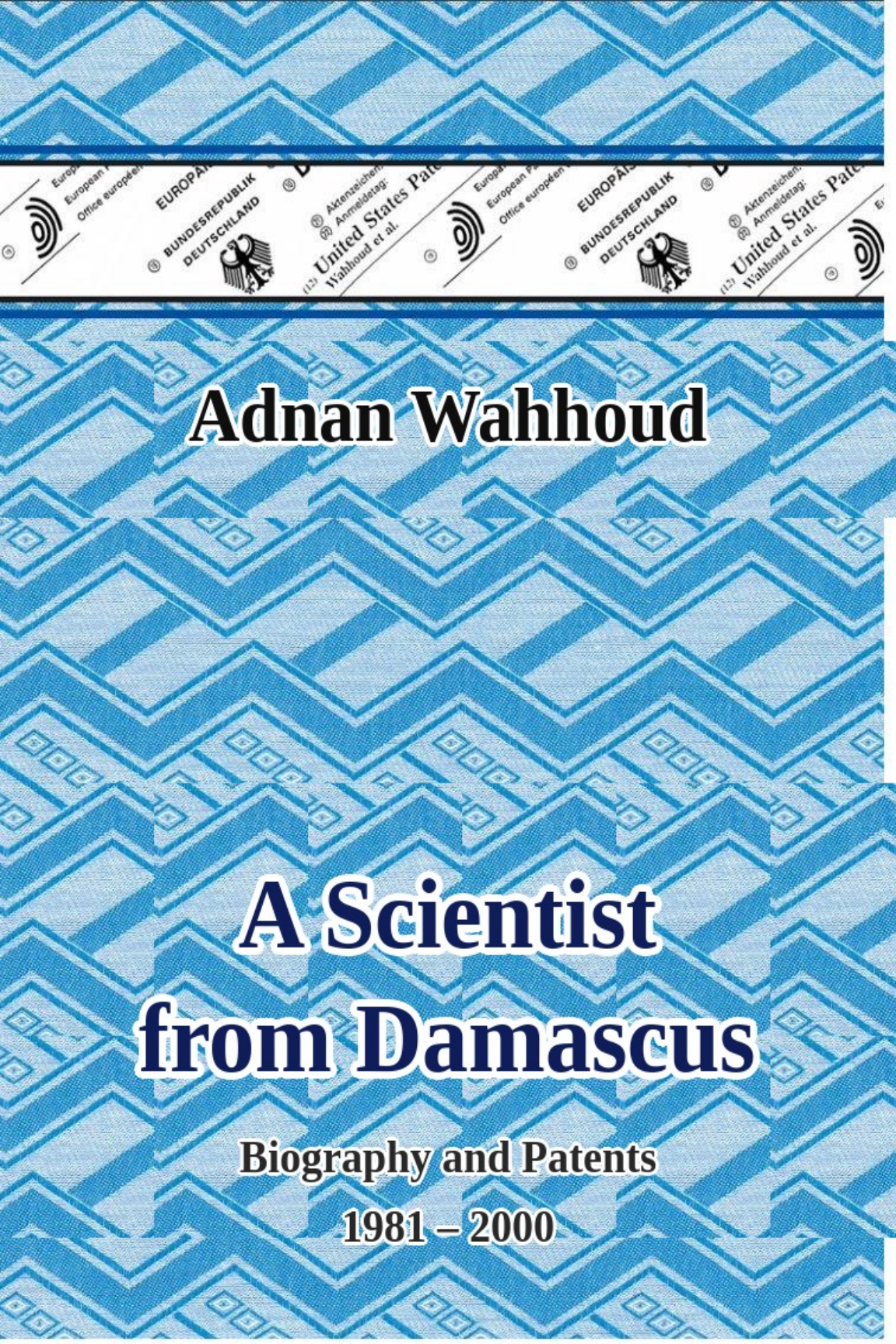




Adnan Wahhoud

**A Scientist
from Damascus**

Biography and Patents

1981 – 2000

"All this is from the favour of my Lord."

In the name of God, the Most Gracious, the Most Merciful

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Adnan Wahhoud

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Biography and Patents

1981 — 2000

English biographical companion · 2026

A Scientist from Damascus

An English biographical companion to *Ein Wissenschaftler aus Damaskus*, the autobiography of Dr.-Ing. Adnan Wahhoud first published in German in Lindau in 2003 (ISBN 3-00-012293-1) and in Arabic shortly thereafter.

This English edition is an independent biographical work prepared in 2026 with the consent of the author. It draws on the facts of his life as documented in the German and Arabic original editions, on public records of his patents, and on materials prepared for his personal website. The text is original; the photographs are reproduced with the author's permission.

The forewords by Mr. Peter D. Dornier and the late Mr. Issam El-Attar that appear in the German and Arabic editions are not reproduced here; readers wishing to consult them are referred to the original editions.

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Cover motif: surface texture of damask fabric, whose origin is the city of Damascus.
The upper border reproduces excerpts from the author's patent certificates.

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A NOTE ON THIS EDITION

From the publisher

In 2003, Dr.-Ing. Adnan Wahhoud published a slim self-issued volume in Lindau, Bavaria, recounting the long road from a child's hand loom in old Damascus to the development laboratory of one of the world's leading weaving-machine manufacturers. He titled the German edition *Ein Wissenschaftler aus Damaskus* — "a scientist from Damascus" — a phrase coined, he tells us, by his German friends. An Arabic edition followed shortly thereafter.

This English edition, prepared more than two decades later, is not a word-for-word translation. It is an independent biographical companion, written afresh in English and drawing on the same facts: the dates and places, the teachers and patrons, the patents and the public record. Where Dr. Wahhoud's own words have been quoted, they appear in quotation marks.

Two pieces of the original work are not included here. The first is the foreword by Mr. Peter D. Dornier of the Lindauer Dornier Gesellschaft, dated July 2003, in which he recalls a first dinner at the Wahhoud family's table in Aachen in 1987. The second is the foreword by the late Issam El-Attar, the Syrian scholar and reformer who became Adnan's spiritual mentor in Aachen and whose family ties to the Wahhouds run deep. Both

forewords are copyright their authors and may be read in the German and Arabic original editions.

What follows is the rest of the story: a life lived along the line that runs from Damascus to Lindau, and from the wooden hand loom to the air-jet weaving machine — a line, as the reader will see, that was always more continuous than it first appeared.

On the dedication

The German and Arabic original editions open with a long personal dedication, written by Dr. Wahhoud himself. It is addressed, in order, to his parents and to his wife; to the teachers of his earliest schooling and to the teachers of his trade; to the spiritual mentor to whom he owed his intellectual maturity; and to the teachers of his academic formation. From these private dedications it then opens out, in a series of widening rings, to every reader who values another person's work — whether modest or vast — and to every reader who refuses injustice in any of its forms, from the smallest petty theft to the dispossession of whole homelands.

— readers wishing to consult the full text are referred to the original editions —

PART ONE

Damascus

1951 — 1971

CHAPTER ONE

The Loom

Damascus, 1951

Adnan Wahhoud was born in Damascus in May 1951, the sixth of eight surviving children in a family of modest means. His father worked at a wooden hand loom; his mother wound the bobbins that fed it. The hand loom stood in the family quarters, and for the first years of the boy's life it provided not only the family's income but also the soundtrack of his childhood — a soft, regular percussion, a clack of shuttle and beat of reed that, repeated through long afternoons, never quite became silence.

When he was very small — too small to reach the treadles, too small to do anything but watch — he would lean against the breast beam of the loom and listen. The rhythm soothed him. He would later say, with the candour of a man recalling his earliest memory, that he had found a rare peace there: half awake, half asleep, his cheek against the wood that his father's hands had polished smooth.

Damascus in those years was a city that remembered. Syria had emerged from French mandate only five years before Adnan's birth, and the older generation still carried the texture of the occupation in their stories. His grandparents had lived near Bab el-Hadid, the Iron Gate, one of the historic

gates of the city walls. From their windows they had watched freedom fighters slip through the narrow lanes around the gate, in and out of the city by night. They had seen children — Adnan's father, perhaps, among them — pelt French soldiers with stones and then disappear into the alleys, taking refuge in the mosques, whose thresholds the soldiers would not cross. The boy grew up on these stories.

He loved both his parents very much. When the father worked at the loom, the boy would sit nearby and watch rather than play. When either parent left the house on errands, he asked to come along. He was not a child who needed entertainment apart from his family.

There was nothing about the household that was unusual for the time. Damascus in the 1950s was full of artisan families like the Wahhouds — carpenters, blacksmiths, stonecutters, bakers — practising the trades of the old quarter much as their fathers had practised them. The boy walked among them and watched. A few of these workshops had begun to use small electric tools, but for the most part the work was done by hand, with hand tools, in the way it had been done for centuries. The idea that a machine might do all of a hand worker's tasks at once — replace eyes and ears and counting fingers — struck him, when he first encountered it, as a kind of miracle.

CHAPTER TWO

Two Worlds

Damascus, 1958 — 1965

One day in 1958, when he was seven, his mother took him by the hand to a place he did not know. He found himself in the courtyard of an old Damascene house, a place fragrant with jasmine, and was enrolled there in the first grade.

For the first three years of school he was an ordinary pupil — diligent, quiet, no particular distinction. In the fourth year something shifted: his report card came home with high marks in every subject, and the change surprised his parents as much as it surprised the boy himself. From that year on he was usually among the best in his class.

It would be inaccurate to say that he was driven by ambition. He was driven, rather, by attention. Six children stood above him in the family, and two would come after; in a household occupied above all with making ends meet, the middle child did not naturally draw notice. School noticed him. School rewarded the kind of quiet, sustained effort that came naturally to him. Inside the school day he found that he existed as an individual, not as a number in a sibling sequence, and that recognition pulled him deeper into the work.

But the household needed every pair of hands. The hand-weaving trade was slipping; what his father could earn was no longer enough to feed everyone. It was understood, in the Damascus of those years, that children of twelve who could work would leave school and start earning. Many of Adnan's schoolmates did. Some chose to; others were taken out of school whether they wished it or not.

When he reached the fifth grade and then the sixth, he did the calculation himself and presented his father with a proposal. He would stay in school. In exchange, he would work three hours a day at the loom after school, and double that on holidays. By then his legs were long enough that his father could adjust the loom for him. He learned to throw the shuttle, beat the weft into place, work the treadles in the rhythm he had been listening to since he could remember.

The day became two days. In the morning he was a pupil; in the afternoon he was a weaver, contributing four ells of artificial silk per working day, eight ells on weekends. The arrangement taught him three lessons, he would later observe, that he carried for the rest of his life: that time had value, that money had value, and that knowledge had value — and that the three were not in conflict but, if managed carefully, could be made to work together.

He was small for his age; among his schoolmates he was the shortest. The kind of responsibility he was already shouldering at twelve was, even by Syrian standards of the period, advanced. He carried it without complaint. By the time he completed his school leaving examination, in his whole extended family he would be the first ever to have done so.

CHAPTER THREE

Workshop and Vision

Damascus, 1965 — 1970

When he was fourteen, in the eighth grade, the hand-weaving trade in Damascus was visibly dying. Two of his older brothers were already working in weaving mills where the cloth was made by electrically driven machines — small family operations, scattered across the city. At the start of summer that year, having passed into the ninth grade, Adnan proposed to his father that he go with one of his brothers to the mill, to see for himself.

He had imagined the machines, since he could not yet picture them, as monstrous things. How could a single piece of equipment do what a weaver did with both hands, both feet, eyes, ears, and a working memory of two thousand warp threads? What did it look like? Where did the thread go in? Where did the cloth come out? Where, if anywhere, did the human being stand?

In the mill he found a small electric loom, and he stood in front of it for a very long time. He did not understand it at first. He studied each mechanism in turn, tried to follow the sequences, listened to the operators as they talked among themselves about its problems. Every small thing he managed to grasp was a small joy to him. By the end of the summer he had

found a half-time position in another mill, and from then on, after school in the morning, he worked in the mill in the afternoon — no longer at his father's hand loom but at a machine that, however imperfectly, was a younger relative of the looms he would one day help to design.

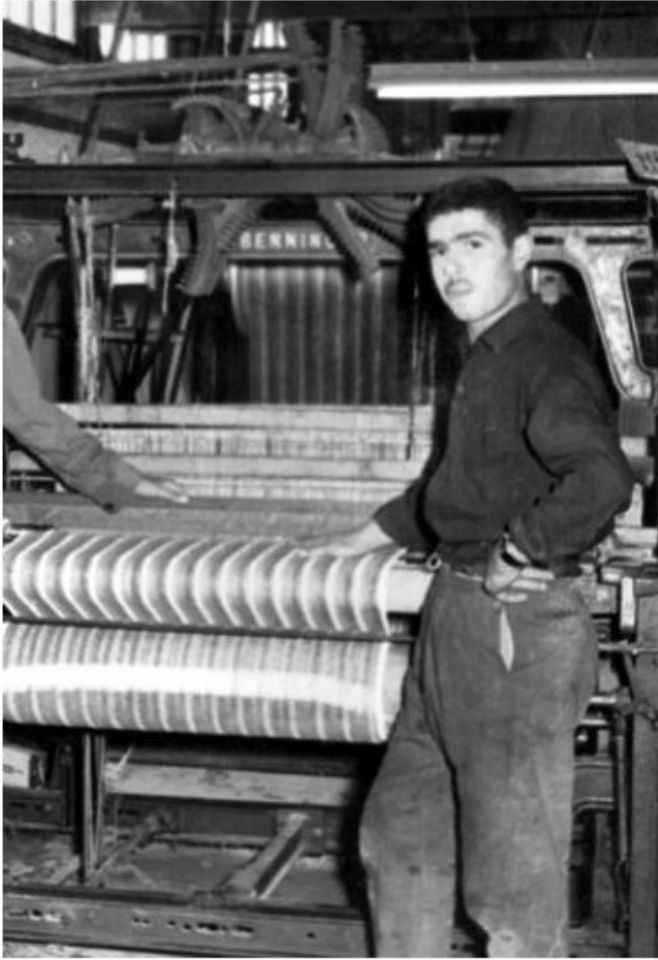
For five years he stayed that course. In 1970 he sat his school-leaving examination — the technical Abitur — and passed it with distinction. But before that, he had made a discovery that would shape the next phase of his life. The standard school leaving exam, he learned, could be taken at a technical Gymnasium, where pupils were also trained in a trade. He enrolled. In the first weeks the new pupils were rotated through the trade specialisations: electrical work, mechanics, lathe operation, casting, forging, carpentry, model making. He learned, too, that the school once offered a textile track, but that enrolment had been suspended for several years and the track was to be closed when the last students completed it.

In the first week of term, the General Secretary of the Ministry of Education, Mahmoud Al-Ayyubi, visited the school in person to ask the new pupils whether they had found their vocations. The pupil from the old quarter raised his hand and asked why the textile track was being closed when Syria's textile industry was famous, both in its past and in its present. The Secretary promised that the track would be reopened. It was.

Within the textile track he flourished. The founder of the programme and the teachers who came in under his direction took particular care with the boy who, alone among the new intake, had already spent years on the shop floor. He absorbed the theory quickly because he had the practice; he applied the practice more thoughtfully because he was learning the theory. By the end of three years his teachers acknowledged, with the matter-of-fact respect of trades people, that his combined knowledge had begun to exceed their own.

One of those teachers wrote, in the margin of his exercise book, a sentence the boy carried with him forever after: "With a start like this, I see for this pupil a remarkable future."

In his last school year, before the Abitur, he stopped working in the weaving mill. He set up a workshop in his parents' house, in which he produced Jacquard cards — the punched programmes that, threaded through the great Jacquard heads above ornate looms, control how the warp threads cross the weft and so determine the figured patterns of upholstery fabric. The Jacquard work paid better than the mill work had, well enough that he saved consistently. His standing in the family rose, though that had not been the purpose of the work; the purpose, as always, was to learn more and to earn what the learning required.



Damascus, 1969. The author, aged eighteen, in front of a weaving machine at the technical Gymnasium that he had just converted from plain weaving to terry weaving.

During this period he met, almost by chance, the most prominent textile engineer in Syria. They talked at length about the technical problems of the trade. At the end of the conversation, the older man told him plainly: if he was serious, he should go to Europe. There he could find the kind of knowledge that Damascus, at the level he had now reached, could no longer

supply.

CHAPTER FOUR

Eastward to the West

Damascus → Vienna, February 1971

He passed his Abitur and added the engineer's advice to his other plans. He had savings from the Jacquard workshop. He had a destination in mind, though no fixed place within it. After several consultations with the cultural attaché at the West German embassy in Damascus, he chose Germany as his country of study. Through a translator he wrote to several German universities. In a short time he received a conditional admission to study mechanical engineering at the Rheinisch-Westfälische Technische Hochschule in Aachen — the RWTH.

On the eighth of February 1971, with three classmates from the technical Gymnasium, he left Syria. The cheapest train was the Orient Express. From Aleppo it ran through Istanbul, Sofia, Belgrade, Graz, and Vienna — five days on a slow, crowded train, watching one set of mountains give way to another. His starting capital for the venture was about one thousand Deutsche Mark.

For four young men with one thousand marks and a great deal of optimism, the first city was Vienna. There he and his classmates shared a single apartment, and there he enrolled in an institute that taught German as

a foreign language. He found, to his pleasant surprise, that the instructors were orientalist who knew Arabic well, and could explain German grammar to him by way of the Arabic grammar he already knew — for the two languages, contrary to first appearances, share a great deal of structure.

He had to support himself. He took night work for a snow-clearing crew through the winter and, later, distributed advertising leaflets through the streets of Vienna by day. His one thousand marks remained untouched.

PART TWO

Aachen

1971 — 1987

CHAPTER FIVE

Vienna Winter

Vienna, spring 1971

After a few months in Vienna the invitation to the entrance examination at Aachen arrived — two papers, in German and in mechanics. He redoubled his German lessons and prepared for the move. He felt, before the test, that he would pass it. He took the Orient Express again, this time onward to Munich, then Cologne, then Aachen.

Aachen was easier to settle into than Vienna had been, for the curious reason that the Germans, when speaking to a foreigner, used high German. The Viennese, in their warmth, had not. With his modest German, he could now follow conversations he previously could not.

CHAPTER SIX

The Mosque on Campus

RWTH Aachen, 1971 — 1975

At the RWTH he passed his entrance examination and was matriculated, then placed into the preparatory programme — the Studienkolleg — that brought foreign students up to the standard expected in mathematics, physics, and chemistry. He also continued his German classes.

In the early years he made the acquaintance of a large number of Arab students who had been at the university for some time, and what he learned from them dismayed him. Many were no longer attending lectures. Some had taken jobs and seemed content to have done so. Some had married European women and seemed to have concluded that this in itself constituted a life. Others had simply got stuck — they did not know when their studies would end, whether they would end, whether they would ever return home with a degree or without one, or what other life they might have to construct in the meantime.

There were also students who were succeeding, who were doing the work, who were carrying their countries' honour into the lecture halls. Looking at the spectrum from one end to the other, the young Wahhoud felt the weight of his own decision settle on him for the first time. He had come

to Europe by his own choice. His family had not been consulted in any practical sense; they had agreed, but they could not help except by remembering him in their prayers. His country, beyond a recommendation letter, could not help. And he had heard, from those who had tried it before him, that financing studies entirely from one's own labour was a road with many ways to fail.

He had been a child who walked dark streets at night by looking carefully at every shape ahead, so that nothing behind him could startle him. That was the temper he applied now. He would attend every lecture and every exercise class without exception. Every assigned exercise he would complete on time. He would work only enough hours, and only at the hours, that did not displace the lecture schedule. For several years he ran a newspaper round from four to seven in the morning, surrendering the easiest sleep of the night and the soft hour of dawn but holding the rest of the day intact.

On the campus stood a mosque, built with the support of the RWTH itself — a recognition, as one professor put it to him later, of the medieval Arab and Muslim contributions to the foundations of modern science. The mosque was within walking distance of every lecture hall he attended. He went often, between lectures, between papers, after his newspapers had been delivered and before the day's work began.

In that mosque, at the Bilal-Moschee in Aachen, he came under the personal teaching of Issam El-Attar — the Syrian scholar and reformer who had himself made Aachen his home in exile. El-Attar would become, over the years that followed, a presence comparable in influence to the parents whose voices Adnan had begun to hear less often. The two men were already linked by deep family ties between the Wahhouds and the El-Attars; here in Aachen, those ties became a daily mentorship. To El-Attar, Adnan owed the steadier understanding that the work he was doing — earning the modest living that paid for his books and his rent — was itself a kind of worship; that the search for knowledge was a road on which the Creator was content with the traveller; that no shame attached to

the early rising, the cold streets, the unglamorous newspaper sack.

It is not too much to say that without those weekly hours at the Bilal-Moschee, the young man with the newspaper round in Aachen might not have lasted long enough to become anything else.

CHAPTER SEVEN

Hayat

Aachen, mid-1970s

The preparatory year ended without incident. He passed into the mechanical-engineering course proper. He had earned a sabbatical semester before the main programme began; he used it to add daytime work to his newspaper round, and at the end of it he had savings, regular work, and a clearer view of the years ahead. He wrote to his parents with what was, by their standards, a surprising letter: he was thinking, even now, of taking a wife.

They knew their son. His plans had been steady so far. He was, after all, the first in the family to have entered a university. They did not stand in his way.

He met Hayat, and the two of them recognised in each other a remarkable agreement about how a life should be lived. She would be his companion for everything that came afterwards — the studies, the lean budgets, the patience required by an unrelenting lecture schedule and an even more unrelenting examination schedule. She was a believing, intelligent woman; she had been brought up to honour learning; she did not mistake their thrift for poverty or his absences for distance. The marriage

they made in those years was the foundation on which everything else stood.

CHAPTER EIGHT

The Air Jet

Institut für Textiltechnik, RWTH Aachen

The preliminary diploma, the Vordiplom, was the first test of whether a mechanical-engineering student would deserve the title of engineer. He passed it, then turned to the main diploma. There he chose, as his specialism, the field he had grown up inside: textile machinery. With this choice the trajectory closed into a continuous line. The boy who had leaned against the breast beam of his father's loom in Damascus was now a young man preparing to design the descendants of that loom.

Among his professors he was already known as someone who could move through complicated material more quickly than his fellow students because he had handled the underlying objects. One of his professors took to calling him a Vollblutweber — a thoroughbred weaver — and the nickname stuck.

When the time came to choose a topic for the diploma thesis, Professor Walter Lünenschloß, director of the Institute for Textile Technology at the RWTH, invited him to a meeting. Lünenschloß was, in those years, among the world's leading scientists of the textile trade. The thesis he proposed was modern, ambitious, and entirely suited to the student: The carriage of a

single weft thread across the width of a loom by means of an air jet.

In a conventional loom, the weft is carried by a shuttle — a small wooden capsule, sometimes the size of a hand — that is thrown across the width of the loom at high speed by a complicated mechanism of accelerators and brakes. The shuttle is heavy. Slowing it down at the far end is a problem; turning it round to come back is a problem. To replace this fast, mechanical, accelerated mass with a controlled jet of compressed air was not a new idea, but it was not a solved idea either. Lünenschloß was beginning a programme of research aimed at bringing the technology into industrial practice. He thought the young man from Damascus, with his hands-on background, would be the right person to start with it.

Wahhoud took the thesis. He spent the early months gathering and studying every previous publication on the subject. He arranged a two-week placement in a working factory where the new air-jet looms were already running, and watched them — as he had once watched the first electric loom in Damascus when he was fourteen. After this immersion he had a clear picture of the problems the technology would face.

After five months of intensive work, he laid before Professor Lünenschloß his plans for a test rig — a bench on which the air-jet insertion could be simulated, the trajectory of the thread observed, the forces measured. Lünenschloß was satisfied. The thesis was completed and the rig built. The mark was *sehr gut*: very good.

But the satisfaction of the professor went further than the mark. He offered the new graduate a position at the institute as a scientific assistant — the first step on the road to the title *Doktor-Ingenieur*. The young man's pleasure was twofold. He had completed his mechanical-engineering course; and the modest salaried position of a research assistant, with public-service benefits, brought to a close the years of newspaper rounds at four in the morning. He and Hayat could, at last, live a little less thinly.

CHAPTER NINE

A Patent in Switzerland

1980 / 1981

When Lünenschloß read the written thesis through, he saw that one passage was more than a study. It described a new design for a valve — the kind of fast valve that would have to supply the air nozzles of the air-jet loom with compressed air. The design, the professor told him, was novel; it would make a first patent.

Letters went out to firms in Germany, Belgium, and Switzerland. The Swiss firm — Gebrüder Sulzer AG, then the world's leading weaving-machine manufacturer — took up the negotiations and filed the idea as a European patent. The inventor was named: Adnan Wahhoud, born in Damascus, Syria. It was the first time his name appeared on a European patent register. It would be a long way from the last.

CHAPTER TEN

Milan, 1983

ITMA, Milan

The acquisition of his first patent by the leading firm in the field changed how his thesis was read. The diploma work that had once been a graduation exercise now stood out as the foundation of a small but real piece of industrial progress. In recognition of this, the Walter Reiners Foundation — the German textile-machinery industry's own award — chose him as a laureate of its young-talent prize.

He travelled to Milan in 1983 for the International Textile Machinery Exhibition, the great quadrennial gathering of the industry, where he received the award in front of the prominent figures of the trade.

CHAPTER ELEVEN

Doctor of Engineering

Aachen, 1983 — 1987

The student was now an engineer; the engineer was now becoming a researcher. Once a week he sat with Professor Lünenschloß, the senior scientist in the field, and they discussed the latest results from his research. Through Lünenschloß's name the young engineer gained access to the industrial laboratories where the theoretical work could be tested against practice — and from those visits he learned to see the technical problems of weaving in the manner of the people who had to solve them on the shop floor.

For his first conference paper he was asked to give an overview of the state of the art in air-jet weft insertion. He delivered the talk; Lünenschloß heard it; Lünenschloß advised him to rewrite it for publication. The International Textile Bulletin printed his first scientific paper. Roughly thirty more followed over the next several years in the international trade press. He presented at one international conference after another. By 1987 the body of work was sufficient. He defended his doctoral dissertation that year and acquired the title Doktor-Ingenieur.

He had begun in 1971 with one thousand marks and a third-class ticket on the Orient Express. He completed his doctorate sixteen years later. Throughout that time, when Professor Lünenschloß introduced him at a conference, he was in the habit of redirecting the credit. "The thanks," he would say, "really belong to his father in Damascus, with whom he began his training in textiles."

AUS DAMASKUS



Als Referent auf Tagungen

Als Prof. Lünenschloß ihn den Teilnehmern vorstellte, wies er daraufhin, dass der Dank eigentlich dessen Vater in Damaskus gebühre, denn bei diesem hatte

Speaking at international conferences in the 1980s. Above left: Professor Walter Lünenschloß. Above right: Dr. Wahhoud at the same lectern. Below: the audience.

PART THREE

Lindau

1987 — 2013

CHAPTER TWELVE

DORNIER

Lindau, Bavaria, 1987

By 1987 his name had reached the German textile-machinery industry well beyond Aachen. In the same year that he completed his doctorate, the Lindauer Dornier Gesellschaft — a firm founded in 1950 by Peter Dornier senior, the engineer and aviation pioneer who had once held the early patents for vertical-takeoff aircraft — invited him to Lindau on Lake Constance, on the Bavarian shore. He accepted the position of development engineer.

Within a year the company had asked him to direct an entire department: the research and development of its air-jet weaving machine. The firm had been a remarkable success with its rapier loom — its flagship product for the previous twenty years — but it stood, in its own assessment, at a crossroads. A new idea, a new "invention", as Peter Dornier junior would later put it, was needed to carry the firm into the next decades. The young Syrian engineer, on his father's suggestion, had agreed without hesitation to take on the responsibility.

In the years that followed, the Lindauer Dornier built — and continued building — what would become one of the finest air-jet weaving machines

in the world. The advantages of the machine are protected by a great number of patents; on a great number of those patents, Wahhoud is the inventor. The complete list, between 1981 and 2000, is reproduced in the appendix of this book.

CHAPTER THIRTEEN

Brockhaus

Lindau, late 1980s

A letter arrived from the F. A. Brockhaus publishing house. The editors of the nineteenth edition of the Brockhaus Encyclopedia — twenty-four volumes, the standard work of reference in the German-speaking world — wished him to write the textile-technical entries. He replied that German was not his mother tongue. The publisher repeated the request: he was, they said, the right person for the work. He felt the honour and accepted.

For three years, in his spare time alongside his research and development work in Lindau, he wrote textile-technical entries for the encyclopedia. His name was set into the list of contributors.

CHAPTER FOURTEEN

The Father in Lindau

Lindau, sometime in the 1990s

After much patient persuasion over many telephone calls, the engineer succeeded in convincing his eighty-year-old father — still in Damascus, still suspicious of long journeys — to come for a visit. The visit was a small festival in the family. The grandchildren circled the old man. They sat around him to hear the old stories.

He told them, again, about Bab el-Hadid — the Iron Gate of Damascus — and how the gates of the city were closed each evening so that the city could sleep in peace. He told them how the freedom fighters slipped under or around the gate during the French occupation. How the children threw stones at the soldiers and ran away into the narrow alleys, into the mosques whose doorways the soldiers would not cross. He said he had pitied those French soldiers, in their way: he had wondered why so many young men had been brought so far from their families to occupy Syria. He had imagined, in his innocence, that France must be a poor country with too little land to feed its sons. Only later, when he himself walked through European countries, did he see the green landscapes and the great rivers and understand that no excuse remained.

The engineer's deepest pleasure of the visit, however, was that he was able to take his father into a textile mill — to show him at last what technology had done to the loom he had worked all his life. They stood together before the air-jet weaving machine. The father watched it go. He reached out and fingered the cloth that was emerging from it, to be sure that it really was cloth, the same kind of cloth he had once woven by hand. Then he turned to his son and said —

*"I cannot make sense of any of it.
I can't see the steps. I can't follow them.
Why this madness of speed?"*

And then he prayed for his son: that he might stay on the right road and that his goals might come to fulfilment.

What his father had woven in fifty years at the hand loom, a single operator in a modern weaving hall produces today in twenty-four hours.

CHAPTER FIFTEEN

Sixty Patents

Lindau, 1987 — 2013

For twenty-seven years he led the development of the air-jet weaving machine at the Lindauer Dornier. Over that period more than sixty separate inventions were registered in his name across the German, European, American, and other patent offices. In international patent databases, taken together, his entries amount to around two hundred publications across nine jurisdictions. To put it another way: every few months, for nearly three decades, his name was added to a patent register somewhere in the world.

The inventions cluster around a number of recurring concerns: how to insert a weft thread accurately across an ever wider loom; how to recover, automatically, from a broken weft without producing a fault; how to keep the reed clean; how to weave leno cloth — gauze — on machines built for plain weaving; how to weave terrycloth efficiently; how to compensate, during shedding, for the changing tension of the warp threads. Under his direction the firm developed, among other things, the Open Reed Weave process: a single working pass that combines techniques previously treated as separate. In 2011 the process received the Techtextil Innovation Prize.

The combined effect of these inventions on the mechanical character of the modern weaving machine was substantial. It is fair to say — as visitors to the factories that use these machines do not always realise — that the great weaving halls of the early twenty-first century, with their hundreds of looms producing fabrics for everything from car airbags to surgical bandages, run in part on patents written, late in the day, by a Syrian engineer who learned the trade from his father, in old Damascus, on a hand loom.

The last day of his employment with the firm was in the autumn of 2013. By then a different country was already calling him home.

A Scientist from Damascus

PART FOUR

On the Craft

A century of weaving

CHAPTER SIXTEEN

A Hundred Years of Weaving

A short history, in the engineer's own field

It is worth pausing, before the patent table begins, to give a short account of what changed in the weaving machine during the twentieth century — the century in which this engineer worked. The summary that follows is brief; the field deserves several books, but for our purposes a few pages will do.

First half of the century. The dominant project of the early decades was to derive every motion of the loom — the throwing of the shuttle, the lifting of the heddles, the beating of the reed — from a few common rotating shafts, driven by an electric motor or a transmission belt. The result was the fully automatic weaving machine: a single integrated mechanism in place of the older patchwork of independently driven mechanisms. By the middle of the century this synthesis was essentially complete.

Second half of the century. The interest of development engineers turned from integration to performance. Three concerns dominated: how to weave faster; how to use less energy doing so; and how to broaden the range of fabrics a single machine could produce, so that the same loom could be set to weave anything from a delicate dress fabric to a heavy reinforced cord.

To these concerns was added a fourth, driven from outside the loom itself: the rise of synthetic fibres.

Fibres. The second half of the century saw the broad industrial adoption of the half-synthetics — viscose, acetate — and then the full synthetics: polyester, polyamide, polyacryl, polypropylene, the aramids. The natural fibres remained dominant in clothing — cotton, wool, silk, linen — but in the new categories of technical textiles, which were the great growth area, the synthetics took the lead. Construction, road making, tyre cord, aerospace, medical applications, household textiles: in each of these the half- and full-synthetics had properties no natural fibre could match.

Metals and plastics. The materials available to the machine builder broadened in parallel. New metallic alloys, new methods of forming and coating them, new ways of treating their surfaces after manufacture — all these arrived together. The plastics, too, multiplied: in number, in properties, in the methods of forming them.

Electronics. The hardest area to summarise is the electronic one. A few markers are enough. The electric motor began as a device for producing a steady rotation; by the end of the century, through electronic regulation, motors could be commanded to any speed and torque the application required. Servo and stepper motors made it possible to control the angular position of a driveshaft degree by degree. Microprocessors brought the control loop down to time scales below a microsecond. Sensors — for tension, for pressure, for temperature, for contact and proximity — became small enough to fit inside the machine itself, the cables disappearing into the body and reappearing only where they connect to the control electronics. Data buses now run through the loom as nerves run through a body.

Force transmission. Where once mechanical force was the only way to move a part, today magnetic, hydraulic, and pneumatic systems share the work — and have changed the architecture of the machine itself.

It is in this combined environment that the engineer works: more materials, faster electronics, more sensors, more ways to move parts. When the disciplines coordinate — process engineering, mechanical engineering, electrical engineering — the result is what one fairly calls industrial culture, advanced one further step. The weaving machine is, in this sense, a small theatre in which a hundred years of engineering meet.

Inside the air-jet loom, today, the valves that supply the nozzles with compressed air open and close in fewer than seven or eight milliseconds. The air jet itself runs at supersonic speed. The weft thread, carried by the jet, reaches three hundred kilometres an hour as it crosses the loom. The acceleration takes about seven milliseconds; the full crossing about thirty. Throughout that brief journey, regulators are adjusting the flight time, brakes are preventing the thread from being overstressed, sensors are confirming arrival. The machine has thirty milliseconds to do this, and it has to do it perfectly, several hundred times a minute, day and night, for years.

This is the world in which the man from Bab el-Hadid spent his working life.

APPENDIX A

Patents

1981 — 2000

Patents, 1981 — 2000

Germany (DE), Europe (EP), and United States (US)

The patents below are reproduced from the appendix of the German edition. They are the public-record inventions of Dr.-Ing. Adnan Wahhoud between 1981 and 2000. Patents granted between 2001 and the time of his retirement from Lindauer Dornier in 2013 are listed on the website www.adnan-wahhoud.de and bring the total to more than sixty inventions, across some two hundred patent publications in nine jurisdictions.

Invention	Patent number(s)
Terry Loom with warp length compensation and deflection into back shed	US 6,390,144 · EP 1 154 057
Terry Loom with interpenetrating ground warp and pile warp	US 6,367,511 · EP 1 154 058
Method and weaving loom for producing leno ground fabric	US 6,311,737 · EP 1 122 345
Weaving loom for producing leno fabric	US 6,315,008 · EP 1 120 485
Weft prespooling device for air-jet loom	US 6,364,235 · EP 1 083 252
Pneumatically operated selvage insertion for weaving machines	EP 1 046 736
Method and apparatus for compensating warp-thread tension or elongation variations during shedding	US 6,135,163 · EP 1 008 683
Method for monitoring the operation of an electromagnet in the weft prewinder	US 6,176,272 · EP 0 962 566
Method for correcting a weft fault on air-jet weaving machines with automatic selvage tucking	US 6,129,123 · EP 0 976 859

Invention	Patent number(s)
Method and apparatus for determining the starting time of weft insertion following a speed change of the main drive	US 6,148,872 · EP 1 039 000
Weft stretching and detecting apparatus for jet weaving looms	US 6,076,563 · EP 0 942 082
Leno device with thread guide eyelet	US 5,921,286 · EP 0 841 417
On-loom weft texturing	US 5,937,915 · EP 0 849 385
Method and selvedge-forming device for an air weaving loom	US 5,803,135 · EP 0 786 547
Multi-section reed for air-jet loom	US 5,782,271 · EP 0 788 365
Pile warp thread tension control apparatus for terrycloth weaving	US 5,722,464 · EP 0 761 857
Method and apparatus for controlled pneumatic removal of a fault weft thread on air-jet looms	US 5,746,256 · EP 0 747 520
Method for avoiding weaving a faulty weft thread during repair of a weft-thread fault	US 5,642,759 · EP 0 747 519
Selvedge twister	DE 195 21 099
Weft thread insertion nozzle / Method for raising performance in weft insertion	US 5,697,405 · EP 0 735 170
Cleaning and clean-keeping of the weaving reed	DE 195 01 794
Weaving loom with a combination of weft-thread cutting device and selvedge laying-in device	US 5,649,570 · EP 0 716 172
Weft detecting and stretching apparatus in a jet weaving loom	US 5,606,998
Method for avoiding fabric faults during transitional loom operation	US 5,590,692 · EP 0 715 010
Air weaving loom with weft hold-down members and enlarged inlet/outlet channel	US 5,570,726 · EP 0 695 821

Invention	Patent number(s)
Method and apparatus for cleaning the dents of a weaving reed (especially in filament-weft weaving with greasy sizing)	US 5,634,981 · EP 0 666 346
Temple table for air weaving machines with visible temple bar	DE 43 11 389
Faulty weft control on air-nozzle looms / Knot-free-fabric weaving on air-jet looms	US 5,332,007 · EP 0 562 230
Method for controlling weft-thread transfer from empty to full bobbin during weft insertion	US 5,303,746 · EP 0 534 132
Air-jet weaving machine	DE 41 31 000
Method for controlling weft-thread insertion timing in an air-jet loom	US 5,107,902 · EP 0 452 667
Guide mechanism for tensioning a weft thread presented to a cutter / Thread deflection device for an air weaving machine	US 5,105,856 · EP 0 438 679
Weft-thread monitor with control circuit to eliminate false weft-detect signals	US 5,031,669 · EP 0 374 398
Air weaving machine with device for removing a faulty weft thread from the shed	EP 0 363 705
Nozzle control device with closed-loop control circuit for an air weaving loom	US 5,031,672 · EP 0 372 046
Air weaving machine for multi-width weaving	DE 38 21 224
Air-jet weaving machine with weft-thread clamping and stretching device	EP 0 335 011
Air-jet loom with Jacquard frame and variable drawing-in width	US 4,958,664 · EP 0 333 201
Method and apparatus for plying a weft thread directly on an air-jet loom / Direct shedding arrangement	US 4,919,172 · EP 0 338 201
Weft-thread insertion device for pneumatic looms with bundled blow nozzles	US 4,905,741 · EP 0 318 802

Invention	Patent number(s)
Auxiliary nozzle for weaving machines with pneumatic weft insertion	DE 37 39 767
Air nozzle for weft-thread insertion on pneumatic weaving machines	DE 37 20 492
Shuttleless weaving machine with pneumatic insertion comprising main nozzle and mixing tube	DE 37 14 826
Jet weaving machine	DE 35 38 386
Control device for the nozzles of a jet-insertion weaving machine	EP 0 079 999

Source: appendix, "Ein Wissenschaftler aus Damaskus", Lindau 2003.
Patent numbers are public record.

APPENDIX B

Where the Machines Run Today

A photographic gallery

Where the Machines Run Today

Five mills on five continents

The photographs that follow show production halls in which weaving machines developed under Dr. Wahhoud's direction were in service. They are reproduced from the German edition of 2003 and convey, more directly than any list of patents could, what those inventions meant in the working life of the world's mills.



Clarysee · Pietem · Belgium · Hand and bath towels



Zorlu · Sorlu · Turkey · Bed linen



Machasa · Santiago · Chile · Denim



Fa. Airbag International

Produkt:

Airbag-Gewebe

in Congleton/England

Airbag International · Congleton · England · Airbag fabric



Fa. Crown Crafts

Produkt: Decken

in South Carolina/USA

Crown Crafts · South Carolina · USA · Blankets

— end of book —

A Scientist from Damascus
English biographical companion · 2026

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