages have been based on C.

I arranged to work with William Cowan at University of Waterloo in human–computer interaction and became adjunct professor at the university.

Nearly 20 years later, after *Toy Story* was released and achieved great success, the Academy searched for the earliest impact of computer animation in the motion film industry. Ed Catmull, then president of Pixar, identified *Hunger/La Faim* as an early Academy award nominee and therefore the earliest example. Catmull nominated Burtnyk and me for a Technical Academy Award. We attended the Science Technical Academy Awards Ceremony and received the award in the form of an Academy certificate. While we received a certificate (see Figure 11), the single statuette went to the creators of IMAX.

Jim Kajiya received an award for animating sand in the film *Twister* that starred the host of the event, Helen Hunt. The event was two years after my retirement.

Burnyk and I were interested in offering tools to traditional animators whom we admired as extremely talented artists. In particular, Peter Foldes was such a talented artist when he took a pen or pencil to paper. We saw the emergence of computers with 3-D animation destroying the traditional media and such talent. We were thrilled that our more modest computer tools could be successful.

I have thought how I ended up in my career. In North America, I have observed that university-educated families took it for granted that their children would attend universities. But families in the trades did not. My father had made a great effort to get me through the war. He then took it for granted that I would attend university

even though he had stopped at grade four. After I entered graduate school, I felt the continued urge to survive, advance, and was grabbed by the urge to learn as much as possible. Then I was taken by the interest in how computers generated images, a new research topic. That interest blossomed in the mid 60s when I discovered computers and the opportunities they offered to produce animated films.

The activities at the National Research Council had a strong positive influence on computer graphics in Canada. In our earliest days, we worked with Ron Baecker at the University of Toronto and later with several universities. We organized and sponsored the Canadian Man Computer Communications Conference that was held at NRC in 1969. The conference attracted participants from many universities. Many showed extraordinary work that has been lost to history. We hosted a second conference in 1971. The conference became biennial and independent of NRC. The Conference went through name changes, the first Canadian Human Computer Communications Conference and, in 1980, the conference changed its name to Graphic Interface (GI). While we participated in SIGGRAPH once it started, we continued to support GI and it has continued providing a focus for activities at Canadian universities.

ACKNOWLEDGMENTS

I acknowledge the leadership of Nestor Burtnyk and the late Ken Pulfer in the leadership of the computer graphics project. I greatly appreciate the great assistance of David Kasik in preparing this manuscript.

REFERENCES

1. M. Wein, "Areal integration for weather radar," Scientific and Technical Aerospace Reports, Tech. Rep. Air Force Cambridge Laboratories AFCRL-65-339, Apr. 1965.
2. M. Wein, "Facsimile and areal integration for weather radar," PhD Thesis, McGill Univ., Montreal, QC, Canada, 1964.
3. N. Burtnyk and M. Wein, "Computer generated key frame animation," *J. Soc. Motion Picture Telev. Engineers*, vol. 80, no. 3, pp. 149–153, 1971.
4. N. Burtnyk and M. Wein, "Interactive skeleton techniques for enhancing motion dynamics in key frame animation," *Commun. ACM*, vol. 19, no. 10, pp. 564–569, Oct. 1976, doi: 10.1145/360349.360357.
5. J. C. Slater and N. Frank, *Mechanics International Series in Pure and Applied Physics*. New York, NY, USA: McGraw-Hill, 1956.
6. *Hunger /La Faim a film By Peter Foldes, 10 Minutes*, R Jodoin. Montreal, Canada: National Film Board of Canada, 1974.

MARCELI WEIN retired in 1985 from the National Research Council of Canada. He received his Ph.D. degree in physics from McGill University, Montreal, QC, Canada. Contact him at mwein@hotmail.com

Contact department editor Chris Johnson at crj@sci.utah.edu or department editor Dave Kasik at dave.kasik@gmail.com or department editor Mary C. Whitton at mcwhitton@gmail.com.

REMEMBERING FREDERICK P. BROOKS, JR. (1931–2022)

Pioneering computer scientist Frederick P. Brooks, Jr. died November 17, 2022, at his home in Chapel Hill, NC, USA.

Dr. Brooks is widely known as the author of *The Mythical Man Month: Essays on Software Engineering*. In it, Brooks clearly describes the lessons he learned while managing the development of IBM OS/360. After leaving IBM in 1964, he founded the Computer Science department at the University of North Carolina at Chapel Hill. As chair for 20 years, he led the department to international prominence in computer graphics.

Brooks' mantra was that *computer scientists are toolsmiths*: they build tools others use to solve their own hard problems. For example, UNC-Chapel Hill computer scientists built systems for displaying and manipulating molecular models for protein chemists and nanoscale structures for material scientists. Dr. Brooks cared deeply about the relationship between people and computers. His research group extensively studied system characteristics, such as latency to understand their impact on the effectiveness of virtual reality systems.

Brooks received dozens of major awards, including the ACM A.M. Turing Award, the IEEE VGTC Virtual Reality Career award, and membership in the SIGGRAPH Academy and the IEEE VGTC Virtual Reality Academy.