

ABRAHAM PAIS

A Tale of Two Continents

A Physicist's Life in a Turbulent World



PRINCETON LEGACY LIBRARY

A TALE OF TWO CONTINENTS

ATALE OF TWO CONTINENTS

A Physicist's Life in a Turbulent World

Abraham Pais

PRINCETON UNIVERSITY PRESS

PRINCETON, NEW JERSEY

Copyright © 1997 by Princeton University Press
Published by Princeton University Press, 41 William Street, Princeton, New Jersey 08540
In the United Kingdom: Princeton University Press, Chichester, West Sussex

All Rights Reserved

Library of Congress Cataloging-in-Publication Data

Pais, Abraham, 1918–
A tale of two continents : the life of a physicist in a turbulent world / Abraham Pais.

p. cm.

Includes index.

ISBN 0-691-01243-1 (alk. paper)

1. Pais, Abraham, 1918– . 2. Physics—History. 3. Physicists—
United States—Biography. I. Title.

QC16.P24A3 1997

530'.092—dc21

[B] 96-39313

This book has been composed in Berkeley Medium

Princeton University Press books are printed on acid-free paper and meet the guidelines for
permanence and durability of the Committee on Production Guidelines for Book Longevity
of the Council on Library Resources

Printed in the United States of America by Princeton Academic Press

10 9 8 7 6 5 4 3 2 1

TO IDA, JOSHUA, LISA, AND ZANE,

And in memory of all on our side who fell
in the Second World War

Contents

<i>Acknowledgments</i>	xi
<i>Prologue</i>	xiii
 <i>BOOK THE FIRST: EUROPE</i>	
1	
Descent	3
2	
Early Years	7
3	
Bachelor's Degrees in Amsterdam	15
4	
Of Music, Films, and Other Diversions	20
5	
First Contacts with Zionism	24
6	
Utrecht: M.Sc. and Ph.D.	31
7	
War	44
8	
Occupation of Holland	52
9	
Sho'ah	66
10	
Wartime Experiences of My Family and Me	88

11	
War's Aftermath: A Last Lesson in Dutch History	126
12	
My Final Months in Holland	136
13	
Getting to Know Niels Bohr	149

BOOK THE SECOND: AMERICA

14	
It Is Time to Speak of America	181
15	
The State of the Union 1946: The U.S., Princeton, and the Institute for Advanced Study	191
16	
Enter Einstein and Other Interesting New Acquaintances	200
17	
In Which Oppenheimer Becomes Director and I a Long-Term Member of the Institute	219
18	
Oppenheimer: Glimpses of a Complex Man	235
19	
My Career Unfolds	244
20	
About Unexpected New Physics, Old Friends, and a Grand Tour	265
21	
Of the Beginnings of Theoretical Particle Physics, Some Baseball History, and Two Long Summer Journeys	284
22	
Of Symmetry and My Longest Journey	302
23	
Greenwich Village, American Citizenship, and the Oppenheimer Affair	321

24	
Of My Best Work and a Year's Leave of Absence. Death of Einstein	333
25	
My First Trip to Russia and My First Marriage	349
26	
Enter Joshua. The 1950s, Concluded	358
27	
Times of Great Change: The Early 1960s	369
28	
Changing My Workplace from Princeton to New York	385
29	
What Befell Me in the Late 1960s	399
30	
The 1970s	408
31	
A Career Change	425
32	
My Final Years—So Far	446
33	
Approaching the Millennium	467
<i>Notes and References</i>	477
<i>Onomasticon</i>	505

Acknowledgments

MY DEEP gratitude goes to those whose generosity, wisdom, knowledge, and criticism have helped me in preparing this book.

Conversations with my friend Tineke Strobos, who saved my life, have refreshed my memory about events in Holland during the Second World War. Jaap Polak, survivor of Bergen-Belsen, has generously put at my disposal his excellent library of books on the fate of the Jews in that war. Rigsantikvar Olaf Olsen has answered many questions about Denmark's history.

Special thanks to Paula and Fred Morgan, editors of *The Hudson Review*, who excerpted and published in their literary magazine fragments of this book (Spring 1993 issue). Its reception has been a great encouragement to me.

I am greatly beholden to the Alfred P. Sloan Foundation for a grant that has aided me in many phases of preparation. I thank Jan Maier for her excellent help in the preparation of the book's manuscript. It was a pleasure to have the thoughtful editorial help of Alice Calaprice.

My dear wife Ida's wise critique of the manuscript and her gentle care have sustained me throughout my labors.

*The stupendous arrogance of such a record!
What should it contain, then? A pedestrian
reckoning by the sun, or aphoristic flights, or a
momentous study of my excretions covering
years? A digest of all three perhaps. One can
hardly tell. No matter.*

—LAWRENCE DURRELL, *The Black Book*

*What gives a man worth is that he incorporates
everything he has experienced. This includes the
countries where he has lived, the people whose
voices he has heard. It also takes in his origins,
if he can find out something about them. By this
is meant not only one's private experience but
everything concerning the time and place of
one's beginnings.*

—ELIAS CANETTI, *The Play of the Eyes*

Prologue

Rabbi Zusia said: "When I appear before the Almighty, I am not afraid to be asked: 'Reb Zusia, why have you not been like Abraham, the patriarch, or like Moses, our great teacher?' The question I truly fear is: 'Reb Zusia, have you truly been Reb Zusia?'"

—OLD CHASSIDIC TALE

FAMILY and friends have often urged me to write the story of my life, saying that this would be an unusual tale. "Yes, that is perhaps so; I'll think about your suggestion," I would reply, but I would not follow up. I did not like the idea of an "I, I, I" book, putting myself center stage.

There came a time, it was 1990, when I had finished writing my biography of Niels Bohr and was thinking about what to do next when Ida, my wife, asked if this was not the right time to start my autobiography. I said to her that I would take a month to consider her suggestion with care, after which I would make a decision.

During those days of reflection I made a discovery, perhaps known to others but new to me: I need not put myself center stage but can rather place myself at the side, like a Greek chorus. As the curtain rises, I can walk to the center and speak as follows: I wish to tell you of happenings in the twentieth century, as I witnessed them and reflected upon them. You will see me return to center stage, but only occasionally. Once that imagery had gotten hold of me, I went back to Ida and said yes, I shall try.

What, in my lifetime, has happened in the world? Over 80 international conflicts, including 2 world wars, more than 120 new nations formed, 1

Great Depression, 1 U.S. president assassinated, 1 resigned, 1 black woman elected U.S. senator, 2 women appointed to the U.S. Supreme Court, 1 polio and 1 AIDS epidemic, 1 royal abdication, 7 men (or were there 8?) who married Elizabeth Taylor, over 300,000 new words added to the *Oxford English Dictionary* (including two created by me), a civil rights movement, a women's movement, billions of hamburgers sold at McDonald's, the beginning of space exploration, the invention of the microchip, the discoveries of DNA and of quantum mechanics—to give but a pretty random sample.

The curtain is still down as I walk to the center of the proscenium and say this. For most of my life I have been a professional theoretical physicist and have actively participated in revolutionary developments in this field, notably discoveries of new, unforeseen forms of matter. It is inevitable that I shall have to speak of those events, and I shall do so. I am aware, however, that what scientists do is a mystery to many of those I hope to reach with this book. Fear not, kind reader, I shall not scare you off with steganography. Moreover, in the text I have marked with an asterisk all sections that deal with specific scientific subjects in layman's terms. If these are still too hard to swallow, just skip them and read on. (It would please me, however, if you would be willing to give these starred entries a try.) I will also try to bring science to life for you in other ways than telling of its contents, to wit, by recalling some of its most prominent practitioners I have had the good fortune to have known, men like Albert Einstein, Niels Bohr, Robert Oppenheimer, Andrei Sakharov.

A word about the title of this book. "Two continents," as I use it, has multiple meanings. First, I am at home and have homes both in Europe, where I was born and raised, and in America, where I made my career. But I have also lived most of my life within the continent of science which, alas, is at some remove from the continent of daily life. You may well have read biographies of scientists who found their destinies revealed to them as young children. I am not one of those. My own revelation came only after some time of university studies, when I attended a lecture in which I first heard how the results of certain experiments could be coded in terms of a curve, and how then a certain theory produced the same curve. Right then and there, this confluence between the continent of the outside world and the continent of the mind made me decide that this was to be my career. Only in my late twenties did I first encounter the great men I mentioned above. Only in my early thirties did I find my own niche—as a pioneer in

the branch of physics dealing with newly observed submicroscopic particles. These facets of my development are woven into the story that follows.

In thought I have started this story many times—lying awake at night, or on walks in the woods. Twice I even began to write something down. The first time was on June 22, 1958, the day after my son, Joshua, was born in Princeton, the first American-born in the line. He and his mother, Lila, were still in the hospital. The house on 94 Battle Road was silent as I sat on the porch, contemplating the life that had just begun. It was then that the urge came, overwhelmingly, to “talk” to Josh about those strange events of my past, to make him the partner of a heritage. And yes, I did write some pages but I don’t know what happened to them.

Then Joshua came home and there was so much to be done, and all was new, and why bother with the old and the dead, when new life came streaming into our home—why bother.

In the late 1960s I tried again—I am not sure why. Was I depressed because I was nearing fifty, and did I feel that it was a way to reconcile myself with my natural decline? I don’t quite know but do recall an event that was perhaps decisive.

Shortly before, I had told some of my earlier experiences to a dear friend. She listened quietly, and I felt she had understood something. The next evening she took me to a poetry reading by Anne Sexton. As we sat down, she turned to me and said: “I think you ought to write of what you have seen.” That quiet statement in a festive atmosphere stirred me. Shortly afterward, I sat down and wrote a few pages—also lost.

Another thirty years have gone by. It is now or never.

Autobiographical elements are present in books I have written before, in my Einstein¹ as well as in my Bohr biography,² and also in *Inward Bound*, a history of the structure of matter and the nature of physical forces as these developed in the twentieth century.³ I believe that it makes for better and more lively reading if authors purposely inject themselves into books of that kind, as long as they remain out of the spotlight. (Deliberately or not, every author is of course present in every book he or she writes—even in a scientific text.) These personal details were only very fragmentary, however. There was no natural reason for including many other events from my past, some pleasant, some (to put it mildly) unpleasant. These happenings are recounted in this book, written not because this author thinks he is all

that important but rather because they may yet serve as another small contribution toward illuminating our turbulent century.

As I am about to begin, a maxim of La Rochefoucauld comes to my mind: Old people like to give good counsel because they are no longer capable of setting a bad example.

Now the curtain rises.

BOOK THE FIRST: EUROPE

I, ABRAHAM (friends call me Bram), am the son of Jesaja,¹ son of Abraham, who was a diamond cutter, son of Jesayas, also a diamond cutter, son of Benjamin Pays—who was married twice and had eleven children from his first and seven from his second marriage—son of Nathan Pais, son of Benjamin Paes, son of Nathan Paes.² All of these ancestors, as well as I myself, were born in Amsterdam.

The reason I can trace my paternal ancestry that far back is that all of these Paises belonged to the Portuguese-Israelitic, also called the Sephardic, congregation Talmud Torah of Amsterdam and were registered in its record books, which have been preserved.

I have not been able to follow my lineage to still earlier times. It is certain, however, that my ancestors came to Amsterdam from the Iberian peninsula at some time after the 1590s, when the first Sephardic Jews reached the Low Lands (now the Netherlands and Belgium) via the Friesian town of Emden, most probably from Portugal. (The early spelling “Paes” perhaps indicates earlier Spanish origins.) Many Sephardim fled from Spain to Portugal after the Inquisition began. To this day the telephone book of Lisbon shows a long list of Paises, a name which in Portugal dates back to medieval times. In 1160, a Gualdim Pais established the Templar Order of Christ near where, in 1345, the town of Tomar was founded—by a Dom Pais, according to an inscription on his statue in the town’s main square. I do not think that these gentlemen are ancestors of mine, however.

The arrival of Sephardim in the northern Netherlands marked the founding of the oldest emancipated post-Renaissance Jewish community in the Western world. Later it would sometimes be called the Jerusalem of the North.

In 1519, the humanist and scholar Erasmus of Rotterdam wrote in a letter: “If it is Christian to hate the Jews, then we are all of us outstanding Chris-

tians.”³ Nothing unusual about that. There were only a few Jews to hate in his environs, however. Before 1500, one finds only scarce and scattered references to the presence (and persecution) of Jews in the area now known as the Netherlands. Of the few Jews who lived there, most disappeared after 1544, when Emperor Charles V, king of Spain, who also ruled over the Netherlands, issued a decree ordering their expulsion from the region. By that time they had already suffered a similar fate in Spain.

The Spanish Inquisition, initiated in 1478, “had been originally devised for Jews and Moors, whom the Christianity of the time did not regard as human beings.”⁴ It brought to an irrevocable end the golden age—the thirteenth and fourteenth centuries—for Jews and Arabs living in Spain; many Spanish Jews converted to Catholicism in order to escape horrible brutality. These neo-Christians were known as Marranos, which is Spanish for swine. Most remained secretly faithful to Judaism, however; thousands were caught and lost their lives at the stake. Those who continued openly to profess Judaism were expelled from Spain by the royal edict of March 31, 1492, four months before Columbus set sail on his first voyage of discovery of the New World. Many fled to Portugal where, shortly afterward, they were again forced to renounce their faith. In 1536, the rule of Inquisition was also introduced in Portugal, causing some to flee, others once again to become Marranos.

Meanwhile, the Inquisition had extended its activities to the persecution of Christian heretics. Recall that the sixteenth century was the age of the great religious and political revolution known as the Reformation, spearheaded by men such as Martin Luther and Johannes Calvin. The new Protestantism found a large following in the Netherlands; the Inquisition reacted there accordingly, ably sustained by Philip II, son and heir of Charles V, with its customary cruel tortures and executions.⁵ These events caused the peoples of the Low Lands to rise up in arms, led by William (the “Silent”), count of Nassau, prince of Orange. In 1568, the eighty-year war with Spain began. Up till then the Low Lands had been an agglomerate of regions ruled by counts, barons, and other nobles. Now it became one nation, “the Netherlands,” which initially comprised both Holland and Belgium. William, known to the Dutch as “the Father of the Fatherland,” wrote that he was prepared to stake “his person and all that is in his power to commence and maintain the liberty of religion and of the fatherland.”⁶

In this favorable climate the first Sephardim settled in Amsterdam, from where the Spaniards had meanwhile been expelled. By 1612 about 500 were already living there.⁷ In 1618 they inaugurated their enlarged synagogue on

the Houtgracht.⁸ It was there that in 1642 Rabbi Manasseh ben Israel welcomed William's son, Prince Frederick Henry, who was accompanied by the queen of England;⁹ also here, on July 27, 1656, the infamous ban on the Sephardi Baruch Spinoza was pronounced. Rabbi ben Israel played an active role in the readmission of Jews to England—from where they had been expelled since 1290—when in 1655 he visited London at Cromwell's invitation.¹⁰ Sephardim were also the first Jewish settlers in New York (in 1654).

The Portuguese synagogue of Amsterdam, inaugurated in 1675, unharmed by war and occupation, stands today as one of the world's most renowned synagogue buildings. Its services are still held in a Hebrew that, apart from small variants, is identical to the Iwriṯh now spoken in Israel. As I remember from my youth, however, announcements to the congregation were made in Portuguese; for example, "Mincha a una hora e mea" (the afternoon prayers will start at one thirty). I also remember the melody and text of the Sabbath prayer for the House of Orange, also in Portuguese: "A Sua Majestade, a Rainha dos Paizes-Baixos, e Seu Real Consorte," etc. (To her majesty the Queen of the Netherlands and her royal consort). On high holidays, the Sephardim would greet each other not with a hearty "Gut Jomtov" but rather with a formal "Boas Festas." When in 1887 the male synagogue choir was formed, it was given a Portuguese name: Santo Serviço. A photograph¹¹ shows my father as second conductor; later he became first conductor.

In the Holland of my youth, half the Dutch Jewish males were engaged in petty trades. Sixty percent of those employed in the diamond industry, and twenty percent of all art and antique dealers, were Jews.¹² Jews belonged in modest numbers to the middle class (from which I hail) but mostly to a large proletariat, all of them led by a handful of well-to-do men.

As to our language at home, my parents, grandparents, and their friends spoke only Dutch, never Yiddish or Ladino, its Sephardic equivalent. (Until about the middle of the nineteenth century, Portuguese had been the Amsterdam Sephardim's everyday language.) I grew up in a religious but strongly assimilated milieu.

My mother was Ashkenazi. Her maiden name was Kaatje van Kleeff. She was called Cato, more often just To. All I know of her ancestry is that her father, Levi, was a diamond cutter. She met Isaiah, my father, when both were studying to become elementary-school teachers. I have never heard anyone call him Isaiah, however; he was always Jacques, and so he signed his letters. Mother taught school until she married my father, on December 2, 1916.

My father was also an elementary schoolmaster, and later headmaster. In addition, he was headmaster of the Sephardic Hebrew school—all this until the Second World War. After the war he became the secretary of the Sephardic congregation of Amsterdam, the executive officer in all secular matters. He was a much respected and greatly beloved man in that community, always ready to listen to and counsel people who would flock to him with their worldly problems. He was formally named a rabbi posthumously. At his funeral we carried his coffin to the Portuguese synagogue and set it down in front of its main doors. (No dead body is ever allowed inside an orthodox synagogue.) Then the doors were opened. Candles had been lit inside. Next, the chief rabbi proclaimed my father a rabbi. Thereafter we brought his body to the serenely beautiful Sephardic cemetery, founded in 1614, in Ouderkerk aan den Amstel, a village just outside Amsterdam. There both he and my mother now rest in peace.

Early Years

I WAS BORN in my parental home in Amsterdam, Pretoriusstraat 24, then a pleasant tree-lined, cobblestoned street. That was on May 19, 1918, in the closing months of World War I, during which Holland had managed to remain neutral.

According to my mother, the first comment she heard about me came from Dr. Trompetter, just after he had delivered me: "Look at those big eyes!" The earliest photograph of me that I own shows me lying on a scale, staring at the world with intense curiosity, one of the few commendable qualities I never lost. My mother has told me that I was "clean" (no more diapers) within six months, a source of pride to her. Like so many Dutch women, she had a compulsion for cleanliness.

On November 1, 1920, Annie, my sister and only sibling, was born. Much later my mother spoke to me about that event. She and my father were still in bed that morning when she told him to get up and fetch the doctor: her time had come. My little bed stood in my parents' bedroom. Soon after my father had left the room in haste, my mother's water broke. I stood up in bed and watched in amazement, yelling at her: "You pig!" I myself have no recollection whatever of that day's events. This is perhaps curious, since I do remember what happened right thereafter.

I had been brought to my mother's parents' home to stay for the next few days. One evening, my grandmother put a plate of food in front of me, but I refused to eat. When in her grandmotherly fashion she urged me to take the food, I became enraged and threw the full plate onto the floor. I can still see the mess of broken shards and scattered food. As a young child I would occasionally throw such tantrums, as the time I threw a wooden ball from a bowling set at a boy with whom I was playing. Fortunately he ducked; unfortunately the ball went through a big window. I would get quite pale

during such outbursts—they came to an end when I was about seven—and had to sit down afterward to rest. It strikes me that these earliest memories are rather angry ones.

At age four I started kindergarten or, as Amsterdam schoolboys called it, *kakschooltje* (little shit school). The only memorable event of those two pleasant years was that I made my first lifelong friendship, with Max Dresden, born on the same street as I, and only one month older. We became inseparable, going later to the same elementary school and high school. At about age nine we moved to another apartment, on the Linnaeusparkweg, also in Amsterdam. At about the same time, Max and his family moved to that street as well. One early recollection: like all the boys around me, I had an intense interest in dirty language. One day Max triumphantly marched up to me and declared: “I know what fucking means.” It took some time to get this important information out of him.

Max and I also started our university studies together, in physics, in Amsterdam. In those years we became part of the first generation of hitchhikers, traveling through Belgium, France, and Switzerland, often sleeping in haystacks on farms—which is comfortable but do not ask how we smelled. Such trips helped solidify our high school knowledge of foreign languages. When you drive with a trucker through France you speak French or else. When you are picked up by an Englishman in a classy automobile—as happened to us in the Rhône Valley in Switzerland—you speak English. One summer day we were near the Vosges in northeastern France, sitting at a roadside, having our gourmet lunch of bread and cheese when suddenly, out of nowhere it seemed, a French soldier stood before us and asked what we were doing there. Our reply appeared to be acceptable to him. He walked off and suddenly vanished again. Only later did we understand that we were having lunch in the middle of the Maginot Line, built before the war to protect the eastern border of France.

After a few years at the university, Max and I parted our ways when, mainly because of the threat of a European war, he left for America. In later years we have seen each other off and on, to our pleasure—most recently as emeritus professors.

Back to the earlier years. At age six I entered elementary school. I had not learned to read earlier but quickly picked it up. Within a few months I was reading books. According to my mother, after having finished my first book I said to her: “I never knew that reading was so wonderful.” Soon I had to be rationed to one book per day. When I was smaller, I had played with my

few toys, blocks, a Meccano set. But now I just read. First, the traditional Dutch children's books, which include neither *Hans Brinker and the Silver Skates* nor the story of the boy with his finger in the dike—these tales are unknown in Holland. Then I took interest in books about American Indians written by the German author Karl May—who had never set foot in America—and the great characters such as Winnetou, chief of the Apaches, Old Firehand, and Old Shatterhand. I read everything by Jules Verne and by Paul d'Ivoi, and then I discovered detective stories, including those by the Dutchman Ivans and by Edgar Wallace (the latter in translation, of course). On occasion I would pick up adult novels being read by my parents, with particular interest in the erotic passages. My mother once found me absorbed in one such book and took me aside, explaining that what was written there was not what went on in the real world. I reassured her with barely hidden smugness that, yes, I understood that. Once I got hold of a copy in Dutch of Krafft-Ebing's *Psychopathia Sexualis*, and became furious when I saw that all the juicy parts were in Latin.

At school I became a smart, rather arrogant kid, always learning fast, especially arithmetic. I was always number one in my class, through high school, doing poorly only in physical education.

In my young days Holland was a stable, bourgeois, and very rich country with little upward mobility. It was then the world's third largest colonial empire, still possessing the Netherlands East Indies (now Indonesia) and the West Indies, Suriname, and Curaçao. My parents could always make ends meet, but well-to-do they were not. We lived in a modest-sized apartment heated with coal stoves. As was quite common, we had no hot water, nor did we have a telephone.

In those years we always had a live-in maid. Most often these young women were German, eager to escape from the economic ruin in their homeland following the First World War, working in Holland at modest salary but with plentiful good food. The maid and my mother kept busy all day long. Every day the bed linens were hung out of a back window. Every day the apartment was dusted and cleaned. Silverware was polished. There was constant washing of clothes and dishes. Once a week the street in front of the house was scrubbed. My mother did the cooking herself.

My parents never owned a car; in my young days that was a prerogative of the rich only. A radio came later. I remember being invited to the home of friends—I must have been less than ten years old—and hearing my first broadcast crackling from a crystal set. Like most middle class homes, ours had no bath. My mother bathed us children in a zinc tub in the kitchen,

while she and my father went to a nearby “bath house,” a tidy place that provided shower rooms. Only after the Second World War did my parents have a shower in the home; also a telephone. They were past forty when they went abroad for the first time, to Paris. (Note that the distance from Amsterdam to the Dutch border is about the same as from New York to Philadelphia.) It was a big to-do; aunts and uncles, Annie and I came to the railway station to wish them *bon voyage*.

The years of my youth were harmonious and without a care. Home life was tightly knit. My father was a truly religious Jew. My mother later told me that she did not share those sentiments, but that nevertheless she always participated. The rules of eating kosher were strictly observed, which meant that we had four sets of dishes, plates, and cups: two for the regular year, one for meals with meat, one for dairy foods, and another two just for the week of Passover, when the regular plates were stored in the attic and the special ones, never touched by anything that contained yeast, were brought down. Friday evenings were special—finer foods, and the table set with the best linens.

Once a year, during Christmas vacation, my parents took Annie and me to the movies, a tremendous treat for us. We saw Charlie Chaplin, or Laurel and Hardy, or Pat and Patachon, the Danish comedians. Saturdays, my father’s one day off, activities were limited by religious constraints. Sundays, while Father taught Hebrew school—he was a hard-working man—Mother took us for a walk, sometimes to Artis, the Amsterdam zoo. My main recollection about weekends is that they were endless and that nothing happened. My parents never took us to any of Amsterdam’s renowned museums, or to a theater or concert. In the summer they rented for four weeks a house in one of Holland’s beach resorts. To defray expenses we always had one or two paying guests along, boys or girls from better-to-do families.

I was a pudgy little boy, most often the shortest one in my class. The pudginess began to change when at about age ten I started to swim (though I always remained a shorty). That became my favorite sport. Some years later I joined Het Y, a prestigious Amsterdam swimming club. It was at a time when Holland produced the best women swimmers—world record holders such as Iet van Feggelen and Willy den Oude, both of whom I got to know personally. Every afternoon after school I swam for two hours. I became a decent water polo player. The proudest time of my young life was a match of Y II, when I played center forward and scored two goals against HPC (the Hague Polo Club) in a play-off game for the championship second division of Holland. In 1946, while I was in Copenhagen, I received a call

from the trainer of the Dutch national team which was about to play Denmark. One of the players had become sick on the plane, I was told, and I was asked to stand by as reserve. Regretfully, that player recovered in time.

Now about my relatives. My father had two sisters and three brothers, and my mother two sisters and one brother, most of them married with children. Relations were comfortable all around, but there was none of that running in and out sometimes found in families. Ours was a quiet home. The only standard visits were those of my grandparents on the Sabbath afternoon. Saturday evening was bridge night, rotating between my parents' and other couples' homes. My father played very well.

The ties to my sister were a fairly common blend of sibling rivalry and great fondness. We did not have much in common. While I spent most of my out-of-school hours with my nose in a book, and with swimming, she, a pretty girl, would charm others. She did all right in school, but tended to be lazy. I was my parents' pride, the smart kid on the block. They doted all too much on me.

My mother was the stronger and more disciplining of the two. My father worshipped her, and she was devoted to him. I remember that my father was really furious with her only once—when she bobbed her beautiful long dark hair which had been held up in a bun. When my father came home and saw what she had done, he did not speak to her for several days.

My mother tended toward emotional restraint. Once I came home and told her that my friend so-and-so had done this, my friend had said that. She told me not to call him friend but comrade since I did know him that well—advice of questionable value. I also remonstrated strenuously against her attempts to teach me French.

My early relations with my father were much colored by his religiosity. From age four on he took me along to the synagogue every Saturday morning. I did not know any Hebrew yet and found the whole thing confusing and unpleasant. Because I went to a public elementary school which was open Saturday mornings, I had to miss those hours, which angered me. As my father and I walked to the synagogue, my classmates passed on their bikes, which I was forbidden to ride on the Sabbath. I hated to be different. My father taught me Hebrew (he had written a Hebrew school primer), and I learned to read it, but with little understanding of meaning. Nevertheless I became religious for about a year (I was about eight or nine), saying prayers at home every morning. Then I abruptly lost all religion.

I remember how that came about. It was on a Saturday afternoon. My

parents were in the living room; the maid had the day off. Suddenly the thought came: What would happen if I lit a match—strictly forbidden on the Sabbath? I went to the kitchen, struck a match, blew out the tiny flame, and ran like hell. No ghastly repercussions. That was the end of that. I still feel it was a privilege to have gone through my liberation as a personal act.

When, many years later, I told this story to my late friend, the physicist Isidor Rabi, he told me of his similar experience. As a boy he too had regularly gone to the synagogue. On the Sabbath morning there comes a moment during the service when the Kohanim (the priests, all those named Cohen or Kohn) congregate in one area, cover their heads and faces with the prayer shawl, and then recite a benediction. The purpose of the covering is that during these moments they should be protected from the strength of God's light shining on them. In turn, the members of the congregation look downward so as to be protected from the strength of God's light transmitted by the Kohanim. One Saturday morning Rabi asked himself: What would happen if I look at the Kohanim but only with one eye? He did. Nothing happened. That, for him, was the end of that.

In spite of having abandoned—for good—religion, I continued to go to the synagogue with my father until well into my high school years. In the home I abided by the rules of orthodoxy. At age thirteen I went through the rituals of the *bar mitsvah*, the formal initiation to manhood, which included the recitation on a Sabbath morning of the weekly *haftarah* (which means “finish” and is taken from the Prophets) before the assembled congregation. In later years I had nothing more to do with Jewish orthodoxy. In fact, whenever I see it practiced I have only one reaction: I find it stifling. Just look at what its inflexibility is doing to Israel these days. Yet wherever I am, be it in Holland, or the United States, or Denmark—my three main centers of residence—I always feel first and foremost a Jew. It is a tribal feeling that mostly lies quietly right below the surface, but it has never restricted my choice of relationships or environment.

I was about ten years old when I experienced a crucial revelation: that my parents are good people, but that they cannot help me find my own way in life. I was on my own now and must seek for myself who I should be and what I should do. And this I did.

At age twelve I finished elementary school, passed the examination for admission to high school, and entered an HBS, a higher burgher school (how Dutch an appellation; such a school is now called Atheneum), on the Mauritskade in Amsterdam. That school—one of several types of high school—had a five-year curriculum with an emphasis on basic subjects.

I think back to those high school years with immense gratitude. This is what I was exposed to: algebra, including trigonometry, geometry, plane and solid, biology, Dutch, French, German, history, and geography, five years each. Four years of English. Physics and chemistry, three years each. Two years of mechanics, including one year of calculus. No electives—you were just told what to do.

My classmates and I worked hard, but there remained time for play. I swam every weekday. I also gave tutoring lessons to younger children, thereby earning much-needed pocket money; part of it was set aside for summer travel, the rest went for the usual diversions. I also had girlfriends in those years, but that was oh so innocent. . . .

When at age seventeen I passed the final examinations (as number one in my class—it might perhaps have been better for my soul if I had not always been number one, but what can you do), I could express myself, reasonably though not fluently, in three foreign languages: English, French, and German.

A main event of that period was my first exposure to good music at age fifteen, when we still had no radio in the home. Until then my only acquaintance with music had come from some years of violin lessons. Neither my abilities, nor my teacher, nor my instrument was of the best quality, and after many arguments with my parents I gave it up. My greatest regret about my childhood is that I never learned to play any instrument passably.

Then came the “youth concerts,” a few concerts a year offered to all high school students in advanced grades in Amsterdam. One evening I entered for the first time the Concertgebouw, Amsterdam’s famous concert hall, filled with youngsters on that occasion. The orchestra was tuning up. Then Willem Mengelberg, the conductor, entered. The first number on the program was the overture to “Oberon” by Carl Maria von Weber.

They began to play.

I began to cry.

I had never heard anything so beautiful. A new world of experience had opened for me.

To conclude the recollections of my early youth, I want to say a word about the Dutch language. On visits to Holland, which have become less frequent as time has gone by, I feel very deeply that Dutch is the language closest to my heart, even though by now I am much more comfortable expressing myself, verbally and in writing, in English. What then causes these feelings about Dutch? I think it is because I can understand so well and still partici-

pate in Dutch small-talk. It is so cozy, so full of redundancy, a type of talking that does not excel at succinctness but gives a particular color to communication. When I discussed this point once with the eminent American author Garrison Keillor, he remarked that the only place in the world where he could always join in the small-talk was in his native Minnesota, and that, for that reason, Minnesota would forever be his home. That is just how I feel about Holland. People like myself, who truly feel at home in several countries, are not strictly at home anywhere. Yet the native country remains special.

Bachelor's Degrees in Amsterdam

ANYONE who had successfully passed the final examinations at a high school of the kind I attended was automatically entitled to enter the Dutch university of his or her choice. One neither applied for admission nor went for interviews, as in the United States. All I had to do, and did, was go to the municipal comptroller's office of the city of Amsterdam, armed with my high school diploma, three passport pictures, and four hundred guilders (the fee for one year's admission), present all that to a man behind a little window, and presto, I was a registered student at the University of Amsterdam. Founded in 1877, it was then still a municipal institution, but became part of the national university system in 1971. The price of admission was quite a sum for my parents. I continued to live in the family home, so there were no additional expenses for bed and board.

When in the fall of 1935 I started my university studies, I was not very clear about my professional goals. In my boyhood years I had read a two-volume, richly illustrated book on the Netherlands Indies (now Indonesia) written by Hendrik Colijn, a member of the "Antirevolutionaries," one of the quaint small Calvinist political parties of the time, who later became prime minister. That book's vivid descriptions made such an impression on me that for years I entertained the hazy idea of becoming an explorer. (I can still recite the names of Java's volcanoes hammered in at high school: Salak, Gedeh, Tangkoeban Prahoe, Papandajan, Merapi. . . .) I had also played with a simple boys' chemistry set, and, while in high school, Max Dresden and I had tried to read an elementary Dutch book on relativity theory. We got stuck, however, on the meaning of symbols such as g_{11} and g_{12} . These, we thought, were misprints. Should powers of g not be written as superscripts, g^{11} , g^{12} ? Ah, those years of innocence, when tensors were still in our future. . . .

In high school I had a very good chemistry teacher. It was from him that I

received my first primitive introduction to atoms and molecules and simple instances of their intercombinations. We also performed elementary experiments. All of it was a lot of fun. Physics, on the other hand, was pretty dull, it seemed to me then. You learned of heat and electricity and optics and all that, but our teacher treated them as one separate subject after another, without even giving hints of the underlying principles that made those various topics into a coherent whole. But I did grow fond of mathematics.

All in all, I knew I wanted to become a student of the exact sciences, though I did not yet have a precise plan of action. Accordingly, I began by taking chemistry and physics as major subjects (knowledge of physics was important for chemistry, that much I knew), mathematics and astronomy as minors. In addition I began to follow on a voluntary basis a course on the fundamentals of philosophy for first-year students. That experience marked the beginning of my lasting distaste for philosophy; I dropped out after a few lectures.

A sizable part of the chemistry curriculum consisted of laboratory exercises, which I handled tolerably well, though not expertly. The first-year lab course was in inorganic chemistry, the second in organic chemistry. My contact with the organic part cured me once and for all of any desire to become a chemist. (I recall that this conviction arose in me in the course of having to synthesize allyl alcohol.) I found organic chemistry—as it was taught to me then—inordinately boring. You had to cram fact after fact into your head with little indication of the whys and wherefores. Early in my second year I made up my mind: chemistry was not for me. And I now began to concentrate on mathematics and physics.

In my second year I also began attending graduate courses. One of these was given by Roland Weitzenböck, a Prussian-born German army officer in the First World War and a rather curious duck. His lectures consisted of a recitation of pages from his textbook on the theory of invariants.¹ The most fascinating part of his book is the preface. Write in sequence the first letters of its first twenty-one sentences and you read: *Nieder mit den Franzosen*—down with the French. If you find this hard to believe, get a copy of the book from some good library and see for yourself.

My undergraduate physics education, solid as could be expected in Holland, included an obligatory laboratory course. My first exercise was to determine how much heat it takes to melt a given amount of ice. I knew the right answers from the books, but with the best will in the world I couldn't get closer than about 75 percent of the right value. With fear in my heart I

handed in my lab report with that result. My lab instructor later told me that my answer was quite satisfactory. It is not all that easy, he assured me, to come close to the correct value for such an elementary experiment with the rather primitive tools put at my disposal. He also said that for those who reported the correct value, he wrote a note behind their names: Watch out, this one has finagled the answer.

At this point I will briefly digress to reminisce about the Dutch chess craze of 1935–37.

In 1935, Max Euwe, an Amsterdamer with a Ph.D. in mathematics from the University of Amsterdam and a recognized chess master, challenged Alexander Alekhine, the reigning world chess champion. It became a grueling long battle lasting thirty games. The interest in Holland in this event was enormous, leading many people to take up chess for the first time. In one of the university's physics laboratories, students would sit in front of chessboards analyzing the moves of which they were informed by telephone. This went on until the professor forbade the presence of chessboards in the workplace. So the students bought thin portable boards that could be folded and put in one's pocket—and the games went on.

Euwe won nine games, lost eight, and drew thirteen. He was the champion. Great joy in the nation. In 1937 a rematch, requested by Alekhine, was played. This time Euwe lost.

I watched all this with interest but, unlike my friends, never sat down in front of a chessboard, for the following reason. Earlier, when I was about twelve years old, my friend Dresden and I had begun to play chess together. For some time we were about evenly matched, until something odd began to happen. Dresden started winning practically all our matches. This puzzled me, and after a while I asked him what he was doing to win all the time? He grinned and at first wouldn't say but then told me the secret. He had gotten hold of a book on chess openings and in that way knew how to obtain decisive advantages against ignorant me. I asked if I could borrow the book; he let me have it. I sat down all alone in front of a chessboard and went through many openings. I can still recall some of their exotic names, such as Nimzo-Indian, Tarrasch, Sicilian, Caro-Kann. Those hours of study impressed me greatly and led me to make up my mind: no more chess for me. I had begun to understand the nobility of the game and its demands on study and concentration. This was no kid stuff, it was a profession. Since I felt I could not give chess the devotion it deserved, I rather gave it up

altogether, and have never again played it. It has gone likewise for me with checkers and with bridge. The only game I have continued to enjoy is an infrequent hand of poker.

Returning now to my activities as a student. In the winter months of 1936–37 an event occurred that brought my study plans into focus. Some time during that period George Uhlenbeck came to Amsterdam to give two guest lectures. Since the spring of 1936 he had been the professor of theoretical physics in Utrecht. His talks dealt with beta-radioactivity, the spontaneous emission of an electron plus a neutrino by certain specific kinds of atomic nuclei. In 1934, Enrico Fermi had incorporated the neutrino, a massless particle, into a systematic theory of beta-radioactivity. Uhlenbeck was among the first to work out consequences of Fermi's quite recent theory. In his first talk he discussed the pertinent experimental facts. In the second, he reported his own analysis of those data. These two lectures were my first exposure to science as it is in progress at the frontier of knowledge.

In later years I came to know other physicists who were at least as distinguished as Uhlenbeck. I have never, however, met anyone who could lecture better on science than he. His calmness, his style—systematic without a trace of pedantry—compelled me not to miss a word he said. That was a fairly rare experience, since I have a propensity for following my own line of thought during lectures, at the cost of missing what I have come to hear. Not only the style but also the contents of those two talks captivated me entirely. I am sure I understood only a fraction of what I was exposed to (I do not remember whether I had even heard of a neutrino at that time) but, curiously, that did not seem to matter to me. As I sat there in the auditorium of Clay's laboratory, I had the intense experience that here and now it was revealed to me what I wanted to do, had to do. From that time on I have never wavered in that conviction.

On February 16, 1938, I obtained two bachelor's degrees, with majors in physics and mathematics, minors in chemistry and astronomy. In that academic year I continued to take graduate courses in Amsterdam, including those in physics given by Johannes Diderik van der Waals, Jr., the one and only professor of theoretical physics, the son of the great van der Waals who in 1910 had received a Nobel Prize for his equation describing the thermodynamic properties of gases and liquids. I found the lectures by his son dull and uninspiring. As I learned later, he was averse to the more modern aspects of physics such as the quantum theory. It soon became obvious to me that he was not the right man to guide me in further studies

of theoretical physics. So I went to see some graduate students to ask for guidance as to how to proceed next. They advised me to try and become a graduate student with Uhlenbeck in Utrecht. Accordingly I wrote to him, asking for an interview.

I shall come back in a later chapter to what happened as a result of that letter, but first I will turn to describing some of my extracurricular activities.

Of Music, Films, and Other Diversions

STUDENTS from Amsterdam University could buy concert tickets at a very considerable discount. I liberally availed myself of this opportunity, inspired by my first exposure to good music gained from the high school youth concerts. Many were the evenings on which I would take my bicycle and ride to the Concertgebouw in the van Baerlestraat, chain it to a lamp post, and enter. Biking was the main mode of transportation for the middle- and lower-class Dutch. It was joked in those days that at birth a Dutch baby would come out riding on a bike.

Never in later life have I been as frequent a concert goer as in the years 1935–40. I should like to relate some of my principal musical experiences of that time.

One day a friend asked me if I would like to have his ticket to a Segovia concert, as he himself could not go. “Who is Segovia?” I asked. “A classical guitarist,” he told me. I had never even heard of the existence of classical guitar music. Well, why not, I thought, and accepted his friendly offer.

So, once again, I wended my way to the Concertgebouw, which houses a large hall for main concerts and a small hall for more intimate recitals. I went to the small hall, expecting Segovia to play there, but it was closed. On to the large hall. As I entered I was astonished to see that it was packed. Most of the podium, normally reserved for the orchestra, was now filled with chairs, leaving open only a fairly small square area in which stood one chair. Before long, Segovia came down a set of steps, a handsome dark-haired man, wearing a flambar, holding his guitar. He sat down on that single chair, and almost at once began to play. His first number was a Busoni transcription of a Bach chaconne. As had happened to me once before, I started to cry. How could a single man make such heavenly music

which to me sounded as if it was created by a small ensemble? Even after Segovia's favorite final encore, the Dance no. 6 in E Minor by Granados, people seemed reluctant to leave the hall.

The very next day I went to a music store and bought myself an inexpensive guitar. For some time thereafter I took lessons but did not get very far. Yet my love for the guitar never waned. In later years I have bought better guitars, but they did not improve my playing by much. I did get familiar with a sufficient number of basic chords, however, and learned to accompany myself singing folk songs of many nations. It was not great music but nevertheless gave me pleasant hours.

Only one more time was I moved to tears because of music. That happened when for the first time I attended a recital by Pablo Casals and heard him play the third Bach suite for unaccompanied cello. When, much later, I spent an afternoon with him, I used that occasion to express my immense gratitude for that experience.

Other strong memories. The Amsterdam debut of a young violinist named Yehudi Menuhin playing duets with his sister Hepzibah at the piano. Sergei Rachmaninoff appearing with the Concertgebouw orchestra, a tall, slender, austere-looking man with salt-and-pepper hair cropped short, wearing a white tie and tails and a red sash to which a decoration was attached, probably czarist. I can still hear the soft "Aahh . . ." that went through the audience as he began his encore with his well-known prelude.

Year after year I attended recurrent performances of great choral works, Bach's *Passion According to St. Matthew* in the Concertgebouw, his *Passion According to St. John* in another hall, the *Vrije Gemeente* (both sung in German, of course). Around Eastertime it became the standard custom among my friends and me to address each other melodiously in *recitativo à la Bach* rather than in regular speech.

Also from that time stems my first acquaintance with another wonderful kind of music, American jazz, which I have loved ever since. That came mainly via radio, but I also recall having heard the saxophonist Coleman Hawkins play in a small Amsterdam dive.

In those years I also became a movie buff as well. It was a very rich period in the development of this young art form.

The United States brought us various new categories of light comedy: Chaplin with *City Lights* and *Modern Times*; the Marx Brothers introduced new heights of zaniness in *A Night at the Opera* and *A Day at the Races*. Of British contributions I remember Leslie Howard in *The Scarlet Pimpernel* and *Pygmalion*, Alfred Hitchcock's *The Thirty-Nine Steps* and *The Lady Van-*

ishes. In the beginning 1930s Germany had produced some outstanding movies as well, such as Fritz Lang's *M* with Peter Lorre as the psychopathic child killer, and *Der blaue Engel* with Marlene Dietrich and Emil Jannings. The greatest contribution of that period, if not ever, made by German film was in my opinion *Dreigroschenoper* (Threepenny Opera), a nonpropagandistic, cynical view of capitalist society's power play, and of love, set among thieves, and starring Lotte Lenya, who sang the pirates' song, and Ernst Busch rendering the ballad of Mackey Messer. This film carries the magic of high art.

To my taste, by far the finest movies of the period were French, superbly acted and directed. Among those masterpieces I remember Jean Renoir's *La Grande illusion*, with Eric von Stroheim and Jean Gabin; Harry Baur in *Crime et châtiment*; and the work of Marcel Pagnol, notably *La Femme du boulanger*, with Raimu, whom Orson Welles has called the greatest actor who ever lived.

It was an ongoing feast to see all those movies—many still steadily played in revival houses—as they first appeared.

For the first time during my Amsterdam student years I also began to visit museums, the Ryksmuseum (National Gallery) which houses the most complete collection of Dutch painters from the fifteenth to nineteenth centuries, and the Stedelyk (municipal) museum, where modern art was and still is on display. (Amsterdam's fine van Gogh museum dates from the postwar years.) Ever since that time I have been an avid contemplator of the visual arts, the world over. Only after having visited major museums abroad did I become aware of the important Dutch pioneering role in how to hang paintings so that they are provided with proper space and lighting.

Of my extracurricular reading in those years, the most important to me was my first exposure to the writings of Sigmund Freud, who was then still alive. I began with his introductory lectures on psychoanalysis, a fortunate start. I always read him in German, and have become convinced that it is sufficient ground for learning that language to read the man in the original; I greatly admire his literary style. As to contents, it was as if a new world opened for me. At the same time, I had the distinct sensation that I somehow already knew what was conveying—except for the fact that I had never consciously phrased it.

It was not long after I had begun these readings that, one day, a young man came into the room in which I was sitting, deeply absorbed in Freud. He had been visiting the family of my girlfriend and came to say good-bye. I did not care much for him but nevertheless intended to say something

friendly. Instead I found myself saying, "I am glad you are leaving." He could not have been more stunned than I was. In a flash it came to me: this is precisely one of those slips I had just been reading about. It was as if I confirmed experimentally what I had been confronted with.

Then I turned to Carl Jung who, in little time, began to enrage me. Whereas Freud wrote in scientific style, clearly stating his assumptions and his verifications thereof (never mind that not all of these have held up), Jung introduced mystical, unverifiable elements. What was all that nonsense about the collective unconscious? How do you *know*? From then on, I have continued to look upon Jung as a sort of charlatan.

First Contacts with Zionism

WHEN in 1935, at age seventeen, I entered the university, Hitler had been head of the German state for two-and-a-half years. Right after he had come to power, the Reichstag building in Berlin had burned down. Holland took special notice of that event since the fire was supposed to have been set by a Dutch communist. All political parties except that of the national socialists had been dissolved. The destruction of German cultural life, until then among the best of its kind, was in progress. The *Beamtengesetz* (civil service law) of April 1933 permitted university authorities to fire staff on grounds of politics and/or race. Another law enacted that same month restricted membership in student organizations to “Aryans” only. The next May the infamous book burning took place. Life for Jews in Germany had become extremely difficult if not impossible. Mass emigration, both legal and illegal, of German Jews had begun.

I followed reports of these events in Dutch newspapers but, like most Dutch people, felt that they took place far away, even though Amsterdam lies only one hundred miles west of the German border as the crow flies. I was of course concerned about the fate of the German Jews—without, however, sensing in any way that they were “some of us.” There was rather a contrary response among many Dutch Jews to the influx from the east, to wit, that these “aliens” might arouse anti-Semitic reactions among the Dutch, which might backfire on the Jews in Holland. In 1938 the Dutch government actually closed its borders to this kind of immigration, for reasons that were not just economic. In 1939 it founded a central refugee camp, residing under the Department of Justice, for Jews who had fled from Germany. The camp’s name (taken from a small nearby town in the north-eastern Netherlands) came to be hated and feared during the next five years: Westerbork.

I may note that anti-Semitism did exist in Holland, but only in a mild

form. The Dutch did have their own national socialist party, the NSB, founded on May 14, 1931, by a man named Mussert. It was never more than a small lunatic fringe affair laughed at and/or hated by nearly all the Dutch. During World War II some of its members volunteered for service in the German army. In any event, Dutch anti-Semitism, whatever its extent, never caused me any personal difficulties.

That was the situation in Holland regarding Jewish problematics when, as a first-year student, I came in contact with Zionism for the first time.

The Zionist world organization was born in 1897, at the first Zionist congress, held in Basel.¹ Two years later a Netherlands branch was founded, the NZB. The call for this action sets a significant tone: "Zionism as an indication for a new fatherland has no purpose for Dutch Jews. They are free people and belong to *their* country. We hope, however, that they will strongly support this effort which is undertaken in the interest of their unfree religious brethren."² In the 1930s the NZB had between three thousand and four thousand members—less than 3 percent of Dutch Jewry. There was considerable anti-Zionist sentiment among Jews with strong assimilationist and/or socialist convictions.

The NZB comprised an agglomerate of factions such as the Mizrachi,³ which maintained the traditional religious values, and the socialist-Zionist oriented Po'ale Zion (workers of Zion). My father was a dues-paying member of the Mizrachi but did not actively participate in any Zionist-oriented work. Like quite a number of NZB members, he expressed solidarity by membership only, and that was that. I have no recollection of discussions on Zionism in my parents' home.

In addition to the NZB there existed a Zionist student organization (NZSO) and the Jewish Youth Federation (JJF), which embodied Zionist youth clubs from various parts of Holland.

It was through the NZSO that I came in personal contact with the Zionist movement for the first time. In the fall of 1935 I was approached by one of its members who inquired if someone might come and talk to me. I said he was welcome to do so. Shortly afterward I had a visit from Jaap van Amerongen, a senior NZSO member. My friend Dresden, who had also been approached, joined us at my home. Jaap began by asking us if we had any interest in Zionism. I replied that I neither cared nor knew in any detail what the movement was really about. (Neither did Dresden.) Whereupon Jaap said that this was not uncommon, that he had not come to propose that we join the NZSO, but rather to invite us for a series of instructional discussions that would take place a few evenings a month throughout our

first year as students. After that time it was left to us to decide whether or not we wished to join. It all sounded very reasonable and potentially interesting, and we accepted.

Those discussion evenings marked the beginnings of a lasting change in my perceptions of Jewry. Up till that time my only contact with Judaism had been the stultifying exposure to orthodoxy. Now it began to dawn on me that to be a Jew, to experience Jewishness, did not necessarily mean to be religious. To be sure, religion had been the main force that had caused the Jewish identity to be maintained throughout the diaspora. Had the Jews not carried their constitution, the Torah, on their backs through centuries of wanderings and persecutions? That constitution, however, was the law of a tribe, and one could be—feel to be—a member of that tribe even if those ancient laws had faded, if not vanished, as a determinant of one's personal conduct.

These changes in attitude and sentiment, beginning roughly in the early nineteenth century, the age of enlightenment and emancipation, had a variety of consequences. There were those who opted for assimilation to their host country, sometimes combined with continued adherence to one or another liberalized modification of Jewish religious custom. I have always felt averse to the assorted versions of reform Judaism which, so the joke goes, replace the Ten Commandments with ten suggestions. As said before, strict religious positions are not mine, yet I have an abiding respect for the tough old Jewish religious stance.

Quite a different consequence of the change in attitude to what it means to be a Jew was the rise, late in the nineteenth century, of the Zionist movement. As is well known, the root idea of Zionism was, from the outset the establishment of a Jewish homeland in Palestine. It was conceived as a secular, politically oriented national movement, in contrast to earlier migrations by Jews who came to Palestine either to live according to religious precepts and to die there, nearest the place of the Last Judgment; or who went, often driven out by pogroms, to cultivate the land according to the agrarian traditions of the biblical Jews. Zionism introduced an entirely new ideal, that of a sovereign Jewish nation-state. The motivation was obvious. The wandering Jew could only become a settled Jew, no longer constantly threatened by persecution and expulsion, if he had a corner of the world to call his own. The Zionist idea never was to establish a grand refugee camp, but rather to find a place on earth where the Jew could finally unpack his belongings, including perhaps his Torah, and live not only in peace but also with dignity.

The father of political Zionism was Theodor Herzl, who concisely formulated the question of the Jew. At about the same time, Ahad Ha'am,⁴ a rabbinical scholar turned agnostic, began to raise a distinct issue, the question of Judaism or, as it is sometimes called, spiritual or humanistic Zionism. "He no longer believed . . . that God had created the Jews and set them apart; on the contrary, the Jewish people, in his view, had given authority to their unique moral values by inventing the God who commanded them."⁵ Ahad Ha'am has written: "Judaism was born in a corner and has always lived in a corner. . . . History has not yet satisfactorily explained how it came about that a tiny nation . . . produced a unique religious and ethical outlook . . . which has remained so foreign to the rest of the world, and which to this day has been unable to master it or to be mastered by it."⁶

Ahad Ha'am believed in the Palestine solution, but not as a homeland for all Jews. For this there was simply no space, he said. He was also among the very first to raise the issue of the local Arabs, warning against the ill-perceived slogan that Palestine was a land without people waiting for a people without a land. In his view, only a select elite should move to Palestine to establish a spiritual center influenced by both Jewish and European culture. "In the modern era of disbelief, he said, religion was no longer preserving the Jewish people. Jews needed to find some other source of communal energy. . . . Judaism [should] aspire to make the Jewish people to a spiritual elite on the way to perfecting all of mankind. . . . He defined for [the Jews] the fundamental human questions: the source of community, the meaning of faith in a disbelieving world, and the relationship of morality to power."⁷

Ahad Ha'am, a self-taught polyglot, published only in Hebrew. "In his hands, the language of Hebrew finally and irrevocably left the Middle Ages."⁸ He was a driving force in making the revival of the Hebrew language a central aim—attained since—of Zionism. His impact on Israel's culture has been profound. Yet he remains virtually unknown in the West.

There clearly exists a range of options between the extremes of purely political populist and purely spiritual elitist Zionism, a subject of much debate when I first became exposed to these issues. In the NZSO discussion evenings, I learned of Herzl's and Ahad Ha'am's views and of points in between. I became aware of a major issue that had hardly been discussed in Holland before the 1930s but that now, in view of the political developments in Europe, became topical: Can one reconcile being a Zionist with loyal Dutch citizenship? I attended a few NZB meetings which made clear to me a divergence between the generations: the older Zionists had not yet

moved away substantially from the position, quoted before, that their movement was essentially in support “of their unfree religious brethren.”

The position of the NZSO and the JJF had turned more radical, however. They never denied the obligation of loyalty to Holland but stressed that their traditions, culture, and future were not the same as those of the other Dutch. As one of them wrote: “We can appreciate the national holidays of the others but they are not ours.” Such opinions were not appreciated by the NZB. In 1939 they would call a young Zionist on the mat for having written that the flags of the *galuth* (diaspora) are not our flags.⁹

I also became aware for the first time of the *chalutz* (pioneer) movement, which aimed at preparing Jews for settling in Palestine by means of *hachsharah*, or schooling in the Jewish background, including the study of Hebrew, as well as menial labor. In Holland this organization had begun in the 1920s, mainly in support of the young *Ostjuden*, Jews from the East, who had fled pogroms. In the thirties, increasing numbers of Dutch Jews joined, often working for some years on Dutch farms in order to acquaint themselves with agricultural methods. By 1936 about 1,200 Jews from Holland (roughly one percent) had emigrated to Palestine.¹⁰

I attended a few meetings of Zionist youth clubs in Amsterdam, encountering there for the first time young Jews who had been directly exposed to the Nazis; for some reason, the 1930s were the JJF’s most flourishing time.

The result of all these experiences in my first student year was the realization that my earlier contacts with Judaism, those realized by going to the synagogue with my father, had little to do with the life of the modern Jew. I liked the new exposure—to Sephardim, Ashkenazim, to Dutch Jews and *Ostjuden* alike. They taught me ideas and songs, and conveyed a lively spirit. So after my trial year, I joined the NZSO.

By then I had already begun to acquire a circle of Zionist student friends. On evenings we would meet frequently in the basement of the spacious house where Jaap van Amerongen lived (his father was a wealthy diamond trader), a place which we called “The Catacombs.” There I met for the first time Lion Nordheim. A deep friendship with him developed, which later would cause the most tragic moments of my life, as I shall relate further on.

Lion was born in 1910, in Arnhem, the son of a well-to-do antique dealer. In his high school years he joined the local Zionist youth club. When he moved to Utrecht to study law he joined the NZSO. A bright, eloquent, and learned man who read widely, especially on Zionism and philosophy, he became president of the JJF in 1934.

After leaving the catacombs, Lion and I would often walk home together,

I accompanying him to his apartment, he then following me to mine, often several times back and forth. I learned much from our discussions and could well appreciate why Lion was widely respected as the leading ideologue of the more radical type of Zionism.

A small circle of catacomb members would meet regularly in the home of Sieg Gitter for joint reading and discussions. We took on Spinoza's *Ethics*. Those were wonderful get-togethers, though I do not remember a word of what Spinoza wrote. I also took Hebrew lessons again, with Leah Neubauer, Sieg's fiancée and later his wife. I did get a bit further than I had been under my father's earlier tutelage, but regrettably never came to master the language. Sieg and Leah have remained good friends of mine throughout the years. They now live in Ramat Gan, Israel. Sieg is professor of medicine at Tel Aviv University. In the spring of 1990 Ida, my wife, and I had the pleasure of taking them out to dinner in a little restaurant right below Suleiman the Magnificent's wall surrounding the Old City of Jerusalem.

In those prewar years I became active in the youth movement. For some years I was a member of the board of the JFF, which involved visiting youth clubs in various parts of the country and giving speeches. I have two special memories of that time.

One was a visit from Zalman Rubashov, a *shaliach*, or emissary, sent from Palestine. His purpose was to mediate the tensions between the JFF and the NZB regarding radical Zionism. Much later he became the third president of Israel (1963–1973). By then he had changed his surname to Shazar. He was the first of five presidents of Israel I have met in my lifetime.

The other was a visit from Menachem Ussischkin, a venerated leader of the Zionist organization who had emigrated to Palestine already in the 1880s. He was the senior fund-raiser of the world organization. In 1921 he had accompanied Chaim Weizmann and Albert Einstein on their joint trip to the United States, aimed at soliciting financial support for the movement as well as for the Hebrew University. The JFF board had organized a luncheon with Ussischkin, during which our president gave a feisty speech in which he said we must raise funds for this, we must raise funds for that. After he sat down, Ussischkin turned to him and said only this: "Sie wollen mich überzeugen?" (You want to convince me?)

At one point, *Hanoar Ha'owed* (The Workers' Youth), the youth branch of the socialist Zionists in Amsterdam, was in need of a new chairman. I was asked to take on that task. Like so many youths of that era, I had socialist leanings but had never been then, nor was I later, a devoted Marxist. I had tried to read *Das Kapital* but soon had given up—it was simply too dull for

me. In any event, I felt I had to and did take on the chairman's job. This meant that, for a few years, I had to chair a meeting every Saturday night from September to June, arrange for a speaker, lead in singing the wonderful songs of the movement (I even remember a Yemenite song), join in dancing the *horrah*, and so on. It was time-consuming but on the whole a fine experience. Among my bitter memories of the war is the fact that most of those kids, my kids, were later taken to German "labor camps," never to return.

It was also through my Zionist connections that I met Tineke Buchter.

She is non-Jewish and was a girlfriend of Jaap van Amerongen's youngest sister, still at the end of her high school years when we first met, a beautiful young woman with great style. Already then she had strong emotional involvements with Jewish issues. I still remember an occasion on which she recited a medieval Dutch poem: "*t en zyn de Joden niet, Heer Jesu, die U kruisten . . . ik ben't*" (It was not the Jews, Lord Jesus, who crucified you . . . it is I). I fell in love with her and courted her. It was my first serious involvement with the opposite sex. It took time, but eventually we became attached, unofficially engaged one might say. After finishing high school she became a medical student. Already then her main interest was psychiatry; today she is a distinguished analyst. It was Tineke who introduced me to the writings of Freud. Once she took me to the university's anatomical laboratory to show me the cadaver which she was assigned to dissect. I had never seen anything like it. Thoughts of illness and death had always made me acutely uncomfortable but, surprising to me, I found the experience utterly fascinating.

When I told my parents about Tineke, my father became furious. He did not wish to see his son attached to a *shiksa* (a non-Jewish female) and absolutely refused to receive her in our home.

During the summer of 1940 Tineke and I were together in a Dutch beach resort. On a walk along the beach I saw my parents sitting on the sand. I turned to Tineke and told her I would now introduce her. So I did. My parents reacted politely; the ice was broken. Soon she was able to visit me at home. In the course of time no one came to adore Tineke more than my father. More about her later.

My Zionist experiences naturally raised the question for me: Should I consider moving to Palestine? I decided: no, principally because of my growing involvement with science. Let me now return to where I left off on that subject, the time when I had obtained my bachelor's degrees.

Utrecht: M.Sc. and Ph.D.

AS ALREADY mentioned at the end of chapter 3, I had written to Professor Uhlenbeck in Utrecht, asking if I could come for a visit to discuss my study plans. After some weeks of impatient waiting I received a letter inviting me to come over on a specific day. When the time had come, I took a train to Utrecht and walked from the station to Býlhouwerstraat, where the physics laboratory was then situated (it has since moved to other quarters). Uhlenbeck shared one room there with his assistant. I knocked at the door of room 220, went in, stumbled over the threshold (I must have been nervous), and, Charlie Chaplin-fashion, fell right down in the presence of the professor: a glorious beginning. I quickly composed myself, was invited to sit down, then told Uhlenbeck of my hopes to become a graduate student in theoretical physics under his guidance.

Uhlenbeck's response was unexpected. "If you like physics," he asked, "why don't you consider becoming an experimentalist? Or if you like the mathematical aspects of theoretical physics, why not become a mathematician?" In explanation he noted that the practical future for a theoretical physicist in the Netherlands was extremely limited. At that time there were only five professorates in the subject in the whole country. Accordingly, chances for a continued career were quite slim. Experimental physics as well as mathematics opened many more possibilities, for example in industry. Furthermore, he added, theoretical physics is very difficult, it would be a life of toil with many frustrations and disappointments.

I was quite taken aback and mumbled, "But I like theoretical physics so much." Uhlenbeck's reaction was again unexpected. "If that is really true," he said, "then by all means become a theorist; it is the most wonderful subject you can imagine." As he later told me, his preliminary attempts at dissuasion were exactly like those he himself had been exposed to when he

wanted to start his own graduate studies, adding that he used the same routine whenever anyone applied to study with him.

Having gone through these preliminaries, Uhlenbeck said next that he wanted to tell me about his current research. The subject was cosmic rays, radiations of photons and various other species of particles that come from outer space and are detectable on earth. In particular he was interested in a recent paper by the Russian physicists Landau and Rumer on so-called showers, processes in which radiations entering the upper atmosphere generate many additional particles when colliding with air molecules farther down. Uhlenbeck outlined the theoretical treatment on the blackboard, while I sat and listened, occasionally asking for more explanations or information which he patiently provided. Some mathematical tools (integro-differential equations—never mind if you don't know what these are) were new to me, so I had to keep my wits together, following not only the physical reasoning but also the mathematical analysis. I did not do all that badly, but after an hour became tired of the intense discussion. Uhlenbeck imperturbably went on, however. After another hour I was dazed but told myself to hang in there, boy, this is trial by fire. This went on still a bit longer, then the professor stopped, gave me the reference to the paper we had been discussing,¹ told me to study it and come back in two weeks. I sort of staggered out of the room, unable to concentrate on anything but getting back to the train station.

Years later I told Uhlenbeck how that first afternoon with him had affected me. He told me with a smile that he had gone through the very same treatment, had the very same reactions, when he had visited his revered teacher, Paul Ehrenfest, for the first time. Ehrenfest in turn had received the same treatment from the great Ludwig Boltzmann in Vienna. This tradition is part of teaching in the grand old style, concentrating on but very few students. In my time I was the only student Uhlenbeck had taken on. Because of that privilege I may count myself as a spiritual great-grandson of Boltzmann. Meanwhile the old style has gone forever, I think, because of the large number of students now clamoring for higher education.

All through the spring term of 1938 I paid regular visits to Uhlenbeck; I had dropped out of taking graduate courses in Amsterdam. After further discussions on cosmic rays, Uhlenbeck said he would soon put me on a problem in that field. But first I had to study the textbook on quantum mechanics by Hendrik Antony Kramers, a professor in Leiden and Holland's most prominent theoretician of the period. I did all right. During one of my visits to Uhlenbeck, the door to his office suddenly opened, no

knocking first, and a man stormed in without saying hello, planting himself squarely in front of the blackboard. After a few moments' study of what was written there, he turned to Uhlenbeck and finally spoke: "You need a *schleifenintegral*," a technical mathematical term. It was Kramers. I would meet him later many times, as we shall see.

It was springtime when Uhlenbeck told me that the following fall term he was taking a leave of absence to become a visiting professor at Columbia University in New York. That was of course a disappointment for me. He gave me a list of things to study and work on. That fall I enrolled in the University of Utrecht but continued to commute from Amsterdam. I was permitted to use Uhlenbeck's office, which I had all to myself (Boris Kahn, his assistant, was in Bristol for postdoctoral work).

During Uhlenbeck's absence, Hendrik Casimir, then reader at the University of Leiden, came to Utrecht twice a week to give a course on quantum physics. From him I got my first instruction in atomic structure and atomic spectra. These were lucid lectures from which I benefited much, as also from private discussions afterward. It was from Casimir that I for the first time heard stories by someone who had been in personal contact with Niels Bohr.² In addition I took courses in mathematics, which was to be my secondary subject for the master's degree.

I was also obliged to do one year's experimental work in the Utrecht laboratory. This brought me in contact with Leonard Salomon Ornstein, the professor of experimental physics, a scientist of distinction who had started his career as a theorist. He took to me and would almost daily visit me in Uhlenbeck's office for a chat. He was also prominent in the Zionist organization, so we had a lot to talk about.

My experimental work ended abruptly and prematurely when I caused a catastrophe. I was assigned as "slave" to a senior graduate student who was performing a series of experiments in beta-radioactivity for his doctoral thesis. He was supposed to educate me in the workings of his apparatus; I was to obey orders to assist in all kinds of ancillary matters. One of these was to keep a careful eye on a huge bank of batteries, several yards long, which were coupled in series so as to provide a very steady DC voltage. When my boss was absent I was to keep check on this affair. Since this only involved reading off some meters once in a while, I installed myself with a theoretical physics monograph to read in the meantime. I remember being deeply absorbed in *Leçons sur la théorie des spineurs* by Élie Cartan when suddenly a flame shot through the battery bank from one end to the other. My inattention had killed every battery in the setup. With fear in my heart I

immediately went to a higher-up to report what had happened. In no time Ornstein, a man known for his ferocious temper, appeared in my work space. He examined the damage, then furiously turned to me and said: "Out you go, and don't come back to do any more experiments." That was the end of my brief career as an experimental physicist. I had not completed my year, but fortunately that was not held against me for my master's requirements.

Nevertheless, my contacts with the experimental physicists remained good. The Utrecht laboratory was especially renowned for precision measurements of intensities of spectral lines. In Uhlenbeck's absence, people would come to me with questions about spectra. This forced me to study the subject further, and for some time I was the resident expert on the theory of spectra.

Another event brought me in close contact with experiment—though I was obliged to keep my hands off the apparatus. In February 1939 I read a now famous article in the journal *Nature* which explained the principles behind nuclear fission. I became quite excited and ran into the laboratory to tell my friends, suggesting that we should have a look at this phenomenon ourselves. We had all the necessary tools available for a primitive test: some uranium, a source of neutrons, and an oscilloscope. Willem Maas, a fellow graduate student, aimed the neutrons at our uranium and detected what happened on the screen of the oscilloscope. There we saw them: huge spikes on the screen that we had never seen before. We could of course not prove in this way that these spikes appeared because in fission uranium nuclei split into two nearly equal halves (plus some debris), yet it was obvious that what we saw could not be understood in terms of nuclear reactions we had known until then. It was that simple.

Shortly thereafter, Uhlenbeck returned from America, where he had learned about fission. We had long discussions on this brand-new branch of nuclear physics. He told me of a meeting in Washington, D.C., he had attended, where Bohr and Fermi had for the first time made public the news about fission, and how American newspapers had immediately picked this up as a piece of sensational news.³ He also told me of sharing an office at Columbia University's Pupin Laboratory with Fermi, who had just escaped from Italy with his family. (The reason for his flight was that Mussolini's government had recently enacted anti-Semitic laws—and Fermi's wife was of Jewish extraction.) One day, he said, Fermi and Uhlenbeck had been discussing fission. Fermi got up, walked to the window, looked out, and said something like: "Do you realize, George, that fission may make pos-

sible the construction of bombs so powerful that just a few of them can destroy this whole big city?" Which goes to show that there was nothing secret about atomic weapons: the issue was obvious to the physicists, and even I, a youngster, at once understood the import.

Shortly afterward I met the nuclear physicist Frédéric Joliot, son-in-law of the late Marie Curie. He had come to visit Uhlenbeck who afterward told me of their discussions. It turned out that facilities on a military airfield had been made available to Joliot for doing undisturbed fission research under military protection. Joliot, a confirmed communist, had been given a fine car for personal use. When Uhlenbeck asked him if that would not change if the communists came to power, he replied, "Oh no, they will realize that I deserve a car because of my importance."

Back to Uhlenbeck's return from America. He also brought another piece of news that was most unwelcome to me: while in the States he had accepted an offer to return to the University of Michigan in Ann Arbor, where he had been employed before, from 1927 to 1935. He was to leave Utrecht in the summer of 1939. Until then, he promised me, we would do a lot of physics together.

The first thing I was told to do was make some calculations concerning fission. I had to compute a certain curve that displays the force between two fission fragments. The curve was expected to exhibit one minimum. Enthusiastically I started to work. Lo and behold, my curve showed two minima! Excitedly I went to tell Uhlenbeck, who snapped: "Impossible. You've made a mistake." Back I went to check. The two minima remained. Again I went to see Uhlenbeck, more timidly this time. Together we went through the calculations, then saw what had happened. I had used a book containing Kobayashi's mathematical tables of Bessel functions. My fake second minimum was due to an error in one of the printed tables, which I could have spotted myself—but what young kid doubts the printed word? It was a lesson for me always to use horse sense to anticipate roughly the answer to a calculation before one starts to sweat it out.

During that spring of 1939 Uhlenbeck gave a course called *Capita Selecta*, selected topics. He had chosen to lecture on the still quite young theory of the electron and the positron (a particle just like the electron except that it has an electric charge of opposite sign) developed by Paul Dirac. One of my life's strongest emotional experiences related to science occurred when for the first time I understood Dirac's equation for those particles.

Uhlenbeck had been one of the discoverers of a property of the electron called spin. Roughly speaking, it says that an electron spins around an axis

while moving in some orbit or other, in some ways similar to the earth's rotation around an axis while moving around the sun. Uhlenbeck's discovery in 1925 had been the result of an analysis of certain spectroscopic phenomena which showed that an electron *had* to spin—but not *why* it did so. Then, in 1928, Dirac came forth with an equation that explained why. Finding this very tiny, compact equation was one of the most important discoveries in twentieth-century theoretical physics, made by a twenty-six-year-old man whom I would get to know very well later on. I was deeply moved when I first grasped how that equation works. It is such a simple equation, yet so rich in implications—it is beautiful and elegant.

What does a scientist mean when he or she says that a mathematical equation is simple, or beautiful, or elegant? Can such an inherently nonscientific appreciation be shared with the nonscientist? In explanation I should like you to imagine that you have a friend who has devoted himself to the study of the Chinese language. One day the friend comes to you and says, "Look at this Chinese poem here. It is so simple, so elegant, so beautiful." You will tell him, "I must take your word for it but cannot share your appreciation because I do not know Chinese." You will appreciate what your friend has in mind even though you cannot follow why he has those emotional responses. It is likewise with the language of mathematics. You will have to study for years in order to reach the possibility—not even the certainty—of developing the rewarding capacity for appreciating simplicity, elegance, beauty in a language that, so regrettably, has scared off so many.

Among my assignments for obtaining the master's degree was giving a few theoretical seminars. My first one was on fission. I was well prepared, I thought, and began my talk, writing formulas on the blackboard as I went along. Uhlenbeck interrupted almost at once: "First tell us what the problem is," he said, "then state your conclusions at once. Only thereafter should you go into details of the derivations." I followed instructions, but still the professor interrupted me several times with comments like: "You must explain in simple language, not show how smart you are." It was a most instructive and illuminating experience, and I have taken it to heart ever since. Uhlenbeck also taught blackboard techniques which, he later told me, he had learned from Ehrenfest, one of the best physics teachers in the early part of the twentieth century: "Start on the top left corner, prepare your written comments so that by the end of your talk you are at the right bottom corner. Never, never erase anything while making your presentation." Such advice may seem simple, almost trivial, but it is cru-

cial for keeping your audience's attention, for not distracting them, as many otherwise good physicists do by holding a piece of chalk in one hand and an eraser in the other while they lecture. Among the debts of gratitude I owe to this great teacher is this style of presentation. I still get agitated when I listen to young physicists in action who are out to show how clever they are, how much they know, without apparent regard for the limited capacity of almost every person in the audience to absorb what they are saying.

I was also obliged to give a general colloquium in front of all local physicists, not just theorists, plus, possibly, outsiders. As a topic I had chosen the theory of a particle called the meson, another quite novel subject in the 1930s. My only recollection of that event is meeting Ornstein afterward; he asked me—he was known for rough language—if I really believed in all that shit.

Among my other tasks was assisting Uhlenbeck with certain calculations on the behavior of cosmic rays as they pass through a sequence of absorption layers made of different materials. That work was published later.⁴

Then the time came for Uhlenbeck's departure. I vividly remember our last encounter on Dutch soil. I thanked him for all I had learned from him. His final words to me were: "We shall meet again." That remark has given me added courage during the subsequent dark years. He left by boat in August 1939, only weeks before the outbreak of the Second World War. The next time we were to meet was in September 1946—in New York City.

In the preceding period I had learned more of the mathematical techniques of theoretical physics from Uhlenbeck than I would ever after from anyone else. I would have benefited much more in this respect had he not departed. In later years I have always felt that I did not master mathematics well enough for physics purposes. I have come to the conviction that a theorist can never know enough mathematics, yet, paradoxically, he can easily know too much of it. Mathematics should always be treated by physicists as a tool, not as a purpose. As Kramers once said to me, mathematics should forever be an unrequited love to the physicist, like a woman worshipped from afar.

From the experiences of the past year, I came to understand that theoretical physics was to be my life's way, wherever it might lead me. I could not reconcile this choice with a life in Palestine. Earlier I had given serious thought to emigrating, but now I decided that I could not possibly do so and also pursue science with the passion I had begun to lavish on it. I have never regretted that choice.

Before his departure, Uhlenbeck had arranged my first academic appointment, a quite modest one, of course. His earlier assistant Kahn had left to become *lector* (associate professor) in Groningen. He had been succeeded by Kees van Lier, a student with whom Uhlenbeck had published a nice nuclear physics paper.⁵ During academic year 1939–40, van Lier was on a leave of absence, and Uhlenbeck saw to it that I became his temporary replacement. As a result, I now received my first salary, small but nevertheless most gratifying. And so it may be said that at age twenty-one, still only a graduate student, I began my academic career. In September 1939 I moved to a rented room in Jutphaas, a suburb of Utrecht.

I devoted the fall of 1939 to preparations for my master's degree in Utrecht. I now had regular discussions with Ornstein to give me some guidance in my independent physics studies. However, before leaving, Uhlenbeck had spoken about me to Kramers in Leiden who had said he would be willing to receive me now and then for discussions. So a few days a month I journeyed to Leiden, also attending on occasion the famous so-called Ehrenfest colloquium. My talks with Kramers showed him to be a man of quite unusual depth in his thinking, not only on physics but also in regard to numerous other aspects of human culture. He was very musical and, as I was soon to hear for myself, played the cello very well. I remember a story he once told me about music. One evening he was attending a concert of music he was particularly fond of. Suddenly, in the middle of it all, he got up and left, because, he told me, he had found himself sitting there calculating in his head the energy levels of an oxygen atom, unable to concentrate on the music at the same time. That was too much for him. He never went to a concert again but continued to make his own music because that he could do with undivided attention.

My acquaintance with Kramers grew into a friendship that would last until his death in 1952.

Meanwhile, steps were being taken to find a successor to Uhlenbeck. As a result, Léon Rosenfeld, professor of physics in Liège, Belgium, was invited to spend a few days in Utrecht and give a colloquium.

In this colloquium, which I of course attended, Rosenfeld reported on very recent work which he and Christian Møller were still doing, dealing with the meson theory of nuclear forces.⁶ We had several detailed technical discussions during his stay. One of the topics was the quadrupole moment⁷ of the deuteron, the nucleus of heavy hydrogen, the simplest of all composite atomic nuclei, consisting of one proton and one neutron. I found those talks stimulating but quickly realized that Rosenfeld belonged to a different

breed of physicist than Uhlenbeck. He was more the *savant*, the learned scholar, than the enterprising explorer. He was more philosophically inclined and also a rather outspoken Marxist. Wolfgang Pauli once described him as the square root of Niels Bohr and Léon Trotski.⁸

On April 22, 1940, I successfully passed the examination for the master's degree. It consisted of several written tests in mathematical subjects and lengthy oral probes conducted by Ornstein.

On May 7, 1940, the minister of education sent a letter to Rosenfeld that was signed by Queen Wilhelmina. It begins with the usual salutation: "*Wy Wilhelmina, by de gratie Gods Koningin der Nederlanden, prinses van Oranje Nassau, enz., enz., enz., hebben goedgevonden en verstaan . . .*" (We Wilhelmina, by the grace of God, Queen of the Netherlands, princess of Orange Nassau, etc., etc., etc., have approved and understood . . .). It was the official document approving his appointment to professor in Utrecht.⁹

On May 9, 1940, I sent a letter of congratulations to Rosenfeld in Liège. The day before I had also written to him, asking if I might be permitted to continue my studies under his direction if and when his appointment were to come through.¹⁰

On May 10, 1940, German armed forces invaded the Netherlands, Belgium and Luxembourg. After brave resistance, the Dutch army capitulated on May 15.

Mail delivery between Holland and Belgium was now interrupted for several months. When in August 1940 I was able to write to Rosenfeld again, I had to report a tragedy: "The capitulation of Holland has caused a great psychic shock to some people. . . . This shock has been too severe for some. In this connection it is my sad duty to report to you the death of van Lier."¹¹ He had committed suicide.

"I have been appointed his successor and I hope that you would be willing to accept me in that position."¹² Rosenfeld did so. He arrived in Utrecht in September.

I now began work on my doctoral dissertation. The problem Rosenfeld had proposed to me was an outgrowth of his program with Møller. The latter had made an attempt¹³ to formulate their version of the meson theory in terms of a specific five-dimensional description, the so-called de Sitter space, in which the universe is supposed to possess a fifth dimension confined to a very small extension.¹⁴ It is qualitatively analogous to replacing an infinitely thin spherical surface, analog of the usual universe, by a spherical shell of finite thickness, analog of de Sitter space. Superstring theories,