

# A Science Career Against all Odds



Bernhard Wunderlich

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A Life of Survival, Study, Teaching  
and Travel in the 20th Century

 Springer

Prof. Dr. Bernhard Wunderlich  
200 Baltusrol Road  
Knoxville TN 37934-3707  
USA  
Wunderlich@CharterTN.net

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# Preface

*Today is Sunday, June 17, 2007.* Father's Day. Naturally, the obligatory, carefully selected cards, phone calls, and small gifts arrived from the children and grandchildren. Best wishes for Father's Day were also the first words in the morning from Heidel, my wife of 54 years, although for many years I had made the comment: "I am not your father." But, in the frame of my life's experiences in the 20<sup>th</sup> century, as I intend to summarize them over the next few years, the 17<sup>th</sup> of June has much deeper significance. This was the day in 1953 when we finally fled from our life of oppression which had lasted 20 years. Two successive dictatorships, one of Hitler and the other of Stalin, caused the most horrific slaughter of civilians and soldiers, eclipsing all prior history. During these first years of my life, I was plainly lucky to survive. After this day, I had a much better chance to experience the freedom needed to lead a life of creativity, satisfaction, and ultimately prosperity, all directed largely by our own decisions.

The 17<sup>th</sup> of June 1953 was a Wednesday. I stayed in the apartment of my parents in my hometown of Brandenburg, in the German Democratic Republic (GDR), the former Russian occupied zone of Germany. The summer vacation of the Humboldt University in East Berlin, some 40 mi further east, had just started. But, I was alone with my father, "Vati." My mother, "Mutti," and two little brothers, Joachim and Manfred,<sup>1</sup> had left several weeks earlier to the safety of West Berlin for an indeterminate stay with my Tante Minna (Mutti's sister). We were to follow in a week or two after completing the surreptitious closing of Vati's roofing business. Despite voluntary 'downsizings' since the end of the war in 1945 to less than 10%, it was leaked to us by friends in the SED (the "Sozialistische Einheitspartei Deutschlands," the political party controlled by the Soviet Union) that the label 'capitalistic enterprise' was unavoidable and that take-over by the state was to follow. Somewhat on purpose, the week before, I had failed an examination in 'Marxism-Leninism,' the required lectures for students of science. I had never attended these lectures. Heidel, at that time my fiancée and law student at the same university, had to flee several weeks earlier to West Berlin because of conflicts of conscience in working on exercises which included indictments of political detainees which might have been used later for the actual trials, ending commonly with inhuman punishments. My older brother, Frank, who worked close to Berlin in government employ, also had just fled the GDR with his wife, Dagmar, mother in law, and baby son, Eberhard.<sup>1</sup> Eventually, we all were recognized as political refugees, attained the rights of citizens of the Federal Republic of Germany (FRG), and received financial support to get on our feet.

On this Wednesday morning, I only wanted to go to town and purchase a new Zeiss microscope. I had convinced the sales lady in the state-owned department store ("HO") that I urgently needed it as a student of chemistry. The cost was to be 400 DM-Ost, a price equivalent to my whole summer's stipend. Since I did not intend to return to the university, it would have been safe to resell the microscope in the FRG. It had to be registered in my name and then would have been forbidden to be exported. After being safely in the FRG, however, I could not be held

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<sup>1</sup> A brief genealogy to identify the various relatives is given on pages 11-1-4.

responsible for it. The price of such desirable objects in the FRG was the same in DM-West and could have been our support for the first months of freedom. Otherwise, conversion of DM-Ost to DM-West was at that time 10:1 in our disfavor.

Joseph Stalin had died about three months before, and the firm grip of the Soviet Union on the GDR seemed to loosen and discontent with the government was beginning to be voiced more openly. People were hoping for a change. In East Berlin, a strike was called on Tuesday to protest against the increased production quotas. When the regime failed to respond immediately, the workers took to the streets and demanded also a change in government. The rebellion, then, quickly spread throughout the GDR. When I walked up the “Steinstraße” in Brandenburg, at about 10 a.m., a surprising scene showed in front of the Court House. A noisy crowd had gathered as shown in Figure 1 ( taken an hour later by a



**Figure 1:** *In front of the Court House on June 17, 1953.*

news photographer). Shouts were heard to release political prisoners and many court documents were scattered in the street. I would have loved to join the crowd, but was aware of the danger. Our plan to unite the family in West Berlin would have been put in jeopardy. Soon, the borders would be sealed. I hastened to the department store in the “Hauptstraße,” but to my dismay, it showed a hurriedly hand-written sign ‘Closed Today.’ Plan B had to be enacted. I walked quickly the 20 min to Vati’s business office in the Werder Straße 28. Vati and I decided, we must leave immediately. All unfinished business had to be left undone. With only our briefcases, we got railway tickets to Potsdam. To Berlin, none were sold anymore, an ominous sign. This was reinforced by the conductor who said, today, you will not make it to West Berlin anymore.

Indeed, from Potsdam all the “S-Bahn” trains to East Berlin which went through West Berlin were cancelled. Rumors circulated that Russian tanks were rolling toward Berlin. The only thing we could find, was a slow, local train which bypassed West Berlin in a circle, to ultimately enter East Berlin from the south, taking more than an hour. We took it, but after half an hour, it also stopped on the tracks near Teltow. This was one of the first suburbs straddling West Berlin’s southern border, and many people were walking this afternoon along a foot trail leading through the border fence into and out of West Berlin. The trail, patrolled by the East German police, reinforced by the army, was used by West Berliners who worked in the East and vice versa. There were barely any guards on the side of West Berlin. The city was not fully divided at this time. “Die Mauer” (the Wall) was erected only in 1961. There even was an official money-exchange system in place. Anyone with a job in the ‘other’ Germany got his or her wages in the currency of the home address, and naturally had papers to freely cross the border (as long as no contraband was detected by the

border guards). With only briefcases as luggage, we left the train, crossed the tracks, and blended into this crowd of workers on their way home. With beating hearts we approached the re-enforced and armed border guards. I went first. As a student in East Berlin, I had an identification card stating in German, Russian, French, and English that in any emergency, I was to be given every help to reach the university (see on pages 4-12-13). In this case, it was best to travel through West Berlin. The East German guard looked at the card and let me pass. I immediately took off, not looking back to Vati. At least one of us made it across! This was wisdom, gained from the weekly border crossings when traveling between Brandenburg and the university. From a safe distance, I could then see that the guard had confiscated Vati's passport and held it in his hand with several others. Vati stood behind the fence, a few steps aside, among the other persons forbidden to cross. What was I to do? As usual, I knew that no clever argument would help. So, I played as calm, relaxed, and disinterested as possible. Waiting a few minutes, so that some 20 or 30 others had crossed the border and hopefully dimmed the memory of the guard, I walked back the few steps and



**Figure 2:** Martial law declaration in Brandenburg. Issued June 17, 1953. Photograph of an original.

asked Vati through the fence, loud enough so that the guard could hear: "Why didn't you come with me?" He answered: "The guard took my passport, I have to wait." Next, I turned to the guard and asked indignantly: "Why didn't you let my father pass? We both belong together!" My face must have had the right degree of innocence so that he said: "This is your father? I didn't know. He can go." Nothing else was said until we were safely on the West Berlin side. This was a close shave and both of us were fully aware that we just had won big in the lottery of life. If my Vati would have been detained, it would quickly have been found out that he was fleeing East Germany and multi-year incarceration, if not worse, would have been the likely consequence.

The uprising was soon quelled throughout the GDR. Soviet troops and tanks intervened. At least 21 people were killed, and hundreds of others wounded. In the wave of retribution that followed, some 1,300 were sentenced to prison for taking part in the uprising, which the East German government portrayed as a plot by West Germany and the United States. A copy of the declaration of martial law in Brandenburg is reproduced in Figure 2. It was posted later in the day, after we had left. Interestingly, it was not proclaimed by the civilian

government of the city, but by the Soviet Military Command who supposedly had relinquished control to the civilian government. We all knew, they had not! The hesitation of the Soviets had passed. Revolution and free elections could certainly not be permitted, as was proven later in the brutal suppression of the uprisings in Hungary and Czechoslovakia. The six points made in the martial law declaration of Figure 2 translate as follow:

1. Martial Law is declared. All control is in the hand of the Soviet Commandant.
2. No demonstrations and meetings are permitted.
3. All public buildings are closed.
4. From 8 p.m. to 6 a.m. there exists a curfew.
5. State-owned business continues to operate.
6. Persons who violate this order will be turned over to the military tribunal.

At the Teltow border, however, we had not yet made it to our family in West Berlin (Rudow, a suburb). A march of about 15 mi was necessary. There was a street-car terminal after about one-half mile. But we had no western currency! In the spirit of the Berliner who rises to any emergency, the conductor told us: "Today there is a revolution in the East. We hope they will get rid of the communists. You do not have to pay today." He gave us a ticket to anywhere we wanted to go. Happily we arrived about an hour later at our destination. It was about 6:45 p.m. by then. The family had anxiously gathered around the radio and listened to the reports about freeing of political prisoners in Brandenburg, looting of the court house and other government buildings, and ultimately, the actions of the Soviet troops, leading to the closing of the border, arrests, and shootings.

For us, the uprising was over. Fortunately, it ended without harm to our family. A new life could begin in the second half of the 20<sup>th</sup> century. This new start was again from level zero, quite similar to the end of the war in 1945. Figure 3 catches one of the many serious discussions needed to plan the future between Vati and Onkel Paul. The only way to get out of West Berlin and reach the Federal Republic of Germany (FRG) was now to be flown out by plane.

To fully understand the significance of this new beginning, additional episodes require to be recounted and other questions need to be tackled: How did our whole family survive the two dictatorships? How did I, eventually, come to study chemistry? *June discussing our future.* How could we achieve so much when starting with so little? How were



**Figure 3:** Vati and Onkel Paul a few days after the 17<sup>th</sup> of June discussing our future. The garden of Onkel Paul was close to the border and one can see the watch-tower with armed guards in the distance, keeping us in West Berlin.



childhood and education affected by the environment we grew up in? How was our further life affected by war and oppression? How did the teaching change toward the end of the century and how could it be improved? How did travel fit into the professional and private life? These and many other questions will be tackled as they arise out of the overall description of the customs of society which, in my opinion, are not always positive. Since I like photography, pictures out of my collection will be used to document the narrative and thus save 'thousands of words.'

The later life was naturally heavily intertwined with my effort to research, understand, and teach the chosen profession, polymer science. The three appendices available with the on-line version of the book display the details. Appendix A is a catalogue of all scientific publications and a list of my students and coworkers. Appendix B contains a newly updated manuscript of a personal review: 'Thermal Analysis of Macromolecules,' the central field for all my work. Appendix C, finally, is a listing of the various places we lived at and of our travels throughout the world for science sake (with lecture titles), for pleasure, and for what I like to call the 'need to see.' The Epilogue, Chapter 10, contains a brief conclusion and an outlook into the beginning of the 21<sup>st</sup> century. On pages 11-01–12, there is a brief, illustrated genealogy. It should be consulted to make the connection between the family members. The Table of Contents, below, is designed so that its quick 'reading' points to the general aspects of life, profession, politics, and travel. The Indices, finally offer access to people that crossed my path in person or by action, and serve as an extensive listing of the subjects, objects, places, and topics mentioned in more than passing in the text.



A handwritten signature in blue ink that reads "Bernhard Wunderlich". The signature is fluid and cursive, with a large initial 'B'.

Bernhard Wunderlich, Prof. of Chem., em.,  
The University of Tennessee, Knoxville, TN  
and Rensselaer Polytechnic Institute, Troy, NY

6/17/2007



# Acknowledgments

First and foremost, I would like to acknowledge the more than 55 years of unwavering support by my wife, Heidel (Heidi). Without her help, many of the projects simply could not have been completed. I hope she always meant it only jokingly when she said on occasion: “I am only wife number two. Wife number one is ‘Mrs. Chemistry.’ ” Similarly, our children had to grow up knowing that often research, teaching, and travel had to take precedence over what other people may call a ‘normal’ family life.

Next, it must be acknowledged that without coworkers, little could have been accomplished in quality and quantity of research. The 144 postdoctoral fellows, graduate students, and technicians contributed 340 person-years to the work listed in Appendix A. In addition, many friends and colleagues contributed with constructive discussion and criticism, and sometimes also by participation in joint publications (see Appendix A). Much progress is based on such interaction and exchange of ideas. Perhaps, it should be mentioned that there also were the not so friendly comments from colleagues who were sharply negative. For me, these also were valuable. They were incentives to do better in the future and to offer more precise explanations, so that the different approaches which I liked to take, would be understood by everyone.

The limited space does not permit to give a full appreciation of the importance of the ideas drawn from the literature. More about them is summarized in Part I of Appendix B, where my publications are listed which detail the thousands of literature sources. Much of my knowledge about the link to industrial applications grew out of the connection I had for over 25 years as an exclusive consultant for E. I. du Pont de Nemours and Company (see Appendix C, page C-4).

Support for instrumentation in thermal analysis was received from the three major equipment makers: TA Instruments, Inc., Mettler-Toledo, Inc., and the Perkin-Elmer Corp. Without this help we would not always have been able to be at the forefront of experimentation.

Financial support for research came from outside the universities. Over the 50 years, about five million dollars were spent by government agencies, companies, and private foundations to support coworkers, myself, research equipment, expenses, and travel. This is little, when compared to expenditures needed to support ‘research centers’ or to build ‘megamachines.’ It amounts to about \$10,000 per publication, a modest amount when compared to the knowledge and ideas gained.

Sustained funding came from the National Science Foundation (Division of Materials Research, Polymers Program, where particular thanks must go to the long-time program directors Drs. N. M. Bikales and A. J. Lovinger). During 1988–2001, additional support was connected to my position as Distinguished Scientist at UTK and ORNL, as described in the Footnote to page 9-6. On my arrival in Knoxville in the year 1988, ORNL was managed for the U.S. Department of Energy by Martin Marietta Energy Systems, Inc. In 1995, the management was taken over by Lockheed Martin Energy Research, Inc. Since the year 2000, ORNL is managed and operated by UT-Battelle, LLC. The entire list of the supporting agencies and companies is given in Chapter 7 in the Footnote to page 7-5.

This autobiography, naturally, did not only rely on my memory. Many relatives had to contribute data. A major help were Heidel’s recollections of names, dates, facts, and places. Finally, both Heidel and Brent were of great support in proofreading the various versions as they were generated during the concentrated writing stage.

Frequent use to reconstruct the past was also made of the accumulated large number of memorabilia. For our personal life, there were the many photographs in the 95 albums assembled by Heidel which contained not only pictures, but also other items linking to events of importance that happened over the years. These included the following: Occasional airline tickets (with itineraries dates, and prices), event tickets, hotel and restaurant bills and sometimes also the menus, announcements (like Figures 16 of Chapter 5 and 11 in Chapter 10), newspaper articles (like seen on page 8-122 and as Figure 6 in Chapter 6), dried flowers, cards (received on special occasions), letter excerpts, etc. From my years of study, there were report cards (as shown in Figure 16 of Chapter 1 and Figure 9 of Chapter 3), high school and college papers, study books (as shown in Figure 6 in Chapter 4), “Übungsscheine,” graduation certificates (as reproduced on page 6-23), etc. Also kept were the basic science and mathematic books and notes (as discussed on pages 4-17–18). For the later professional life there existed, from 1963 on, a full line of ‘annual reports of activities.’ These reports were continued, even when not required, until the end of 2009 and allowed to recall the happenings of every year. They were more valuable to me now, than for the people who originally requested them. The feedback when reporting special events and recognitions (which I rarely advertised otherwise) was minimal. This makes me believe that hardly anyone ever read those reports, particularly after 1964, when my tenure had been decided.

The lists of publication, lectures, and coworkers were also started in 1963 and proved sufficiently valuable to be attached as Appendices A and C. The personal review “Thermal Analysis of Macromolecules” found its start in 1996 and was regularly updated. Its final form is found as Appendix B, completed in 2009. Until I gave up my office at UTK in 2009, a full collection of all correspondence was available as backup of my memory. It was stored in four standard filing cabinets and has resisted the occasional onslaughts of efficiency efforts by my secretaries. (One secretary even tore all files that had no entry in the prior five years and threw them into a large waste container for disposal—fortunately there was no shredder. When I discovered the ‘clean up’ in progress, it took several weeks to resurrect the files and tape the torn letters.)

It was fortunate that the bombing of our house in 1945 involved no fire (see Figure 9 of Chapter 2) and personal papers and books were not of value to looters. The two periods as refugees were such that, with some effort, many of the memorabilia could be retained. The major move to the US contained the large amount of baggage documented in Figure 21 of Chapter 11. A good part of this was the memorabilia and my basic books of study. The last big move in 1988 filled the moving van which is shown in Figure 114 of Chapter 8 with no restriction on weight.

Helpful to verify facts and in the search for historical information were: The internet, chronics (like “Chronik der Menschheit,” Chronik Verlag Harenberg, Dortmund, 1988), encyclopedias (like “Encyclopædia Britannica,” printed editions of 1771, 1911, 1973, DVD edition 2007, and “Brockhaus’ Konversations Lexikon,” Brockhaus, Leipzig, 1895), and various dictionaries helped with the proper wording. To find the most suitable German–English and reverse translations, the ≈1500 pages of “Langenscheidts Handwörterbuch” (Langenscheidt, Berlin, 1981) helped enormously. Useful internet sites existed about the political developments in Germany from 1945 to 1990. The comments about most of the over 50 sites on the UNESCO World Heritage List we visited over the years were checked with: <http://whc.unesco.org/en/list>. The official web sites of the universities I was connected with, offered succinct details about the founding of the schools and their goals, often not known to me in such detail before. Finally, the days of the week and of the holidays mentioned could easily be confirmed at the site <http://www.timeanddate.com/calendar>.

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<i>Frank came home on furlough from the “Arbeitsdienst”</i> . . . . .	2-25
<i>flight of the population out of the eastern area of Germany began</i> . . . . .	2-25
<i>In late March we could hear a continuous rumble in the west</i> . . . . .	2-26
<i>first direct air attacks on Brandenburg occurred in 1944</i> . . . . .	2-26
<i>the last two bombings occurred March 31 and April 20, 1945</i> . . . . .	2-26
<i>We have to get out of here</i> . . . . .	2-26
<i>to build a small bunker to safely house all 11 of us</i> . . . . .	2-27
<i>I never heard such loud explosions again</i> . . . . .	2-27
<i>We must try to escape the Russian Front</i> . . . . .	2-28
<i>we arrived in Lindau</i> . . . . .	2-28
<i>American trucks with soldiers seated in the back entered the area</i> . . . . .	2-29
<i>The Russians are coming</i> . . . . .	2-29
<b>May 8, 1945</b> . . . . .	2-30
<i>this unconditional surrender was the zero hour</i> . . . . .	2-30
<i>The war being over, one could set up statistics</i> . . . . .	2-30
<i>The terrible progressions of war and my personal experiences</i> . . . . .	2-31
<i>The casualties and destruction in Brandenburg</i> . . . . .	2-31

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<b>Starting from the ‘Zero Hour’ on May 8<sup>th</sup>, Germany ceased to exist as a state</b> . . . . .	3-01
<i>We worked for the farmer</i> . . . . .	3-01
<i>One had to make use of the known channels of barter for food</i> . . . . .	3-02
<i>off, we went to the railroad station</i> . . . . .	3-02
<i>Next morning, I, the butcher apprentice went to work</i> . . . . .	3-03
<i>Not all the work in Lütte was butchering</i> . . . . .	3-03
<b>The return to Brandenburg had to wait until the end of July 1945</b> . . . . .	3-04
<i>we joined the trek by horse-drawn wagon and on foot</i> . . . . .	3-04
<i>This certainly was our personal ‘zero hour’</i> . . . . .	3-05
<b>Less than a week later, we moved into our own apartment</b> . . . . .	3-05
<i>Little did we know that periods of being refugees would happen twice more</i> . . . . .	3-05
<i>Russian soldiers would undertake “Razzias”</i> . . . . .	3-05
<i>school started again after a break of about four months</i> . . . . .	3-05
<i>New books, paper, pens and other supplies were non-existent</i> . . . . .	3-06
<i>shipment to the USSR as war reparation</i> . . . . .	3-06
<i>something is wrong with education if the consumer does not value the goods</i> . . . . .	3-06
<i>walking alone through the city was not always safe</i> . . . . .	3-06
<i>I started a second apprenticeship. This time, as a roofer</i> . . . . .	3-07
<i>I was permitted to work on the tower of the “Brandenburger Dom”</i> . . . . .	3-07



<b>In fall 1945 we moved into a bigger apartment</b> .....	3-08
<i><u>I had to change my occupation again</u></i> .....	3-08
<i><u>Soviet Military Administration had permitted anti-fascistic political parties</u></i> ..	3-08
<i><u>the Potsdam Conference and the formation of the “Alliierte Kontrollrat”</u></i> ...	3-09
<i><u>Any farm larger than about 250 acres was to be dispossessed</u></i> .....	3-09
<i><u>the daily bread and a safe, dry, and warm place to live</u></i> .....	3-09
<i><u>Vati had to use all his connections to keep us from harm</u></i> .....	3-10
<i><u>Since most stores had little to sell</u></i> .....	3-11
<i><u>The new books helped me to find a new occupation</u></i> .....	3-11
<i><u>to copy technical drawings of all types of machinery</u></i> .....	3-12
<b>A “Schulreform” (reorganization of the school system) was initiated in 1946</b> ..	3-13
<i><u>I immediately liked the school</u></i> .....	3-13
<i><u>Our mathematics teacher was Professor Dr. Josef Geißler</u></i> .....	3-13
<i><u>Next in the list of my preferred teachers was Dr. Karl Geißler</u></i> .....	3-14
<i><u>On the list of my admired teachers was also our director Herr Albert Büstrin</u></i>	3-14
<i><u>A final outstanding teacher was Herr Studienrat G. M. Hartmann</u></i> .....	3-15
<i><u>Better overall grades were not given at graduation in this year</u></i> .....	3-16
<b>Gradually a dictatorship was instituted despite the promise of a democracy</b> ...	3-16
<i><u>1946 brought also an increase of our family</u></i> .....	3-16
<i><u>Vati’s business was set back many years in automation</u></i> .....	3-17
<i><u>At home, life improved in very small steps</u></i> .....	3-18
<i><u>In 1946 we still had to spend time to clear the ruins of Brandenburg</u></i> .....	3-18
<i><u>I soon set up a tiny laboratory in the basement</u></i> .....	3-18
<i><u>people in the house started complaining about the esoteric smells</u></i> .....	3-19
<i><u>to show experiments in the “Volkshochschule”</u></i> .....	3-20
<i><u>salvaging the rowing boat wrecks for our use</u></i> .....	3-21
<i><u>The democratic rule in school and country, however, saw a fast demise</u></i> ...	3-22
<i><u>Efforts to indoctrinate the students</u></i> .....	3-23
<i><u>Cultural events were re-emerging quickly</u></i> .....	3-23
<i><u>My technical skills were occasionally called upon</u></i> .....	3-24
<i><u>1947 was the year when I went to dancing lessons</u></i> .....	3-25
<i><u>By the year 1948 we were well established in school</u></i> .....	3-26
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<i><u>to be an actor for a few months was later of great value to me</u></i> .....	3-27
<i><u>The split of Germany into a democracy and a dictatorship continued</u></i> .....	3-28
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<i><u>But why then did I want to become a chemist?</u></i> .....	3-30
<b>The high school final exam, the “Abitur” was to be the last hurdle</b> .....	3-31
<i><u>A fool-proof examination system?</u></i> .....	3-32
<i><u>Wednesday and Thursday, July 20 and 21, were the days of the exam</u></i> .....	3-33
<i><u>What does one do after the Abitur? Celebrate!</u></i> .....	3-33

<i>we decided to have a last, relaxing vacation</i> . . . . .	3-34
<b>This period of 1945–1949 was the most important one for my future</b> . . . . .	3-35
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<i>My second hometown, thus, was Werbach an der Tauber</i> . . . . .	3-36
<i>Hastings, NE, as a third hometown</i> . . . . .	3-36
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<i>The military weapons of mass destruction</i> . . . . .	3-38
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<i>let me recall how I became aware and incensed about these happenings</i> . . . . .	3-38
<i>Only as the Nürnberg trials proceeded</i> . . . . .	3-39
<i>On our visit to Poland in 1972 we saw the concentration camp</i> . . . . .	3-39
<i>I want to finish this dark paragraph with a quote</i> . . . . .	3-39

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<i>My application was supposed to be acted upon</i> . . . . .	4-01
<b>Nobel Prize winners in Chemistry, Physical Chemistry, and Physics</b> . . . . .	4-02
<b>A two-month effort was necessary to change the rejection to an admission</b> . . . . .	4-03
<i>I received the rejection notice</i> . . . . .	4-05
<i>Immatriculation as stud. rer. nat. in Chemistry</i> . . . . .	4-08
<i>I quickly had to become a “Berliner”</i> . . . . .	4-09
<b>the list of courses I wanted to try in the first semester</b> . . . . .	4-09
<i>How did one learn anything without exams during the semester?</i> . . . . .	4-10
<i>Most important was the introduction into inorganic chemistry</i> . . . . .	4-11
<i>‘Theoretical Foundation of Organic Chemistry’</i> . . . . .	4-11
<i>to know and understand all there is in chemistry</i> . . . . .	4-12
<i>a Christmas Party, organized by Fritz Weikert</i> . . . . .	4-13
<i>“Studentenratswahl” (election of the student council)</i> . . . . .	4-13
<i>This was contraband and had to be smuggled into Brandenburg</i> . . . . .	4-14
<i>I also got to know Heidelberg</i> . . . . .	4-14
<b>The second semester went until the end of July 1950</b> . . . . .	4-16
<i>making an effort not to lose the books one first learned from</i> . . . . .	4-17
<i>Frederick the Great (“der alte Fritz”) had disappeared</i> . . . . .	4-18
<i>The summer vacations in August and September 1950</i> . . . . .	4-18
<i>October 10, 1950, the silver wedding anniversary of Vati and Mutti</i> . . . . .	4-19
<i>Vati maintained strict rules</i> . . . . .	4-19
<i>my monthly budget was 150 DM-Ost</i> . . . . .	4-20
<i>I was at a university which gave me good-old-fashion academic freedom</i> . . . . .	4-20
<b>The 3<sup>rd</sup> to the 8<sup>th</sup> semester were characterized by inorganic laboratory work</b> . . . . .	4-20
<i>He had been asked by the FDJ group leader to convince me to join</i> . . . . .	4-21
<i>summarize the remaining courses at the HU</i> . . . . .	4-21

<i>In February 1951 I had to interrupt my study</i>	4-22
<i>Frank and Dagmar got engaged</i>	4-22
<i>Mutti, who had been rather ill in 1952/53</i>	4-23
<i>vacation at the one-family village of Wendoche</i>	4-24
<i>why did it take so long until I finished the inorganic laboratory?</i>	4-25
<i>The new study plan developed for 1951/52</i>	4-25
<i>The enforcement of the new study plan</i>	4-25
<i>the possibility of an apolitical study at the HU was coming to an end</i>	4-26
<i>the new, 35-mm, single-lens mirror-reflex camera (SLR)</i>	4-27
<i>it was decided our engagement should be celebrated at Easter</i>	4-28
<i>our remaining friends in the GDR</i>	4-28
<b>The efforts to prepare for the flight out of the GDR accelerated in 1952/53</b>	4-29
<i>In the end, I had moved over 20 suitcases of goods</i>	4-29
<i>time was spent in the American Sector of Berlin</i>	4-29
<i>At Easter, our engagement was celebrated</i>	4-30
<i>Heidel would not return to Neubrandenburg, but register as a refugee</i>	4-31
<i>the exam in 'Marxism-Leninism'</i>	4-31
<i>Back in Brandenburg I made final plans with Vati</i>	4-33
<b>By the 17<sup>th</sup> of June we were refugees again</b>	4-33
<i>Heidel had arrived earlier and was flown out earlier</i>	4-33
<i>in West Berlin, the case of recognition as refugees</i>	
<i>of Vati and myself was combined</i>	4-34
<i>I needed to get my "Übungsscheine"</i>	4-34
<i>In 1968 I met Werner Schmidt again</i>	4-34

## CHAPTER-05 "Goethe University, Frankfurt, Federal Republic of Germany, 1953–54"

	Pages:
<b>Getting settled in "Weinsberg an der Weibertreu"</b>	5-01
<i>On August 11, 1953 we registered in the refugee camp Weinsberg</i>	5-01
<i>With this encouraging information, we settled into the camp routine</i>	5-01
<i>an invitation to come to the "Johann Wolfgang von Goethe Universität"</i>	5-03
<i>I was incarcerated for the night</i>	5-03
<b>I was on my way to the refugee camp in Frankfurt-Griesheim</b>	5-04
<i>But first, I needed a job</i>	5-04
<i>On Monday, September 28, I walked to work</i>	5-05
<i>This house was much too fancy for us</i>	5-06
<i>We were now both working full time</i>	5-07
<b>Early in November we moved to the Mendelssohnstraße 81</b>	5-08
<i>On November 11 we celebrated Gisela's birthday</i>	5-09
<i>Why did we work so hard to get out of the camp?</i>	5-09
<i>our interest in world politics had decreased considerably</i>	5-10
<i>The 'Third World' changes</i>	5-10
<i>admission to the "Johann Wolfgang Goethe-Universität" for Heidel and me</i>	5-11

<b>The problems of the first semester in Frankfurt</b> .....	5-11
<i><u>Then I could go to the “Vordiplom”</u></i> .....	5-11
<i><u>This left only course-work and the beginning of the thesis</u></i> .....	5-12
<i><u>“Exmatrikulation” from the Humboldt University</u></i> .....	5-12
<i><u>work on the emigration to the United States</u></i> .....	5-13
<i><u>I had to travel once more to my new hometown in Werbach</u></i> .....	5-13
<b>Getting Married</b> .....	5-14
<i><u>In January the stipend was finally paid</u></i> .....	5-16
<i><u>Now we were ready for guests</u></i> .....	5-17
<i><u>By now we were quite certain that we would leave for the US</u></i> .....	5-18
<i><u>The last few months in Frankfurt passed rather rapidly</u></i> .....	5-19
<b>The trip to the US</b> .....	5-21

## CHAPTER-06 “Study in the US, 1954–58”

	Pages:
<b>Early in the morning of November 6 we arrived in New York City</b> .....	6-01
<i><u>With two taxis we went to the Pennsylvania Station</u></i> .....	6-01
<i><u>The streamlined train traversed the 900 mi between</u></i> <i><u>New York and Chicago in 16 hours</u></i> .....	6-03
<i><u>Hastings, NE, was reached 650 mi into the trip of the Zephyr</u></i> .....	6-03
<i><u>The first breakfast in the US was a feast</u></i> .....	6-04
<i><u>a city whole and untouched by the terrible past</u></i> .....	6-04
<i><u>In short order our luggage was delivered and our move was completed</u></i> .....	6-05
<b>Hastings has a College</b> .....	6-05
<i><u>Next was our official welcome in Hastings with an ‘Open House’</u></i> .....	6-06
<i><u>Ingleside State Psychiatric Hospital</u></i> .....	6-07
<i><u>Both George and Shep made proper fun of my pronunciation and</u></i> <i><u>showed me how to improve</u></i> .....	6-08
<i><u>Had I already registered at the post office for the draft?</u></i> .....	6-10
<i><u>We also had to learn some different customs</u></i> .....	6-10
<b>Our plans for 1955 needed to address advances</b> .....	6-11
<i><u>Why was a car so important?</u></i> .....	6-11
<i><u>By now I was convinced I should apply to graduate school</u></i> .....	6-12
<i><u>only the graduate school of Northwestern University</u></i> <i><u>seemed to have what looked like a world-class chemistry program</u></i> ..	6-13
<i><u>In March 1955 I was admitted to Northwestern University</u></i> .....	6-14
<i><u>why we never even considered going back to Frankfurt</u></i> .....	6-14
<i><u>an offer to change my teaching assistantship into a 12-month</u></i> <i><u>research assistantship</u></i> .....	6-16
<i><u>August 29 we arrived in Evanston</u></i> .....	6-16
<b>Living in Chicago and attending Northwestern</b> .....	6-17
<i><u>Next we needed furniture</u></i> .....	6-17
<i><u>In the meantime, we lived out of suitcases</u></i> .....	6-18

<b>On September 1, it was time to go to work</b> .....	6-19
<i><u>one should honor one's scientific 'grandparents'</u></i> .....	6-20
<i><u>to tame the beast of an adiabatic calorimeter</u></i> .....	6-20
<i><u>Next, the courses that needed to be taken</u></i> .....	6-21
<i><u>all exams, except the one for the PhD, were written exams</u></i> .....	6-21
<i><u>Comparing oral and written exams</u></i> .....	6-22
<i><u>Thermodynamics of the Copolymer System</u></i>	
<i><u>Poly(ethylene terephthalate-sebacate)</u></i> .....	6-22
<i><u>Instructor in Chemistry</u></i>	
<i><u>in the College of Liberal Arts of Northwestern University</u></i> .....	6-23
<b>During the study, our private life also saw changes</b> .....	6-24
<i><u>Heidel started work in the Deering Library</u></i> .....	6-24
<i><u>guests and friends in our apartment</u></i> .....	6-24
<i><u>international sign language</u></i> .....	6-25
<i><u>don't lose your accent, it sounds so nice</u></i> .....	6-25
<i><u>study the effect of irradiation on polymers</u></i> .....	6-26
<i><u>to celebrate the Christmas Holidays 1955 and the New Year 1956</u></i> .....	6-27
<i><u>Our daughter Caryn was born on the 20<sup>th</sup> of September, 1956</u></i> .....	6-27
<i><u>there was an automobile accident in front of the house</u></i> .....	6-28
<i><u>we decided to have Caryn christened</u></i>	
<i><u>in Vati and Mutti's First St. Paul Lutheran Church</u></i> .....	6-29
<i><u>The next milestone in our family history</u></i>	
<i><u>was the arrival of Frank, Dagmar, and Eberhard in Chicago, IL</u></i> ...	6-30
<b>Teaching as an instructor at Northwestern</b> .....	6-32
<i><u>I was invited to consult for the Toni Hair-waving Laboratory</u></i> .....	6-32
<i><u>my research during this extra year at Northwestern</u></i> .....	6-33
<i><u>I attended my first National Meeting of the ACS</u></i> .....	6-33
<i><u>employment discussions with ten companies and nine universities</u></i> .....	6-34
<i><u>Instructor of Physical Chemistry at Cornell University</u></i> .....	6-37

## CHAPTER-07 "Cornell University, 1958-63"

	Pages:
<b>Over the Labor Day weekend of 1958 we arrived in Ithaca, NY</b> .....	7-01
<i><u>The duplex apartment had two bedrooms</u></i> .....	7-01
<i><u>The countryside in and around Ithaca was much to our liking</u></i> .....	7-02
<b>a research and teaching effort had to be established at Cornell</b> .....	7-03
<i><u>I reported to Dr. Franklin A. Long</u></i> .....	7-03
<i><u>To find a suitable laboratory was of greater difficulty</u></i> .....	7-04
<i><u>The initial teaching duties were light</u></i> .....	7-04
<i><u>Next, funding had to be attained and students had to be found</u></i> .....	7-05
<i><u>In 1960, the first graduate student knocked at my door</u></i> .....	7-06
<b>My earlier involvement and interest in global politics had decreased</b> .....	7-07
<i><u>What had happened in the meantime in Germany?</u></i> .....	7-07

<i>Many of the Third World Countries followed an almost predictable fate</i> . . . .	7-08
<i>This was my last larger excursion into the world of politics</i> . . . . .	7-08
<i>The effect of the various world conflicts on teaching in the US</i> . . . . .	7-08
<i>My own experience with the teaching of veterans was positive</i> . . . . .	7-09
<b>Our personal life in Ithaca, NY</b> . . . . .	7-10
<i>our travel was within the US or Canada</i> . . . . .	7-10
<i>to find the best suited and most economical station wagon</i> . . . . .	7-11
<i>How could we handle the increase in family during the first few months?</i> . . .	7-12
<i>Our son Brent was born on the 22<sup>nd</sup> of September 1959</i> . . . . .	7-13
<i>By 1965, pensioners could officially leave the GDR</i> . . . . .	7-15
<i>Our next big step in 1960 was to apply for US citizenship</i> . . . . .	7-15
<i>1960 approached its close with an ice storm late in fall</i> . . . . .	7-15
<i>In Hastings the whole family got together again</i> . . . . .	7-16
<i>As usual, when we were at home for holidays,</i> <i>we tried to invite students, friends and colleagues</i> . . . . .	7-18
<b>My research topic had been from the beginning and is still</b>	
<b>that of the solid state physical chemistry of macromolecules</b> . . . . .	7-19
<i>Why were the academic chemists not interested in macromolecules?</i> . . . . .	7-19
<i>Is polymer physics underdeveloped?</i> . . . . .	7-20
<i>the study of natural science, “philosophia rerum naturalis”</i> . . . . .	7-20
<b>For 1960–63 I had been promoted to the rank of an assistant professor</b> . . . . .	7-21
<i>In early spring 1962, when looking at the odometer of our car</i> . . . . .	7-21
<i>Major travel projects in 1962</i> . . . . .	7-22
<i>When the year 1962 ended</i> . . . . .	7-23
<i>The stories about Professor Debye were many</i> . . . . .	7-24
<i>Smoking was at that time still unrestricted</i> . . . . .	7-25
<b>My search for a more secure job began late in 1962.</b> . . . .	7-25
<i>Discussing my situation</i> . . . . .	7-27
<i>A total of 14 openings were finally identified</i> . . . . .	7-27
<i>The visit and lecture at Rensselaer Polytechnic Institute</i> . . . . .	7-28
<i>The first solid offer came to Hastings, NE</i> . . . . .	7-28

**CHAPTER-08 “Rensselaer Polytechnic Institute, Troy, NY, 1963–88”**

	Pages:
<b>The first half of 1963 was used to wind-up work in Ithaca</b>	
<b>and to arrange for life in Troy</b> . . . . .	8-001
<i>This involved planning of the research for the spring term at Cornell</i> <i>and the summer and fall at RPI</i> . . . . .	8-001
<i>visits in Troy to discuss laboratory space, equipment, and housing</i> . . . . .	8-002
<i>we had bought a house</i> . . . . .	8-004
<i>Arriving in Troy, a much different impression was obtained</i> . . . . .	8-006
<i>visitors from Germany</i> . . . . .	8-006
<i>coworkers from Japan, sometimes brought surprises</i> . . . . .	8-006

<i>At home it was my initial job to tame the 2½ acres of wilderness</i>	8-007
<i>To appreciate the beauty of the area,</i>	
<i>    one had to go into the surrounding countryside</i>	8-008
<b>the neighbors, colleagues, and coworkers were part of a pleasant support</b>	8-009
<i>    These reservations, resulting from our past, were even more serious</i>	
<i>        with our neighbors across the road</i>	8-010
<i>    Dr. Glaser introduced us to his Jewish-German friends</i>	8-010
<i>    We had to find the supplies for German cooking and baking</i>	8-011
<i>    Going to work at RPI</i>	8-012
<b>I had a chance to get involved in teaching freshmen</b>	8-013
<i>    television had to come to the rescue</i>	8-013
<i>    further analyze and experiment with teaching</i>	8-014
<b>Support of my research activities by RPI</b>	8-015
<i>    Our research began in Walker Laboratory and North Hall</i>	8-016
<i>    combined work with a vacation</i>	8-017
<i>    with TWA to Denver</i>	8-018
<i>    The biggest public event in 1964/65 was the World's Fair</i>	8-018
<i>    In 1964 I did not get tenure as associate professor</i>	8-019
<b>Is promotion in 1965 to a full professor the end or the beginning of my career?</b>	8-020
<i>    directly apply research to industrial uses</i>	8-021
<i>    On a personal level, life continued to improve</i>	8-021
<i>    first trip back to Germany after 11 years</i>	8-022
<i>    The next trip to Europe</i>	8-022
<i>    Research after 1965</i>	8-023
<i>    very productive students and postdoctoral associates</i>	8-024
<i>    we collected a basic set of research tools</i>	8-024
<i>    the IUPAC Meeting in Japan, 1966</i>	8-025
<i>    more than 50% of the top academics in the field were attending,</i>	
<i>        and most of all, I, as the youngest, got to know them all</i>	8-030
<i>    two more IUPAC Macromolecular Symposia I attended</i>	
<i>        were served by ACS charter flights</i>	8-031
<i>    Meeting in Budapest</i>	8-031
<i>    The final trip by ACS charter flight went to Rio de Janeiro in 1974</i>	8-032
<i>    Two other interesting things happened in Rio</i>	8-034
<i>    the charter flight went on to Cuzco with its great Inca buildings</i>	8-034
<i>    taking stock of my situation at RPI</i>	8-036
<b>my first sabbatic leave in Germany, 1967/68</b>	8-037
<i>    How can one get a sabbatic leave, if the university does not allow one?</i>	8-037
<i>    a tour speaker at local ACS Meetings</i>	8-038
<i>    The sabbatic began with the Meeting of the German Physical Society</i>	8-039
<i>    The following Monday, work started in earnest</i>	8-041
<i>    changes had occurred since I was a student</i>	8-042
<i>    An academic career in Germany is different</i>	8-043
<i>    the burden of the German bureaucracy</i>	8-043

<i>A few other exciting happenings during the sabbatic</i> .....	8-045
<i>an excursion to Berlin</i> .....	8-046
<i>acquisitions that also influenced our future life</i> .....	8-049
<i>our favorite vacation spot</i> .....	8-049
<i>in Troy, by 1970, we had completed the remodeling of our house</i> .....	8-051
<b>What caused the decline of the ‘Golden Age of Sciences’ in America?</b> .....	8-052
<i>The decline in teaching efficiency and quality</i> .....	8-052
<i>the villainizing of chemistry</i> .....	8-053
<i>other signs of decreasing interest in chemical research</i> .....	8-054
<i>the change of research support by government agencies,</i> <i>the salary structure of professors, as well as</i> <i>the support of graduate students and postdoctoral associates</i> .....	8-054
<i>the ‘Golden Age of America’ in the sciences has ended</i> <i>and a new effort needs to be started</i> .....	8-055
<b>a monograph about the ‘Crystalline Solid State of Linear High Polymers’</b> .....	8-057
<i>Was this a chance to understand the field even better?</i> .....	8-057
<i>another sabbatic?</i> .....	8-057
<i>By June 1971 the first half of the manuscript of Volume 1 was submitted</i> ..	8-058
<i>Soviet and Chinese students had much easier access to my books</i> .....	8-058
<i>a trip into the past</i> .....	8-059
<i>“You have no visa”</i> .....	8-061
<i>time to complete Volumes 2 and 3 of Macromolecular Physics</i> .....	8-062
<i>Plans to complete the project with a fourth and fifth volume</i> .....	8-063
<b>progress of research during the 1970s and 80s,</b> <b>as well as the development of new teaching methods</b> .....	8-063
<i>The research planning and execution</i> .....	8-063
<i>wide-spread application of computers</i> .....	8-064
<i>my own complaints about computers</i> .....	8-065
<i>the new tools for teaching</i> .....	8-066
<i>re-visit and simplify the basic knowledge</i> .....	8-066
<i>In time, my lecturing was increasingly in graduate education</i> .....	8-067
<i>self-study with audio courses</i> .....	8-068
<i>the introduction of computer courses</i> .....	8-069
<b>a look into the future of teaching and learning</b> .....	8-071
<i>The ancient form of transmittal of knowledge</i> .....	8-071
<i>education consists of two vital parts, the teaching and the learning</i> .....	8-072
<i>research by the professor joined by his students should question</i> <i>established knowledge and expand into new areas</i> .....	8-073
<i>conferring an academic degree has the dual purpose, to evaluate past</i> <i>performance and to discourage unsuited candidates</i> .....	8-074
<i>how to pay for the education</i> .....	8-074
<b>I need to return to the changes in our family</b> .....	8-075
<i>The cottages at Chase Pond near New London</i> .....	8-075
<i>fun in winter time in Troy</i> .....	8-076



<i>the precious possessions we had in our sugar maples</i> . . . . .	8-077
<i>Other entertainments for Brent and Caryn</i> . . . . .	8-077
<i>it was quite clear that they would ultimately try to enter RPI</i> . . . . .	8-078
<i>we enrolled Caryn as day student in the Emma Willard School</i> . . . . .	8-079
<i>Brent went to Troy High</i> . . . . .	8-080
<i>Brent went to Syracuse University as an evening student</i> . . . . .	8-081
<i>Brent and Anna's wedding in 1984</i> . . . . .	8-082
<i>we had invited all our friends besides the few relatives</i> . . . . .	8-083
<i>Brent's marriage was not the first broadening</i> <i>of our German-American family</i> . . . . .	8-084
<i>prior larger family gatherings were the golden wedding anniversaries</i> . . . . .	8-084
<b>decrease of interest in polymer chemistry at RPI</b> . . . . .	8-085
<i>fund-raising effort of RPI in 1980 for 'Rensselaer 2000'</i> . . . . .	8-086
<i>The de-emphasis on polymers became clear</i> . . . . .	8-086
<b>more pleasant developments in Troy</b> . . . . .	8-088
<i>Sterling and Francine Clark Art Institute</i> . . . . .	8-088
<i>Caryn had to find a medical school and arrange for the finances</i> . . . . .	8-089
<i>In January 1977, we bought 100 acres of the Adirondack State Park</i> <i>the 'Hideaway Beaver Lodge'</i> . . . . .	8-089
<i>an exchange program supported by the US State Department</i> . . . . .	8-091
<i>a civil suit about the patent rights to polypropylene</i> . . . . .	8-092
<b>Several interesting travel destinations in the 1970s and 1980s</b> . . . . .	8-093
<i>From Mexico City I flew to Tampico</i> . . . . .	8-094
<i>Two Asian trips, to India and Japan, were supported by fellowships</i> . . . . .	8-095
<i>a four-week stay in China for 1984</i> . . . . .	8-099
<b>Impressions in China</b> . . . . .	8-103
<b>The year 1985 foreshadowed major changes in our life</b> . . . . .	8-107
<i>the March Meeting of the APS in Baltimore</i> . . . . .	8-107
<i>On July 29, Vati passed away</i> <i>and the family assembled for a sad funeral in Hastings</i> . . . . .	8-108
<b>another sabbatic leave in Germany for 1986/87</b> . . . . .	8-109
<i>the various phases were in need of a better understanding</i> . . . . .	8-109
<i>The key coauthor of the early work on mesophases was</i> <i>Dr. Janusz Grebowicz, who joined my group in 1980 from Poland</i> . . . . .	8-109
<i>The discussion for a new sabbatic leave in Germany for 1986/87</i> . . . . .	8-110
<i>but things do not always go as expected</i> . . . . .	8-112
<i>an X-ray tomogram revealed a sizable cancer</i> . . . . .	8-112
<i>The first part of the sabbatic was in Freiburg</i> . . . . .	8-112
<i>the work that could be accomplished during the sabbatic</i> . . . . .	8-115
<i>During this visit, the offer to join The University of Tennessee</i> <i>in Knoxville, UTK, and ORNL was finalized</i> . . . . .	8-117
<i>in retrospect, I was frequently right</i> . . . . .	8-119
<i>the 1987 March APS Meeting in New York City</i> . . . . .	8-119
<i>The move to Ulm for the second half of the sabbatic</i> . . . . .	8-121

<i>another short trip back to Troy</i> .....	8-122
<i>the development of the student group for the year 1986/87</i> .....	8-123
<b>the IUPAC Polymer Symposium in Merseburg, GDR</b> .....	8-124
<i>two invitations for lectures in the GDR</i> .....	8-126
<i>Papa had started his new life in a senior citizen home near Bergheim</i> .....	8-129
<b>Retirement from RPI and a new beginning in Tennessee</b> .....	8-129
<i>to find a suitable house in Knoxville</i> .....	8-129
<i>To sell the old house in Troy</i> .....	8-130
<i>On August 30, our grandson Stefan was born in Utica, NY</i> .....	8-131
<i>Next came a period of good bye parties</i> .....	8-131
<i>A final Summary of almost 25 years at RPI 1963–1988</i> .....	8-132
<i>Moving day was January 2, 1988.</i> .....	8-132

## CHAPTER-09 “University of Tennessee & Oak Ridge National Lab, 1988–2001”

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<b>The move to Knoxville coincided with the beginning of the year 1988</b> .....	9-01
<i>I knew it! You are foreign Yankees</i> .....	9-01
<i>200 Baltusrol Road, in the development of Fox Den</i> .....	9-01
<i>It was one of the great southern US snowstorms of all time</i> .....	9-03
<i>Work began shortly thereafter</i> .....	9-04
<i>the department got its share of the Distinguished Scientists</i> .....	9-06
<i>Let us take a look at Knoxville</i> .....	9-07
<i>Great Smoky Mountains National Park</i> .....	9-07
<i>Four other interesting cities within easy driving distance</i> .....	9-09
<i>We were looking for Danish modern teak furniture</i> .....	9-09
<i>the 1975 Mercedes was ailing</i> .....	9-10
<b>In these first months we also needed to connect with our neighbors and colleagues</b> .....	9-11
<i>Heidel created a unique guest book</i> .....	9-12
<b>The ‘Distinguished Scientist Program’ was ideal to do creative research</b> .....	9-13
<i>a failed proposal</i> .....	9-13
<i>Much progress could be made by having similar positions available in many universities</i> .....	9-13
<b>A good start of the research was accomplished within the first three years</b> .....	9-14
<i>cooperation between UTK and ORNL was furthered by weekly meetings at 4500 N of X10</i> .....	9-14
<i>The ATHAS Data Bank</i> .....	9-14
<i>thermal analysis on new samples of interest</i> .....	9-15
<i>to learn about the solid-state <sup>13</sup>C NMR</i> .....	9-15
<i>cooperation between ORNL researchers and the ATHAS group</i> .....	9-16
<i>molecular dynamics simulations</i> .....	9-16
<i>cooperation in the field of X-ray diffraction</i> .....	9-17
<i>The work performed by my students and me was recognized</i> .....	9-18

<b>An interesting international travel was arranged during the summer of 1988</b>	9-20
<u>a listing of our itinerary</u>	9-20
<b>In 1989 the most momentous event was the opening of the “Berliner Mauer”</b>	9-23
<u>How was this possible?</u>	9-23
<u>Reunification followed in 1990</u>	9-25
<u>What did reunification bring to the former GDR?</u>	9-26
<u>direct information about this exciting period</u>	9-27
<u>Heidel kept three letters from one of her more critical girl friends</u>	9-27
<u>How were we personally affected by the reunification?</u>	9-30
<u>we went to our hometown, Brandenburg</u>	9-31
<u>Lähnwitz Seminar</u>	9-34
<b>Teaching at the University of Tennessee</b>	9-35
<u>the courses which I was asked to teach</u>	9-35
<u>course and curriculum development</u>	9-35
<u>study program between European and US universities</u>	9-36
<u>the first Internet courses</u>	9-36
<u>to improve the standing of the continuously decreasing scores</u> <u>of the US students in mathematics and sciences</u>	9-36
<u>President G. H. W. Busch was to be the Education President</u>	9-37
<b>a number of changes in our personal life</b>	9-38
<u>Alyssa was born on May 1, 1989</u>	9-38
<u>one generation dies after the other</u>	9-39
<u>a two-week trip to Sweden</u>	9-39
<u>Frank, my older brother died suddenly</u>	9-40
<u>the oldest surviving male member of the Wunderlich Family</u>	9-41
<b>Research at UTK and ORNL in the last decade of the 20<sup>th</sup> century</b>	9-42
<u>molecular dynamics</u>	9-42
<u>full-pattern X-ray diffraction</u>	9-43
<u>direct view of the crystals of polymers</u>	9-44
<u>Single-molecules single-crystals</u>	9-45
<u>Detection of the motion in mesophases by solid state NMR</u>	9-46
<u>a first definition of nanophases</u>	9-46
<u>new dimensions to the ATHAS effort</u>	9-46
<u>the coworkers at UTK</u>	9-48
<u>the main progress in calorimetry in the 1990s,</u> <u>the temperature modulation</u>	9-50
<u>our multi-directional broadening of the approach to thermal properties</u>	9-50
<u>Into the middle of the just described period of research fell my 65<sup>th</sup> birthday</u>	9-51
<b>travel on business was increasingly augmented in the 1990s</b>	
<u>with travel for the ‘the need to see’</u>	9-55
<u>the most common business travel across oceans went to Japan</u>	9-55
<u>Three other transcontinental trips outside of Europe and on ‘business’</u> <u>went to South Africa (1992), Australia (1995), and China (2000)</u>	9-57
<u>The inviter was the South African Thermal Analysis Society</u>	9-57

<i>The next 'business trip' went to Australia</i> . . . . .	9-59
<i>our second visit to China, 16 years after the first memorable visit</i> . . . . .	9-62
<i>The question which arose out of what we had seen on this trip to China</i> . . . . .	9-65
<b>the first vacations for private explorations</b> . . . . .	9-66
<i>trips to Cancún and Belize</i> . . . . .	9-66
<i>as far north as one could go in North America and Europe</i> . . . . .	9-69
<i>It had taken over 40 years until we again boarded an oceangoing ship</i> . . . . .	9-69
<i>cruising through Glacier Bay National Park</i> . . . . .	9-70
<i>Norway reaches just as far north</i> . . . . .	9-73
<i>the Hawaiian Islands</i> . . . . .	9-77
<b>the question arose when should one retire?</b> . . . . .	9-79
<i>key questions had to be answered to find a solution</i> . . . . .	9-80
<i>I would retire on my 70<sup>th</sup> birthday in 2001</i> . . . . .	9-82
<i>planning for the future</i> . . . . .	9-82
<i>Planning our personal future was a bit more uncertain</i> . . . . .	9-83
<b>On December 31, 2000, the 20<sup>th</sup> century came to an end</b> . . . . .	9-85
<i>back-integration of new knowledge into daily life is necessary</i> . . . . .	9-86

## CHAPTER-10 “Epilogue”

	Pages:
<b>On January 1, 2001, the 21<sup>st</sup> century began</b> . . . . .	10-01
<i>a brief reexamination of the stages of our life</i> . . . . .	10-01
<i>The most formative period in my life</i> . . . . .	10-01
<i>what would have been if</i> . . . . .	10-02
<b>a short summary of what the first tenth of the 21<sup>st</sup> century has brought</b> . . . . .	10-03
<i>the birthday and retirement festivities of 2001</i> . . . . .	10-03
<i>Research after retirement</i> . . . . .	10-04
<i>an expansion of the laboratory facility at UTK</i> . . . . .	10-04
<i>Polymer Characterization Laboratory, PCL</i> . . . . .	10-05
<i>The first two years of the PCL</i> . . . . .	10-05
<i>the demise of the PCL</i> . . . . .	10-05
<i>the future of ATHAS at UTK found its end in 2006</i> . . . . .	10-07
<b>The teaching effort continued after the retirement in 2001</b> . . . . .	10-07
<i>A major event after the closing of the laboratories in 2006</i> . . . . .	10-08
<i>Closing the laboratory in 2006</i> <i>did not mean that all my scientific work stopped</i> . . . . .	10-08
<i>The continuation of the lecturing outside the university</i> . . . . .	10-09
<b>Going through our annual personal picture albums</b> . . . . .	10-09
<i>Golden Wedding Anniversary in 2003</i> . . . . .	10-09
<i>Other family festivities</i> . . . . .	10-11
<i>travel plans after retirement</i> . . . . .	10-13
<b>travel around the world</b> . . . . .	10-13
<i>the flight to Peru</i> . . . . .	10-14

<i>the 45 square mile small Easter Island</i> .....	10-15
<i>the rainforest highlands of Papua New Guinea</i> .....	10-17
<i>We landed in Siem Reap, Cambodia</i> .....	10-19
<i>the Serengeti Seronera Airstrip in the middle of the National Park</i> .....	10-21
<b>One final statement and a comment will close the book</b> .....	10-23

## CHAPTER-11 “A Brief Genealogy”

	Pages:
Bernhard’s Parents and Grandparents .....	11-02
Heidel’s Parents and Grandparents .....	11-03
Our Children and Grandchildren .....	11-04
Pictures to page 11-2 .....	11-05
Pictures to page 11-3 .....	11-07
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<b>Index of Personal Names</b> .....	12-01–10
<b>Subject Index</b> .....	12-11–37

# APPENDICES

(These Appendices are only available in the On-line book as an Electronic Supplement)

## APPENDIX-A “List of Publications and Research Associates”

This Appendix contains in Parts A–D a complete list of all scientific publications written between 1955 and 2008. Listed are the sequential numbers according to the date when considering writing the manuscript. In Part A these are furthermore sorted by the year of appearance. In Part E, a list of the research associates is given, separated in level of appointment. The number of years in my laboratory is given, together with a brief characterization of the research topic and later employment.

	Pages:
A: The University of Tennessee and Oak Ridge National Lab, 1988–2010 .....	A-01
B: Rensselaer Polytechnic Institute, 1963–1988 .....	A-22
C: Cornell University, 1958–1963 .....	A-31
D: Northwestern University, 1955–1958 .....	A-32
E: Research Associates during the Period 1960 to 2006 .....	A-33

## APPENDIX-B “*Thermal Analysis of Macromolecules*”

In Appendix B a scientific publication is presented. It reviews the development of my research over the years. Earlier versions were written for the NATAS Symposia on Thermal Analysis and Applications in 1996 and 2006. (See pages C-49 and C-63–64 in Appendix C, and publications 407 and 575 listed in Appendix A).

	Pages:
A: Introduction	B-01
B: Early Calorimetry and Knowledge about Solid Polymers (1955–1965)	B-03
C: First Work on DSC & Structure and Morphology of Crystals (1965–1975)	B-07
D: Computerization and Formal Development of ATHAS (1975–1988)	B-13
E. Molecular Motion and Disorder (1988–1996)	B-17
F: Reversible Melting and the Rigid-amorphous Phase (1996–2001)	B-23
G: Chain Segment Decoupling of Flexible Macromolecules (2001–2006)	B-37
H: Final Papers after Closing the Laboratory (2007–2010)	B-42
I: Conclusions and Acknowledgments	B-43
J: References	B-44

## APPENDIX-C “*Permanent Homes, Travel, and Lectures of Bernhard Wunderlich*”

This Appendix C is a listing of the travels to give lectures (titles, location, occasion, and dates) outside the normal teaching duties. Since this travel was often extended to inspect ‘need to see’ sites, the list includes also travel for ‘need to see’ only, and occasional vacations. The entries are subdivided in addition by dates in sequence of places of residence, so that one can identify my whereabouts in the various years.

	Pages:
A: GERMANY (1931–1954)	C-01
Brandenburg an der Havel (1931–1949)	C-01
Berlin (1949–1953)	C-02
Frankfurt am Main (1954–1955)	C-03
B: UNITED STATES OF AMERICA (from November 1954)	C-03
Hastings, Nebraska (1954–1955)	C-03
Chicago, Illinois (1955–1958)	C-03
Ithaca, New York (1958–1963)	C-04
Troy, New York (1963–1988)	C-05
1967/68 Sabbatic in Germany	C-08
1986/87 Sabbatic in Germany	C-30
Knoxville, Tennessee (1988–2001)	C-33
Retirement in 2001	C-57
After closing of the Laboratory in 2006	C-63
C. MAJOR VACATION TRAVEL AFTER 1954	C-65