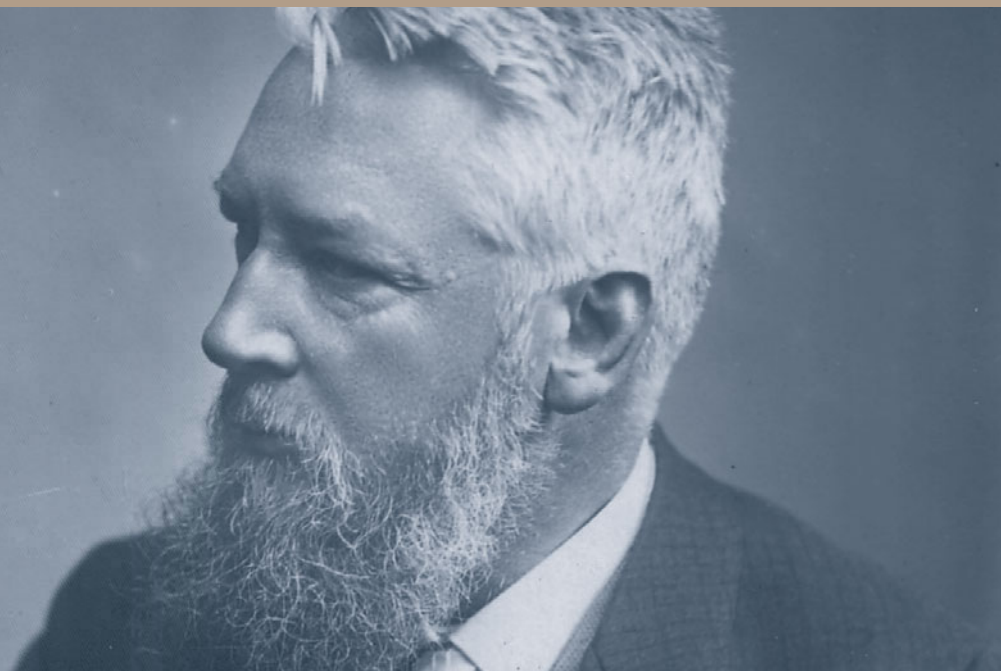


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# Wilhelm Ostwald

The Autobiography

ROBERT SMAIL JACK  
FRITZ SCHOLZ

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Robert Smail Jack · Fritz Scholz  
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# Wilhelm Ostwald

## The Autobiography

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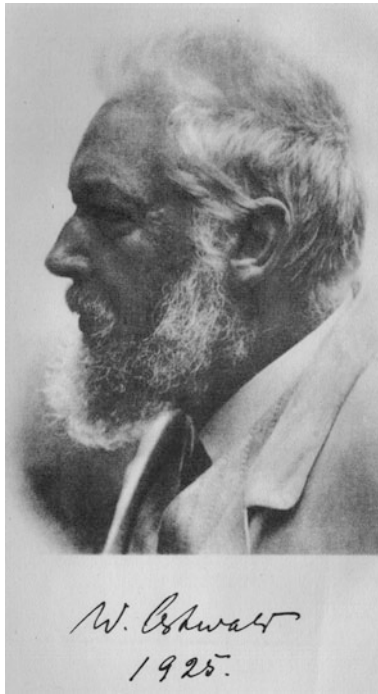
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*Dedicated to German youth<sup>1</sup>*

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<sup>1</sup>This is Ostwald's dedication of volume I of his autobiography.

## Translator's Note

Why do we need a translation of Wilhelm Ostwald's autobiography? George Orwell once remarked that autobiographies are almost never worth reading: *A man who gives a good account of himself is probably lying, since any life viewed from the inside is simply a series of defeats.* Ostwald's autobiography is different: Its strength lies in the fact that it is both an idiosyncratic account of the life of a gifted and important scientist and at the same time it provides a glimpse into the soul of a brilliant, arrogant, sometimes foolish, often self-satisfied and yet deeply disappointed and frustrated individual. And so when Fritz Scholz invited me to join him in preparing this annotated translation I jumped at the chance.

Ostwald's tale as he lets it unfold, is rather like Dick Whittington without the cat. A poor but gifted boy from the impoverished Latvian province propels himself by sheer hard work, discipline and will power into the big bright world of German science. Once there he eagerly seized the opportunity to propagate the important discoveries made by van't Hoff and Arrhenius and, by playing Huxley to van't Hoff's Darwin, he contributed significantly to the establishment of physical chemistry. However, he also makes clear in his autobiography that this important role was, for him, not enough. He wanted to produce a truly revolutionary idea of his own and the first attempt was what he called "Energetics". His contemporaries, however, did not take Energetics seriously. Ostwald endured a humiliating and very public defeat at the Natural Scientist's meeting in Lübeck in the autumn of 1895 and, in the aftermath, he suffered a severe nervous breakdown. He recovered slowly while at the same time gradually losing interest in chemistry—and during this process Dick Whittington turned into Don Quixote.

As related in the autobiography, Ostwald had largely lost interest in chemistry by the time he was 55 and turned instead to making his mark in a wide range of other issues, in many of which he was quickly out of his depth. In some of these matters his opinions were far sighted, in others they were merely commonplace and in yet others, such as his ideas on how to write a splendid poem or his Doctrine of Happiness, his views were simply ridiculous.

The autobiography was written in the period 1925–1927 and may owe some of its quirks to the manner of its birth. At the beginning of his career Ostwald wrote all

his drafts in longhand, though later he speeded things up by learning to use a typewriter. It was only after his retirement that, in 1910, he switched to the use of a dictaphone and this is what he was using for his autobiography. He was well aware that the dictaphone brings with it the danger of repetition, for instead of working hard to get the meaning across accurately the first time—as he did when writing in longhand—there was a tendency to just repeat an argument in several imperfect versions. He promised to try to avoid this pitfall, but he was not always successful. Perhaps in his old age Ostwald simply lacked the energy to proofread the dictaphone transcripts, for such repetitions abound. German sentence structure is more forgiving of this sin than is English and so, in the interests of clarity; many of the unhelpful repetitions in the German text have been removed.

Lack of adequate proofreading might also explain some aspects of the organisation of the text. Ostwald frequently seemed to dictate in “lung-fulls” of words and the inevitable pauses, which then entailed, may have been transcribed as the start of new paragraphs. Certainly, the text does tend to jump about in a plethora of one sentence and two sentence paragraphs. Though this layout is at times challenging, it has been left intact in the translation.

Yet despite all that, the text is eminently readable for Wilhelm Ostwald—winner of the Nobel Prize in Chemistry in 1909—was a prolific and accomplished writer both of scientific and of popular texts. He was someone who could and did write clearly and effectively. Here in his autobiography, which he kept largely free of any hard to understand technical matters, his style is dictated by his view that, *every time a writer treats a subject in exalted, solemn, touching or uplifting terms then he has probably abandoned logic and clarity*. True to this motto, he left the story of his life free to emerge in plain language and in a largely conversational style.



# Preface

Wilhelm Ostwald was a genius who was equipped with a knack for unconventional thinking in science and philosophy and with skills in both painting and music. On the other hand he was, surprisingly, a much more conventional and average personality in everyday life. Whereas his scientific achievements are part of the fundaments of modern chemistry, and his philosophic views have been extensively and critically reviewed,<sup>2</sup> the world of his personal thinking and feeling, laid out in his autobiography, has so far been rather closed for non-German readers. The present translation will hopefully change that. The translation of his autobiography is certainly of special interest for readers in the US, the UK and France, as it shows what impressions Ostwald took from these countries during the course of his extensive travels. They will, of course, not agree with all of his views.

Ostwald published the first volume of his autobiography in 1926, followed by the second and third volumes in 1927.<sup>3</sup> An abridged and commented (German) version was published in 2003.<sup>4</sup> That edition contains a number of regrettable cuts and also errors in some comments. Beside his autobiography, two biographies have been published in German; one by his daughter Grete Ostwald<sup>5</sup> in 1953 and one as early as 1904 by his former student Paul Walden.<sup>6</sup> There are also other biographical

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<sup>2</sup>Görs B, Psarros N, Ziche P (eds) (2005) Wilhelm Ostwald at the Crossroads between Chemistry, Philosophy and Media Culture. Universitätsverlag, Leipzig.

<sup>3</sup>Ostwald W (1926/1927) *Lebenslinien. Eine Selbstbiographie*. Klasing & Co GmbH, Berlin.

<sup>4</sup>Ostwald W (2003) *Lebenslinien. Eine Selbstbiographie. Nach der Ausgabe von 1927/27 überarbeitet und kommentiert von Karl Hansel*. Verlag der Sächsischen Akademie der Wissenschaften, Leipzig (in Kommission bei S. Hirzel, Stuttgart, Leipzig)

<sup>5</sup>Ostwald G (1953) *Mein Vater*. Berliner Union, Stuttgart

<sup>6</sup>Walden P (1904) *Wilhelm Ostwald*. Engelmann, Leipzig

publications about Ostwald in German.<sup>7,8,9</sup> Although the corner stones of Ostwald's life are known in the English speaking world,<sup>10,11</sup> the subtle details and especially his personal attitude towards his colleagues in Germany and abroad are still hidden in his German writings. The fact that the autobiography has never been translated to English may be surprising, especially because Ostwald and his students played an outstanding role in the establishment of physical chemistry in the USA<sup>12,13,14</sup> and his contributions to chemistry are basic to this science and part of the chemistry curricula world wide. The lack of a translation may be due at least in part to the anti-German feelings that prevailed after World War I, during the Nazi period (1933–1945), and also after World War II. These times were not conducive to the popularisation of the biography of a German scientist, especially since Ostwald, as a child of his times, was a strong believer in a nationalistically biased world view. There is however an interesting dichotomy here for, as the autobiography shows, Ostwald was at the same time a tireless propagator in many diverse areas of, international cooperation. Perhaps now that the dust of these historical struggles has settled back down, non-German readers may be better prepared to understand that some of Ostwald's seemingly outrageous remarks merely reflect the spirit of the times in which he lived. The present publication, together with a recently published book on the development of electrochemistry in Eastern Europe<sup>15</sup> is aimed at opening up the history of science in Europe and making it accessible to English speakers.

This translation is based on the German original 1926/27 edition. In addition to the text and photos, it contains a Name Index (see end) and a pedigree of the Ostwald family. I am very happy that my colleague at the University of Greifswald, Professor Robert Jack, carried out the translation, because this was a task which needed someone who is both a “native speaker” and a scientist. We have

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<sup>7</sup>Ertl G (2009) *Chemie in unserer Zeit* 121:6724-6730.

<sup>8</sup>Bartel HG (1999) Ostwald, Friedrich Wilhelm. In: *Neue Deutsche Biographie* 19:630-631 (online: <http://www.deutsche-biographie.de/pnd11859057X.html>)

<sup>9</sup>Messow U, Krause K (1998) *Physikalische Chemie in Leipzig. Festschrift zum 100. Jahrestag der Einweihung des Physikalisch-chemischen Instituts an der Universität Leipzig*. Universitätsverlag, Leipzig.

<sup>10</sup>Donnan FG (1933) Ostwald Memorial Lecture. *J Chem Soc* 316-332

<sup>11</sup>Sutton M (2003) The Father of Physical Chemistry. *Chem Brit* 39(5):32-34

<sup>12</sup>Stock JT (2003) *Ostwald's American Students. Apparatus, Techniques and Careers*. Plaidswede Publishing, Concord

<sup>13</sup>Servos JW (1996) *Physical Chemistry from Ostwald to Pauling: The Making of a Science in America*. University Press, Princeton

<sup>14</sup>Coffey P (2008) *Cathedrals of science. The Personalities and Rivalries that Made Modern Chemistry*. University Press, Oxford

<sup>15</sup>Scholz F (ed.) (2015) *Electrochemistry in a divided world. Innovations in Eastern Europe in the 20th Century*. Springer, Berlin

intensively—sometimes heatedly—discussed the details of the translation, because it is no mean task to make Ostwald's text understandable to contemporary English readers. Robert gives some explanations of his translation in the Translator's note.

Greifswald, Germany

Fritz Scholz

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**Part I**  
**Riga—Dorpat—Riga**

# Chapter 1

## My Parental Home and Childhood

*My hometown Riga.* I was born in the autumn of 1853 in Riga, Livonia.<sup>1</sup> At that time Riga belonged to the Russian empire in which the old Julian calendar was still used and, despite its heathen origin, the Greek Catholic Church preferred it to the newer Gregorian calendar which, in their view, was the work of “schismatics”. By the old calendar my birthday fell on the 21st of August, by the new one on the 2nd of September. I was my parents’ second son; my brother Eugen was born 2 years before and my younger brother Gottfried 2 years after me. I had no sister.

At that time Riga was essentially a German city whose architecture and constitution resembled that of Lübeck from where Riga’s founders had come some 1000 years previously. The entire upper and middle social strata, aristocrats, owners of large estates, academics (they were referred to as “men of letters”), tradesmen and artisans spoke German as their mother tongue and their mental world was rooted in German culture. Indeed the first edition of Kant’s “Critique of Pure Reason” was published by J.F. Hartknoch in Riga. The rural population was made up of native Latvians who had been freed by the estate owners at the beginning of the nineteenth century—long before this happened in Russia—and who had been made owners of tolerable amounts of land. They lived on small scattered farms rather than in villages. From these farms a steady stream of excess workers moved into the cities, particularly into Riga, where they easily found jobs as servants, apprentices and so on and, in the second generation, by picking up the German language and German habits, they formed a new social tier in the city. They were, however, considered lower class.

The Russians were represented by a number of government administrators and army personnel; a few were also traders, artisans or gardeners. They were considered to be culturally and socially inferior, but were tolerated as an unavoidable evil and were treated with cool politeness. A small minority of them, those who had

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<sup>1</sup>Governorate of Livonia (in Russian Lifyandskaya Guberniya) was part of the Russian empire. Before 1796 it was called the Riga Governorate.

benefited from a European education, might on the basis of their personal merit be accepted into society, though they retained the stigma of being basically foreign.

*Russia.* This Baltic German attitude towards Russia was not unfounded. Tsar Peter the Great's attempt to bring Russia out of barbarism and lead it towards European culture had been at best a superficial success, because Peter himself remained a barbarian to the end of his life. The real civilising work was begun by Alexander II who realised that the standards of the broad mass of the people must be raised, and he implemented the first measures to this end. However this sort of work is like planting a wood; in the best of circumstances the gardener only lives to see the first beginnings and he must place his trust in an uncertain future, for much time and favourable weather will be needed to allow the trees to flourish. Because Peter, driven by his coarse nature, expected to reap the fruits of his work almost before the seeds had germinated, all he managed to achieve was a mere illusion of culture that one patriotic Russian described as being "rotten before it was ripe". The enormous upheavals which have shaken Russia for the last two decades and which are even today not completed, have to be viewed as a movement by which the Russian people rid themselves of Peter the Great's half digested "reforms". Only when this process is complete will an organic development of culture be possible.

*My native country.* In contrast to the volatility which for centuries had held things up in Russia, cultural development in the German population in the Baltic provinces had proceeded steadily, thanks to the unbroken connections to the mother land. People from these provinces tried, whenever possible, to study in Germany or at least to finish their education there. At each of the larger German universities, particularly in Jena and Göttingen youths from Courland and Livonia made up a significant and easily recognisable part of the student body.

The conditions of life in the Baltic States were heavily influenced by German culture and, as mentioned above, the freeing of the serfs had been achieved here half a century earlier than in Russia. Schools had been built all over the country and they were run in close cooperation with the church. The language of the Letts was studied by the priests because it provided the only route to the souls of the rural population. Because of all this, the cultural border between Europe and Asia ran north and east across the Baltic provinces rather than along the political border of the Russian Empire.

*My grandparents.* My paternal grandfather—the family memories go no further back—was a master cooper in Riga. He had emigrated from Berlin to Riga where he was not particularly successful in business but did manage to give his five children—four sons and a daughter—sufficient education that they could provide for themselves. My uncles all stayed in the same trade but did manage to give their sons access to higher goals. I remember my grandfather Ostwald only as a decrepit old man who day in and day out sat almost motionless in his armchair smoking a long pipe. His wife, my grandmother, was by comparison spry. She kept the house and the cooperage going till her sons, who all worked as coopers, had settled down. She died long after, in her late eighties when I, her favourite grandson, was about to



get married. My bride-to-be was a good listener and grandmother was happy when she had the chance to tell her all sorts of stories from my childhood. When illness finally chained her to her bed her carefree spirit remained unbroken. When she realised that death was near she put her affairs in order and made all the arrangements for her own funeral. The priest responsible was a bigot who wished “to prepare” her for death by graphic descriptions of hell and its punishments. She listened to him patiently rather than devoutly. When he finally left she pulled at one of the ribbons holding her nightcap and with a gesture of indescribable irony threw the bonnet at the door through which he’d left. She’d been a practicing Christian all her life and an admirer of Dietrich, the old village pastor, but she could not find Christianity in the words of this foolish zealot. Soon after, she closed her lively eyes and passed into eternal peace.

*My father.* At the time of my birth my father was a very poor but adept and enterprising artisan who, long after his journeyman years as a cooper in Russia, had settled down in his home town and married an equally poor baker’s daughter. With the first money that he earned he bought his own little house. The money was just enough for a small house in the cheapest neighbourhood which was on the outskirts of the so-called Moscow suburb in the “Sand Hills”, a long barren ridge of sand dunes on the eastern periphery of the city. Soon after my birth this house disappeared under an embankment of the Riga–Düneburger railway, so that I never knowingly saw it.

My father was the most talented of the brothers according to his teacher, H. Fromm, from whom I, 30 years later, took my first lessons. Since Fromm lived to be nearly one hundred, he could also have taught my eldest son had I not just at that time left Riga. My father had shown a special skill in drawing. In fact he was so good that it almost cost me my existence. This happened as follows: At that time Russia was ruled by the strong and ruthless Tsar Nicholas I who, in order to ensure a good supply of students to the imperial Academy of Fine Arts in Petersburg, ordered the administrators of all the schools in the enormous empire to select and forward the names of the most gifted schoolboys in their area. A certain number of them—I believe around a hundred—were then to be given an imperial stipend to study at the Petersburg academy. My father was one of those to be nominated from Riga. However my grandfather viewed the whole matter sceptically and exercised his parental rights to block the nomination. Had this not happened my father would have gone to Petersburg, would have married a different woman and the special mix of paternal and maternal genetic material which is responsible for the special properties that make me would never have come into being.

My grandfather’s decision ended any possible artistic career for my father and instead he started an apprenticeship. As a memento of these times, there hung in my parents house two of my father’s sketches, very carefully executed with special sharpened sticks of chalk and then framed under glass. These were objects of admiration to me throughout my childhood. One was a copy of Raphael’s angel from the Madonna in Dresden; the other was a woman’s head in oriental costume

the original of which is unknown to me. Later my father gave up drawing; he said that the work in the cooperage had made his hand too heavy for it.

Once his apprenticeship was over my father became a travelling journeyman in inner Russia and there he experienced many different sorts of adventure. Apart from the repeated danger of dying in winter from snow and loneliness, he also luckily survived other dangers which threatened to throw the young, fresh and energetic youth off the track. For example he was for a while a teacher in the household of a Count Tolstoy. I have been unable to find out whether the famous Count Leo Tolstoy was one of his pupils; however it is certainly possible because Leo Tolstoy was born in 1828 and my father's years as a journeyman were in the early forties. However, the Tolstoy family is many branched and direct evidence to support the notion is missing.

I asked my father, how he, as a journeyman-cooper, got a job as a teacher. I don't remember the details but it seems that his determined intervention during a chance encounter had rescued the Count from a difficult situation and this had so impressed the Count that he wanted to retain his helper permanently. At that time in Russia almost any German was considered erudite and in any case teaching standards were not very high. By staying up half the night to learn whatever he had to teach the next day he managed to carry out his duties satisfactorily and so keep himself in his job. Out on a walk with his handsome pupils he was once even spoken to by Tsar Nickolas himself; he liked to tell us children of the great impression the sharp look of the emperor's steel blue eyes had made on him.

This situation came to a sudden end when a beautiful grown up sister of his pupils returned home. She soon became the object of the teacher's unspoken desire and she seemed to be not averse to this homage. The family felt it advisable to avoid any future difficulties by discharging the teacher, and a tortoiseshell needle box, daintily inlaid with mother of pearl, which my father long kept as one of his treasures, leads me to suppose that the parting was accompanied by tears from pretty eyes and this gift as a pledge to memory.

However this episode only temporarily separated the young cooper from his trade. He soon found work in the barrel factory of a large brewery in Petersburg, where he quickly rose to a leading position. But here also he did not stay long, because the owner—a rich widow of a certain age—gave him to understand that she would happily promote him to an even higher position. He said goodbye and returned to Riga to settle down and take the exam for his master craftsman's certificate.

*My grandparents on my mother's side.* My mother was also a pure bred German. She was born in Moscow where her father, who had emigrated there from Hesse, ran a baker's business. I have no idea what induced him to leave Moscow and settle in Riga for such a journey was at that time quite a difficult venture. One made a contract with a wagoner for the transport, and the journey took 30 to 40 days. It could only be undertaken in winter when frost and snow made the roads passable; in summer this was not possible. Food and shelter for the night had to be carried along because accommodation along the way was rarely to be found. In this way

my mother came as an adolescent to the town in which she would spend the rest of her life. Her two sisters and two brothers completed the family.

I can still well recall my mother's father Heinrich Leukel. In his later years he gave up the bakery trade and became toll collector on the long bridge which at that time was the sole connection between the two parts of the town on opposite banks of the river Duena. The bridge and the adjacent rampart of the river bank were the landing places for the numerous ships which visited the port. Because of this, certain nautical traits became evident in the former baker's dress and language, all of which left a strong impression on me and this was increased by the occasional gift of ships biscuits and other naval victuals. Altogether grandfather was a good hearted man who made no secret of his love for his grandchildren. He died when I was still just a boy.

Grandmother was a buxom, busy woman who was confined to the house by an ailment. I remember her best for the dry humour with which she countered life's ups and downs. She loved to emulate her husband's trade at the household level and delighted us children at every celebration—and she was always inventing new reasons for celebrations—with homemade "Saftpiroggen", a pastry in the shape of a shoe sole—but much bigger and filled with preserved cranberries. She died soon after my grandfather.

As one can see, I grew up in a lower middle class milieu. Nobody was destitute, but everybody had to be careful to make ends meet and there was nothing left over for luxuries. My mother often told us how, in the first years of their marriage, she'd go every evening to the workshop to collect the left over wood shavings with which to cook the evening meal.

But things soon started to look up. Just as I was born, my father had his first real earnings in his job and from then on he became ever more successful. The hut in the "sand dunes" was changed for a better situated house whose large inner court was conveniently used for a necessary extension of the cooperage. The inner court bordered a stream called the "Speckgraben" along which lay many small businesses, particularly tanneries. They had driven away almost all the fish and, apart from water beetles, I can only remember the large numbers of leeches which filled its turbid waters.

My first memories are connected with this place. I can see myself trying to catch leeches with a rod held in the water. One of my father's cooper apprentices tried to frighten me by telling me that the leech would pull me and the rod into the water and then eat me; I thought however that if the worst came to the worst I could simply let the rod go. Then again I see myself and my brothers together with the cooperage apprentices in the first snow shouting with joy as we used round pieces of wood to toboggan off the low barn roof.

In summer we used the stream for boat trips, which were strictly forbidden, and for which we were severely punished when found out; in winter it served as an ice rink. There remains fixed in my memory a picture of a boy in black velvet knickerbockers, red jacket and yellow cap who elegantly glided on a sunny winter morning along the stream's further bank while on this side I struggled with the rudiments of the sport.

My brothers had inherited my father's robust build and in comparison to them I appeared to be a bit of a weakling for I had more the build of my mother and I often preferred to play quietly alone rather than join in their loud games.

*Life at home.* At this time the most important person in my life was my mother whose favourite I was. My father worked from dawn till dusk and often did not make it home for the family meals. He was, as I said, tall and strong and later when I met the great chemist R. Bunsen his face reminded me of my father. My father was impetuous and easily roused to anger so that we children were rather shy of him especially as we didn't see him very often. When he wasn't working he devoted his spare time to his one great passion which was hunting and this also kept him from home. Regularly on Saturday afternoons during the summer he'd set out with his little cart to Babbitsee, a small reed covered stretch of water around 15 km away, where countless wild ducks lived. He hunted these from a small boat that a local farmer pushed through the reeds with a pole. Late in the evening he'd return home with his take which was often enough 30–40 ducks, coots and other wildfowl. On Monday morning we boys had to bring most of them to the friends and relatives who were regular recipients of these gifts. The rest would be consumed at home and my mother soon developed an extraordinary skill in their tasty preparation.

In winter father hunted hares, deer and foxes; in the spring there was the snipe and blackcock mating season, so that there were only brief intervals when father stayed at home and spent time with the family.

I inherited nothing of my father's love of hunting. In fact I soon found myself in opposition to it. This started as I began to find the distribution of the huntsman's bag to the friends and relatives increasingly intolerable. On top of that there was a certain animal loving influence from popular science tracts that I'd come across by chance. Moreover I was bored by the endless hunting stories that I had to listen to at the family table, for my elder brother shared father's love of hunting and had accompanied him from an early age. When we schoolboys went for a walk on a free afternoon, many armed themselves with reed blowpipes to hunt birds. Although the quarry was rarely hit, I would go ahead and try to chase off the potential victims of this youthful bloodlust before the hunters could get in range. Since the others were not happy about that, I often enough suffered for my love of animals which, of course, only strengthened me in my opinion and in my opposition to it all.

My mother was both by nature and by education an excellent housewife. The rapid growth of the cooperage considerably added to her duties, because at that time it was the custom that the wife of the master craftsman cooked for the journeymen and apprentices. And so my mother had to daily defend her reputation as a housewife by feeding, in addition to the family, 6–12 boarders whose hunger had been sharpened by hard work. The workers were fed first and only after they had finished was the table set for the family, for the parlour wasn't big enough to hold all at once.

I'm still amazed how my mother, with very little help, managed to keep this large household in perfect order and at the same time found the time to read books and newspapers and so to keep alive a by no means narrow field of mental

activities. Early on, as soon as the financial situation had permitted, my father had organised for her a regular subscription to the town theatre which she eagerly visited. There numerous excellent artists were to be seen and heard for they were glad of the opportunity to break their long and tiring journeys to guest performances in Petersburg by resting in our appreciative and friendly city on the Duena.

My mother's lively interest in the arts had a great influence on my personal development. Through her I was early led to an appreciation of the enrichment of the inner life which can flow from such sources, and there arose an area of common interest between us that set us apart from the other family members who did not share this disposition. As is usual in such cases I soon grew beyond the spheres to which my mother was restricted by the burden of daily work in the house and with the children. I became an omnivorous reader of everything I could lay my hands on and went my own way—a development which she watched fondly though sometimes disapprovingly.

*Support from my father.* From his journeyman years my father had brought home with him the strong belief that education was of irreplaceable value. Because of this he had made it an unbreakable rule to open up for his sons every possibility for advancement.

I don't know if he realised from the start the sacrifices he would have to make; sacrifices which went beyond just the financial burden. I mean by this that he had to accept that his children sooner or later would grow beyond his mental horizons and that their rise into the higher social classes could bring him into conflicts which, in the sharp caste system operating in the Riga population, were bound to hit him hard. Whatever the answer may be, he accepted all this without hesitation and never showed the slightest wish to limit the opportunities which he had opened for us.

*My first school.* As a result we children were sent to the elementary school run by the teacher Mr. Fromm where I started before I was 6 years old. I was a precocious child and had learned to read from what I had, without paying too much attention, overheard from my older brother's lessons. In the school I was diligent without coercion and made my teacher happy, particularly in maths. He was less impressed with my achievement in writing. One says that the sins of youth are paid for later. That seemed to apply in my case for I am certain that of all of my brothers and classmates none would later be faced more than I with the need to write. I did however always like to do it.

*Shadow of the future.* Fromm's school was a so-called crown school, which meant that it was financed and run by the government. Parallel to these schools there were the city schools which were financed by the local authority and which were considered better both in their teaching and in their social status.

Crown schools were largely for the children of the lower social classes and in particular for the sons of ambitious Latvian and Russian families. Because of this we always had a small number of misfits in the school—Letts who mostly spoke only broken German, whose cleanliness and behaviour left much to be desired and who had little in common with the other pupils. Those of them who were talented

quickly learned to adopt our ways of thinking and behaving, but there were also a few who brought with them a determination to move up at all costs though they lacked any real ability. They adopted a hostile attitude to the rest of the pupils and to the teachers and blamed their lack of progress on the malevolence of the school. There were often differences of opinion which, as is the way of boys, would be settled by fisticuffs. I can see today the final scene of such an incident. The Latvian boy, who'd fought with nails and teeth, had been subdued and now sat as a loser with dishevelled hair and clothes, bloody foam on his lips and hate in his face. With a sunken head he squinted maliciously at his opponent. Latvians are, at best, not handsome and this youth was quite some degrees uglier than most. Although boys try not to show these things, I was shocked at the sight of bestial anger in this scarcely human guise.

The impression faded as the boy soon left the school, though it was strong enough to be stamped on my memory. This memory returned to me when, 60 years later, close to the end of the Great War, the Latvian nationalists gained the upper hand in Livonia and Courland and inflicted horrible atrocities on their German fellow citizens.

## Chapter 2

### Youth

*My secondary school.* The question of our further education was painstakingly considered by my father. From the time of Tsar Alexander 1st, who had set out with such zeal and success to improve the cultural development of his empire's Baltic provinces, there existed in Riga a Latin school administered from the government in St. Petersburg. This secondary school laid emphasis on Greek and Latin and was organised along the lines of the schools which had been established in Germany since the start of the nineteenth century under the pernicious influence of Wilhelm von Humboldt. It was the "obvious" preparation for an academic career and, except for a short period in the eighteen seventies, the University in Dorpat, just like the universities in Germany, only accepted as students those who had passed the school leaving certificate exams of a secondary school specialising in the classics. As everybody knows there exists to this day in Germany the absurd situation that a university does not have the right to decide who may enter it, but must leave this central decision in the hands of the school examination committees.

The second possible school was the old Cathedral School that had been founded as a priests' seminary before the reformation. It was now run by the town administration which had organised and expanded it as the town's secondary school. The competence of the town council and guild authorities in educational matters can be judged by the fact that they appointed the brilliant young Johann Gottfried Herder as Director of the Cathedral School and gave the 20 year old a free hand to reform and organise it. His success there was outstanding. Herder probably had his happiest years in Riga where he developed the main ideas of his influential work. He left after 5 years in 1769 to develop his work in a broader arena and in the following year he met Goethe in Strasbourg.

In the meantime the progressive attitude of the school authorities in Riga had led to the founding of a Polytechnic which, it was hoped, would stimulate the development of productive industry which the country lacked. In order to attract suitable pupils, the Cathedral School was converted into a technically oriented secondary school and this was pushed through in the face of opposition from the monopoly of educational classicists, although some considerable concessions had to be made to

them. In particular the Director of the new school was a dyed in the wool classicist called Haffner of whom I will have more to tell later on.

My father was luckily so well advised that he agreed to entrust his sons to this new school. This was a most important decision for my whole future development, because there is no doubt at all that my scientific and organization potential would have been stunted or even smothered at the secondary school specialising in classics. The technical secondary school in Riga was a thoughtfully constructed institution. The entrance exam showed that attendance at the elementary school had been sufficient to satisfy its entrance criteria. The school education was spread over 5 years and hence the institute was divided into five classes. The curriculum was such that only highly gifted and diligent pupils could complete the course in this time so that even a "good" pupil was forced to repeat one or other of the classes. As to foreign languages; there was only French in the first class together with the obligatory Russian, while Latin started in the second class and ended in the fourth where it was replaced by English. Physics was taught from the second class on and Chemistry in the fifth. Maths was taught up to the stage of analytical geometry but did not include differential calculus. At the end of the fifth year there was a final exam which initially only qualified one for entrance to the Polytechnic but not to the University. Shortly before I left the rules were changed so that this school leaving certificate enabled one to study mathematics and natural sciences at the University. This was the result of a long fought battle and my father's decision had been based on the hope that it would turn out this way. Not long afterwards the classicists saw to it that this decision was rescinded.

*My best teacher.* I look back happily on the 7 years in this secondary school. Not, I must say, that the school itself gave me much, but it introduced me to the comradeship of the large and varied pupil population and this opened many new vistas for me beyond what was available in the narrower family circle. There was, however, at least one of the teachers to whom I am indebted for his outstanding support. This was Gottfried Schweder who had studied astronomy and now taught maths, physics, and biology at the school.

Schweder was a tall man with a broad chest and powerful shoulders, who had the reputation of having been one of the best fencers at the university. His short curly beard, full blond hair and blue eyes made him look like an archetypal German. He had a cheerful and friendly nature so that it was no wonder that we boys, from the youngest to the oldest, were ready to follow his lead and would have gone through fire for him. Afterwards he was for many years director and this was a blessing for the school.

*The beginnings of independent thought.* In the first years I was the same willing and diligent pupil I'd been in the preparatory school. Then, however, a new vista opened up which was to have the greatest effect on my development. This was the opportunity of getting hold of all sorts of books from my fellow pupils.



Books in my circle were quite rare and costly. They were largely restricted to what one could get from the lending libraries which stocked mainly contemporary novels. At home we also had the weekly magazine “Gartenlaube”<sup>1</sup> whose well bound volumes constituted the main part of our house library and for many years they were my main source of intellectual nourishment. Looking back it’s fair to say that this nourishment was both ample and healthy. At this time—the start of the 1860s—there was the great outgrowth of science and the start of modern technology and industry in Germany. The editor of the “Gartenlaube” had responded to this by publishing many articles on these subjects which both stimulated and informed me. In addition, the strong patriotism which was constantly expressed in the articles had the effect of making our family more conscious that we were unquestionably German.

*Our German heritage.* The political situation in my home country was that the strident pestilence of Slavic nationalism had begun to threaten our special status, within which a rich and fruitful culture had flourished. We felt—without any special pride but also with no particular wish for change—that we were politically part of the Russian empire but intellectually part of German culture. No political alignment with Germany was possible at that time because the German empire (Reich) had not yet been formed.<sup>2</sup> The Russian rulers had always acknowledged and fostered the special status of the Baltic provinces from which they drew many of the leaders of the military, the administration and the professions—people who could not be so easily recruited from Russian sources. Because of this there was a considerable degree of gratitude and affection felt in the Baltic provinces not to the empire or to the dynasty but rather to the individual Tsar.

*Russification.* The special status of the Baltic provinces was anathema to the developing pan-Slavic movement. Already during my childhood this movement had achieved sufficient influence to force through an increasing use of the Russian language in schools where up till then the lessons had been entirely in German. We pupils despised everything Russian as belonging to a lower class and met the increasing load of Russian lessons with passive resistance. As a means of justifying and anchoring Russian ways of thinking, the theorists of the pan-Slavic movement demanded and got an increasing weight given to Russian history in the schools. At least for the mentally alert pupils this had the opposite effect than that intended, because Russian history is a good deal bloodier than that of Western nations and thus gave them a historical basis for their anti Russian attitude.

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<sup>1</sup>Founded in 1853, this was the first mass-circulation German newspaper and a forerunner of modern magazines.

<sup>2</sup>Ostwald means here the *German Reich*, which was proclaimed in 1871 in Versailles and ended in 1918 with the abdication of the German emperor following World War I. The First *Reich*, better known as the Holy Roman Empire, existed from 962 to 1806. The Third *Reich* was the Nazi state existing from 1933 to 1945 (1943–45 called Greater German Reich) and ending with World War II.

Russian lessons were in the hands of a German renegade called Haller whose political and ethical decay was instinctively detected by us children and so we made his life rather hard. The uncontrolled fury of the harsh punishments with which he'd respond from time to time, only made matters worse, for we regarded it as more or less a matter of honour to do as little as possible in his lessons. On top of that Russian is a very primitive language full of forms and endings but lacking rules, and therefore hard to learn. Even the attempts of Russian linguists to remedy these faults with appropriate rules did not improve the situation much. Meanwhile the government tried by imposing strict regulations to force us to learn Russian. This led me often enough into unnecessary conflicts.

*Order and Beauty.* To begin with, all this didn't bother me. The stimulating lessons of Schweder released a latent love of nature in me which to begin with expressed itself in the usual collection of plants, butterflies and beetles. We were expected to prepare for our teacher a certain number of pages on which herbs had been properly dried and pressed. I remember how I took up the challenge of arranging stems, leaves and flowers all to the best advantage and how this somehow resulted in beautiful sheets for which I got special praise. This was the first flowering of a perception which only ripened in my old age.

Another experience, whose relationship to that one I only later discerned, took place about the same time in the drawing class. We were supposed to draw parallel lines by moving a triangle along a ruler and had been told to do this for the different sorts of lines—bold, soft, close together, far apart, continuous, punctate, dashed, and so on. I wanted not just to draw the lines but to give them some sort of context. To do this, I used an ornamental border to define the top of the wall of a room and accentuated this impression by the choice and distribution of the lines. This drawing earned me special praise from the teacher who was otherwise not particularly pleased with my work. I wondered how the effect had been achieved, but I didn't get very far with this line of thought.

*The beginnings of chemistry.* In my first year in the secondary school I was a model pupil who quickly absorbed and mastered whatever was being taught and so I had no trouble being moved to the next higher class at the end of the year. After that, however, my personal development began. Because of the lively exchange of books between the pupils I managed to get hold of one about making fireworks—something that had interested me for some time. The author was someone called Websky<sup>3</sup> and he had treated the methodological aspects thoroughly. He began appropriately enough with a description of the materials required and used here, in addition to their trivial names, also the chemical formulae. To begin with they didn't mean anything to me because I was just fascinated by the instructions for

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<sup>3</sup>Probably, Ostwald has had either the book (i) Websky M (1850) *Schule der Lustfeuerwerkerei*. Hirt, Breslau, or (ii) Websky M (1842) *Lustfeuerwerkunst, oder leicht fassliche und bewährte Anweisung zur Verfertigung von Lustfeuerwerken*. Hirt, Breslau.

producing the various different fireworks. For the future however they were going to play an important role.

At the beginning it wasn't so easy for an 11 year old boy to follow the instructions because there was nobody to offer any help and, in addition, it was not easy to get hold of the necessary materials and equipment. Finally I found a friendly apothecary from whom I bought small amounts of saltpetre, sulphur, antimony and so on, and he gave me some help. However, for the most part I had to rely on the printed instructions and it was decisive for my future life that I discovered at this early age that all the art and science of mankind is stored in the form of printed words and that it can all be recovered and brought back to life at any time by an eager and dedicated reader. I also learned, even if I could not have consciously expressed it so, that the written words alone are seldom enough, and that the more experience the reader brings to the matter the more he will be able to extract from the text. That was a problem because none of my school friends could help me, though they were, to be sure, happy to join in when the fireworks were set off. So playing with fire opened for me a door to the world with all its wonders, and by wonders I mean the opportunity to experience myself all sorts of strange things that grabbed my youthful imagination.

I am thankful to my parents who tolerated all this, despite the fact that my new hobby was potentially dangerous given that my father's business meant that there was always a large stock of wood and readily flammable shavings lying around. My mother helped out by letting me have all sorts of kitchen utensils like a mortar, sieves, bowls and so on. Even when once a whole batch of flares which I was drying in the oven went off and terrified the kitchen girl they did not forbid my activities but rather gave me a little room in the attic for my magic games. I didn't disappoint their trust for I never caused a fire. My experience with fire did, however, make it possible for me occasionally to help put out a fire in the workshop when the guilty worker who'd accidentally started it had rather lost his head.

The fireworks gave me for the first time that happiness which comes from putting into practice things which had been up till then mere thoughts and ideas and this is exactly what spurs a researcher or explorer to his efforts. At the beginning, of course, youth is satisfied with much less. Looking back subjectively, I see that this sort of experience was a constant and inexhaustible source of joy throughout my whole life. Even today when I am much less active I experience that same anticipatory excitement before a decisive experiment and the almost painful happiness when it succeeds that I did when I was a boy. In this case the strength and duration of the emotion are not as in most situations inversely related; on the contrary the joy of the researcher is both strong and lasting.

*Work style.* Although the family became more affluent around this time, life remained frugal. I had only very meagre resources for my experiments; my small amount of pocket money would sometimes be supplemented by a little additional allowance from my mother—but only in the most urgent cases. Because of this I got used to making for myself almost everything that a boy my age could, and I enjoyed doing that. This habit of getting by with few resources and with simple equipment

and, as far as possible, putting together whatever was needed myself, is a work style that remained with me for my whole life.

Even in times when money was not limiting I kept to this way of doing things and I usually spent as much time and effort on simplifying the technical aspects of my experiments as on their conception. This style later made it possible for me at a relatively young age to give up my teaching position, together with the large laboratory and all the equipment and material that went with it, because I was sure that I'd be able to finance all the research I wanted to do out of my own pocket. And that is exactly how it turned out.

Another point that characterised my work style back then was that I was not averse to rather monotonous repetitive work. For my fireworks I sometimes had to glue and fill hundreds of paper casings or do similar repetitive chores. I never found this horribly boring, but instead tried to find ways to get it done in a more efficient way, and the search for such a solution gave the work a new attraction. Moreover I gained the satisfaction that comes when repetition leads to ever increasing dexterity and efficiency in the work. Finally, I have to admit that I got real pleasure from seeing the products pile up, perhaps rather in the way that the miser gets the joy of his life from the accumulation of money. There is no doubt that my parents' genetic constitution and habits played a role in all this. My mother was endlessly involved in housework and my father, even after he was well off, spent his mornings in business meetings and then, after lunch, put on his working clothes and went to the workshop to do himself all the things which needed particular care and skill. Nevertheless, there was some personal element at work here for this character trait was stronger in me than in my brothers.

In this way I found myself involved in an ever increasing round of work and interests. I'd have liked to have a lathe to make the rods round which the paper casings were formed. Sadly there was no lathe in my father's workshop, and so I decided to make one myself and actually managed to build one out of simple material. Once it was finished—which took quite a while—my interests had turned elsewhere and in the end I scarcely used it. I have to admit that this also is a characteristic that was typical of my later life.

*Painting.* Apart from fireworks my main interests then were collecting butterflies and beetles as well as sketching and painting. A neighbouring family called Schwendowski was a major influence on me in the matter of painting. The father was a minor official in Riga's town administration where his drawing abilities were put to use in preparing Diplomas and other calligraphic works of art. Most of his many children were considerably older than me, and one of them was a professional painter. It was always a great joy to me to be allowed to look through his sketch book with its lively water colour pictures whose colours were astonishingly appealing. Some of these I can still see in my mind's eye to this day.

I very much longed to be able to produce similar things myself. I tried, but given the small amounts of unsuitable material available to me it was a vain endeavour. There was no other way out—I'd have to manufacture the paints myself! By busily questioning my school friends I managed to get hold of a book in which I found the

description of a milling stone and instructions for the proper amount of gum Arabic to use as a binding agent. I bought these things from the friendly apothecary and set to work. It turned out, however, that the colours alone don't make an artist, for my new paintings were no better than the old ones. I couldn't find anybody to teach me how to paint. The artist Schwendowski lived elsewhere and came home only now and then for a few days, and apart from him no one else in the neighbourhood knew anything about painting. Once he gave me some left over oil paint. It didn't go very far, but it was enough to show me that I'd get a lot further with it than with the more difficult water colours. And so I began to make oil paint which, in the old fashioned way, I stored in pigs' bladders because zinc tube had not yet crossed my Riga horizon.

In a paper shop there was a large stock of printed lithographs which I'd look through for hours on end, and then if my pocket money was enough I might buy one or two which I'd colour in using the water colours. To be honest the results were disappointing even for me. There were no good examples from which I could learn. The only paintings I ever got to see were in a gilder's shop window where occasionally an oil painting he'd been given to frame would be displayed for a few days. There was at that time not a trace of the flood of pictures that threatens to drown humanity today. The reproduction of works of art was restricted to lithographs and to the woodcuts which were coming back into fashion. Coloured reproductions were rare and costly and the first attempts at photomechanical techniques were just being carried out in their inventors' workshops. Because of this I was restricted to the odd example that passed by chance before my hungry eyes and I tried with my scanty resources to reproduce the strong effect it had made on me. Right from the beginning I had more luck with colours than with form: I could easily envision the impact of the colours I was applying while, on the other hand, I never dared compose a picture of my own in my younger years.

*The relationship to later work.* I mention these childish things because they later had consequences for me. I want to stress here that I consider the establishment of the quantitative theory of colours my most important work. I have not the slightest doubt that I would never have solved this problem, on which the best and brightest from Goethe to Hering racked their brains in vain, had I not from my youth been involved in producing dyes and, by doing so, been made constantly aware of the most important problems in colour theory which always have to do with non luminous colour (Körperfarbe). In particular one sees how the commonly available physical techniques using lenses and prisms available to Helmholtz led him to conclusions which have nothing to do with non luminous colours.

All in all, when I look back on my working life it becomes clear that all of the many interests and hobbies of my youth, no matter how useless my parents and teachers viewed them, all turned out later to be worthwhile and some even essential for those of my efforts which my peers hold to be not just useful but valuable. By collecting facts and the relationships between them in the boundlessly compliant memory of youth, a store of data is compiled from which the building blocks for the mental efforts of the future researcher can be drawn, for he has to form things which

do not currently exist—and yet they must not be mere castles in the sky. For this he has no other guide than his memories of earlier experiences and so the mental constructs he produces take on a form dictated by these memories. We are therefore not dealing here with the operation of some mystical power that had given me in my childhood just those things which I would later need. Rather the style, and to a large extent the focus, of my later work was largely determined by what fell into my hands and senses in my youth.

What I am describing here from my personal experience is undoubtedly generally applicable. Goethe for example emphasised that the concept of the main figures and events of his literary works were established in his youth and that his whole long life was devoted to developing these early structures. In this case one can see even more clearly how the work of the man was determined by the material which he accumulated at a young age.

*Outlook.* If one follows this line of thought then one can come a long way. Goethe's instinctive rejection of Newton's theory of colour had its basis (Goethe was not conscious of this) in the fact that though it provided information about the "physical" nature of colour, that is to say information derived from the colours of refracted light, it told nothing either about the perception of the colour of light reflected from a surface nor about the properties of dyes. Newton's explanation of non luminous colour as reflecting the colour of thin sections was apparently not known to Goethe. He certainly never referred to it and in any case it would not have led to any scientific explanation because it is quite simply wrong. Goethe, for his part, was acquainted with dyes and non luminous colours because of his personal involvement in drawing and painting and he had the strong feeling that these colours are somehow completely different from the spectral colours. His warning, "My friends, abandon the darkroom", was surely largely due to the fact that he felt unsure of himself there and therefore made a virtue from necessity—but all the same his instinct was correct. He felt sure that there was no justification for the simple transfer of the spectral colour theory to the perception of colour in the environment, though he was unable to justify this view in physical terms. Physicists on the other hand viewed the whole matter as solved and therefore not worth further discussion.

If we look at the work on this theme of the great physicist Helmholtz, then we see how his lack of knowledge of painting techniques and of paints rendered him unable to grasp these problems. In his three volume book on the physiology of optical perception the term "non luminous colours" does not even appear in the index and on the page where colours and dyes are supposed to be dealt with one looks in vain for something on this topic. On the other hand, in his insightful speech on his seventieth birthday he told us that already as a boy he'd spent the Latin lessons, which bored him stiff, working out the light path in optical instruments. He said nothing about experiments at sketching or painting. The structure of his mental world was set in his youth and did not change at all throughout his life.

*Technical and commercial experiments.* No matter how elementary my drawing and painting skills were, they nevertheless turned out to be a great help in