

A TRIBUTE TO THE MEMORY OF  
**ALFRED NOBEL:**  
INVENTOR, ENTREPRENEUR AND INDUSTRIALIST  
(1833–1896)



BY SVANTE LINDQVIST  
ROYAL SWEDISH ACADEMY OF ENGINEERING SCIENCES (IVA)

A TRIBUTE TO THE MEMORY OF

*ALFRED NOBEL:*

INVENTOR, ENTREPRENEUR AND INDUSTRIALIST  
(1833–1896)

PRESENTED AT THE 2001 ANNUAL MEETING OF  
THE ROYAL SWEDISH ACADEMY OF ENGINEERING SCIENCES

BY SVANTE LINDQVIST

The Royal Swedish Academy of Engineering Sciences (IVA) is an independent, learned society whose main objectives are to promote the engineering and economic sciences, and to further the development of commerce and industry. In cooperation with the business and academic communities, the Academy initiates and proposes measures that will strengthen Sweden's industrial skills base and competitiveness.

For further information, please visit IVA's web site: [www.iva.se](http://www.iva.se).

Published by the Royal Swedish Academy of Engineering Sciences (IVA) and Svante Lindqvist, 2001

IVA, P.O. Box 5073, SE-102 42 Stockholm, Sweden

Telephone: Int +46 8 791 29 00

Fax: Int +46 8 611 56 23

E-mail: [info@iva.se](mailto:info@iva.se)

Internet: [www.iva.se](http://www.iva.se)

IVA-M 335 • ISSN 1102-8254 • ISBN 91-7082-681-1

Translation by Bernard Vowles, 2001

Layout and production by Hans Melcherson, Tryckfaktorn AB, Stockholm, Sweden

Printed in Sweden by OH-Tryck, Stockholm, Sweden, 2001

## *PREFACE*

Each year the Royal Swedish Academy of Engineering Sciences (IVA) produces a booklet commemorating a person whose scientific, engineering, economic or industrial achievements were of significant benefit to the society of his or her day. The Commemorative Booklet is published in conjunction with the Academy's Annual Meeting.

This year's booklet is the fifth in the series and is dedicated to Alfred Nobel (1833–1896), for his achievements as inventor, entrepreneur and industrialist.

The immediate reason for featuring Nobel this year is the Centennial of the Nobel Prize. Since the first awards in 1901, almost seven hundred Nobel Prizes have been awarded in Physics, Chemistry, Physiology or Medicine, Literature and Peace. In addition the Bank of Sweden's Prize in Economic Sciences in Memory of Alfred Nobel was instituted in 1968. The Nobel Prize is something for which Sweden is known abroad; it has been called the "strongest brand name in the world". The Academy is marking this anniversary by devoting the Commemorative Booklet to Alfred Nobel.

It may be mentioned that the Academy paid tribute to Alfred Nobel with its memorial medal back in 1926, thirty years after Nobel's death and twenty-five years after the first Nobel Prizes were awarded. This year's Booklet, however, considers Alfred Nobel

as an inventor, entrepreneur and industrialist, quite without reference to the renown and significance of the prize that bears his name. Paradoxically, the Nobel Prize may well have had the effect of obscuring Alfred Nobel's own achievements. Had it not been for the Nobel Prize, Alfred Nobel himself would probably have been much better known today as a technical and industrial innovator in his own right. This is the perspective that has been emphasized here.

We should like to thank the author, Professor Svante Lindqvist, Director of the Nobel Museum, for his work on the production of this year's Commemorative Booklet.

Stockholm, 26 October 2001



President of the Academy



Chairman of the Medals Committee

# *CONTENTS*

INTRODUCTION 6

ALFRED NOBEL: A MAN OF HIS TIME 9

THE INVENTOR 14

THE ENTREPRENEUR 22

THE INDUSTRIALIST 30

SOURCES OF CREATIVITY 36

REFERENCES 40

## INTRODUCTION

The image of Alfred Nobel has been carved in stone and cast in bronze and gold. The ever-growing renown enjoyed by the prize that bears his name has, paradoxically, come to obscure his contributions to engineering and the development of international entrepreneurship. Had it not been for the Nobel Prize, Alfred Nobel would probably have been even better known today as a technical and industrial innovator than he is.

6 The first Nobel Prizes were awarded in 1901. As physics was the prize subject first mentioned in Alfred Nobel's will, the very first Nobel Prize awarded went to the laureate in physics. (This is a tradition that has been observed ever since.) The recipient of the Nobel Prize for Physics at the ceremony at the Royal Academy of Music on 10 December 1901 was Konrad Wilhelm Röntgen. This was a choice wholly in keeping with the wishes of the donor, for the discovery of X-rays was a result of pure research which turned out within a few years to have great practical and humanitarian value in the field of medicine as an aid to clinical examination. The words of the will concerning a reward to "the person who shall have made the most important discovery or invention in the field of physics" and the general provision that the prize was to be awarded to those who shall "have conferred the greatest benefit on mankind" fit the discoverer of X-rays very well.

Röntgen himself was dubious about travelling to remote and wintry Stockholm in darkest December to receive this, as yet, obscure new prize. In a letter to Svante Arrhenius he complained bitterly that it meant not only that he was obliged to request a couple of days' leave from his chair in Munich but also, what was worse, that he had to postpone a number of lectures. Today there are few who grumble as Röntgen did when they receive the news that they have been awarded the Nobel Prize.

In many countries the number of Nobel Prizes is taken as a yardstick of the country's scientific standing. This is not something of which Alfred Nobel would have approved, because, being an internationalist, he directed that in the awarding of the prizes "no consideration whatever be given to the nationality of the candidates, but that the most worthy shall receive the prize". Nor do the Nobel Foundation and the Prize-Awarding Institutions encourage this chauvinistic counting of heads. Nevertheless, it is undeniable that nations around the world count their Nobel Prize winners in the same way as nations compare the number of their Olympic medals.

The fame of all the 700 and more people who have so far been rewarded with the Nobel Prize – an Einstein, a Pasternak, a Mandela – has come to overshadow that of the founder himself. And he would certainly not have wished it to be otherwise, for he was humble to the point of self-effacement and had a panic-stricken abhorrence of pompous ceremony. It has been said that if the Nobel Prize had existed in the latter part of the nineteenth century Alfred Nobel would probably have won it himself for his discoveries and inventions in civilian explosives technology and their application in the construc-



tion of mines, railways, harbours, canals and docks. However it is equally certain that he would also have refused to take part in either the Prize Award Ceremony in the Stockholm Concert Hall or the following banquet in the Stockholm City Hall.

The Royal Swedish Academy of Engineering Sciences is the world's oldest engineering academy, but it was not founded until twenty-three years after Alfred Nobel's death (1919) and it was thus never able to count him among its members. (However, his nephew, Emanuel Nobel (1859–1932), became an honorary member of the Academy in 1926.)

It may therefore be in place in this particular year for the Royal Swedish Academy of Engineering Sciences to give prominence to Alfred Nobel and to dedicate its Commemorative Booklet to him. His bust, cast in bronze, will occupy a place of honour on the podium of the Stockholm Concert Hall a couple of weeks from now, on 10 December. His profile, cast in gold, will be on the medals which the laureates will receive from His Majesty the King. But there is a risk that Alfred Nobel himself will pale by comparison with the nearly 200 of the living Nobel Prize Laureates who have accepted the invitation of the Nobel Foundation to mount the platform alongside him. His bust and profile will serve as decoration rather than as a memory of the human being that he was: all the more reason, then, for this Academy to remember Alfred Nobel the engineer.

## ALFRED NOBEL: A MAN OF HIS TIME

“Engineer, average height, hair brown, face oval, complexion fresh, eyes blue.” That was the description of Alfred Nobel in the passport records of the Stockholm Police in 1863. Who was he, this engineer of average height?

The main events of his life are well known. His father, Immanuel Nobel (1801–1872), was a self-taught master builder from Gävle, an untamed talent who titled himself “Mekanikus”. Immanuel Nobel grew up at a turning point in the history of technical education, because it was during the years

*Alfred Nobel's father Immanuel Nobel in his heyday in St. Petersburg in the mid-1850s.  
(The Nobel Foundation)*



when he was a young man that a system of higher engineering education became established: the Falun School of Mining in 1819, the Technological Institute in Stockholm (precursor of the modern Royal Institute of Technology, KTH) in 1827, and the Chalmers School of Arts and Crafts in Gothenburg in 1829, to mention only the best known. Immanuel Nobel was born just too early to attend any of them: he belonged to another age. After a few years at sea he acquired various skills as on-the-job training and went on to a career as master builder, manufacturer and inventor which became a switchback ride, to say the least.

Alfred Nobel was born on 21 October 1833 in a simple home in the courtyard building Norrlandsgatan 9 in Stockholm. His childhood was one of insecurity and poverty. In 1837 – when he was four – his father went bankrupt and was obliged to flee abroad to escape his creditors. Immanuel Nobel left his family in Stockholm and spent five years alone abroad, trying to build up some sort of new position. During this period his wife provided for the family in Stockholm by keeping a little dairy and greengrocery. At times she and the children were on the verge of penury, something that Alfred Nobel and his brothers were never to forget. At the age of seven he was sent to the School of St. Jacob. This was a school for poor children where, as August Strindberg wrote, the pupils “were poorly dressed, scabby-nosed, ugly of feature and evil-smelling”.

St. Petersburg in the mid-nineteenth century was a big, seething European metropolis, a rapidly growing city that offered great opportunities to anyone with initiative. It was a city where east met west, one to which a profusion of capable and enterprising

individuals were drawn from all over the vast Russian empire and to which thousands of Europeans came as well. It was the nearest great European city to Stockholm and it was cheap and simple to reach by sea. (This was of course before the railway age and it was a good deal more expensive and difficult to get to the Continent by coach.) Immanuel Nobel came too, and started a foundry and an engineering workshop. The company did well, and after a few years he was able to send for his family.

In the 1840s Alfred Nobel and his brothers were taught at home by private tutors, as was common among the children of the upper class in mid-century St. Petersburg. (The city had a large academic proletariat whose only source of income was either to give extra lessons or to transcribe the documents of government authorities.) Tuition at home came to an end in 1850, and his father now had the means to send him on a two-year study tour from 1850–1852, which included a visit to New York, where he is said to have met the Swedish-born inventor John Ericsson.

This was the age of the great world exhibitions. They began to be arranged on a regular basis in the industrial societies of the West in the second half of the century, the first being the Great Exhibition of 1851 at Crystal Palace in London. Nations met “in peaceful competition” at these exhibitions to show who could produce the finest industrial products. Rather as in the Olympic games, which were revived at the end of the century, nations competed in different classes, the winners received gold medals from impartial judges, and the number of gold medals was totalled and used to give the nations a ranking order (which is not unlike what happens with the Nobel Prizes today).

On returning from his study tour Alfred Nobel went to work, like his brothers, for his father's company, "Fonderies & Ateliers Mécaniques Nobel & Fils". This grew into a large engineering works, with the wide range of civil and military products typical of the period. His father's speciality was underwater mines, and he won large orders during the Crimean War (1853–1856). The mid-1850s was his heyday, and the works in St. Petersburg employed more than a thousand people. (Eventually he was able to pay off all his debts in Sweden and in 1856 he could visit Sweden again for the first time for nearly twenty years.) After the war, however, when Russia had been forced to sue for peace on humiliating terms, the orders from the limited civil market could not compensate for the decline. Bankruptcy followed in 1859 and Immanuel Nobel – destitute for the second time – returned to Sweden with his wife.

Alfred Nobel came back to Sweden early in 1863, thirty years old, and that was where his career as an inventor began. He soon moved to Hamburg and established himself there as an international entrepreneur (see below). Hamburg was his permanent home for ten years, after which he moved to Paris. With a population of over two million, Paris at the end of the nineteenth century was the biggest city on the Continent. It was the cultural capital of Europe – a meeting place of artists, writers and intellectuals from all over the world. August Strindberg, for example, lived here for several years. Alfred Nobel moved to Paris in 1873, noting with satisfaction: "Here even the mongrel in the street has an air of civilization." Nobel was to stay in Paris for longer than anywhere else in his life. It was also in Paris that his famous will was signed in 1895.

He built up an industrial empire, which was gradually transformed into a multinational one (more of this below). The second half of the nineteenth century was largely a period of peace, the American Civil War and the Franco-Prussian War notwithstanding – but it was also one of military expansion. Alfred Nobel rode this wave, as many of his inventions, as well as being of enormous civil importance, were also of great military interest.

After his competitors for contracts for the French Army had managed to cast doubts on his loyalty, he moved in 1891 to San Remo in Italy. In the winter of 1893–94, three years before his death, he bought the Bofors estate in Värmland where he was to spend his last summers. Whatever Alfred Nobel's views on the subject of peace and disarmament, it can scarcely be denied that he had an almost passionate interest in the development of weaponry. He felt that if arms were to be produced, then they should be produced within the country: "Because if there is one branch of industry that ought to be independent of imports from abroad, then it is the arms industry." Soon after acquiring Bofors he said: "Things will get lively at Bofors as soon as we get real results from the current innovations. It would be nice to see old Sweden competing in armaments with Germany and Great Britain."

It has been observed that Alfred Nobel differed from most inventors in combining technical creativity with a well developed business sense. He was not only a brilliant inventor but also a daring entrepreneur and a shrewd industrialist. It is on these aspects of Alfred Nobel that we will focus: the inventor, the entrepreneur and the industrialist.

## THE INVENTOR



“If I have 300 ideas in a year and just one turns out to work I am satisfied.” Alfred Nobel had good grounds for his confidence – in the course of his life he had 355 patent applications granted. His words reflect the technological optimism that was typical of the late nineteenth century. This was when Western civilization took up the “Battle with Nature” – by dominating, taming, conquering and overcom-

*Alfred Nobel in his twenties. (The Nobel Foundation)*

ing nature, man would create his own future. The crusade was led by engineers – engineers such as Alfred Nobel, with a strong belief in their own capabilities and the possibilities of science. This was a type of nineteenth-century hero perhaps best represented by the engineer Cyrus Smith, the main character, never lost for a solution, of Jules Verne’s novel “The Mysterious Island” (1875).

Nobel’s most important inventions were all based on nitroglycerine: a viscous, highly explosive liquid which had been discovered in 1847 by the Italian Ascanio Sobrero (1812–1888). Nobel’s great contribution lay in developing methods of making it usable in practice. His main inventions were the detonator (1864), dynamite (1867), blasting gelatine (1875) and the smokeless gunpowder, ballistite (1887).

In 1862 Alfred Nobel began his experiments with nitroglycerine. The problem he wished to solve was that of developing a detonator for nitroglycerine which was safe to handle, but which still allowed full use of all the inherent explosive effect of the liquid. Nobel was the first to succeed in carrying out a controlled detonation of the substance. He filled a glass tube with nitroglycerine and lowered it into a lead tube filled with gunpowder, to which a fuse was attached. Sometime during the autumn of 1863 or the spring of 1864 he designed his detonator. This consisted of a wooden sleeve filled with gunpowder, which initiated an explosive charge of liquid nitroglycerine. He continued to work on the detonator by adding mercury fulminate, and eventually eliminating all the gunpowder. His percussion cap, consisting of mercury fulminate in a small copper sleeve with a fuse clamped in the sleeve, became the normal type.



In June 1864 he applied to patent his detonator and the principle of initiating an explosion of nitroglycerine. This was his first and in some ways the most important of his inventions, because without it the use of nitroglycerine as an explosive would have been impossible: it was essential to all further development of nitroglycerine-based and other powerful explosives. Nobel's was an epoch-making invention, and it has been said that "the introduction of the percussion cap in the initial ignition of an explosive and a clear appreciation of the explosive effect of a shock wave are undoubtedly the greatest discovery ever made in explosives technology, either theoretical or practical."

During the late 1860s a series of serious accidents occurred involving nitroglycerine, giving rise to enormous publicity all over the world (for example, Alfred Nobel's factory at Krümmel was destroyed by an explosion). Nobel began to try using various porous substances to absorb the nitroglycerine: coal dust, sawdust, cement, brick dust. In 1867 he came upon the final solution of using the clayey mineral kieselguhr. Mixing 75 % nitroglycerine and 25 % kieselguhr resulted in a doughy mass which was not only safe in transport but also facilitated the use of the explosive, because the product – a reddish-yellow, soft, plastic, damp paste – could be pressed into cartridges and wrapped in simple paper tubes. (As nitroglycerine was a fluid it had only been possible to use it in drill holes sloping downwards.) This was dynamite, the second of Nobel's main inventions, which he patented in several countries simultaneously in the spring of 1867.

In the 1870s he worked in his laboratory in Paris to improve dynamite, which as it contained 25 % of the inert substance kieselguhr was weaker than blasting oil. Nobel's

experiments were intended to find an absorbing agent for nitroglycerine that could take part in the explosion, and after much experimentation he found it in 1875 in the form of nitrocellulose. A small addition of collodion cotton dissolved in ether alcohol caused the nitroglycerine to gelatinize, giving it a plastic form. However this did not mean that the technical problem was solved. A considerable amount of work was required in order to determine the most suitable quality with regard to the degree of nitration, gelatinizing capacity etc. of the nitrocellulose to be used in future manufacture. Apparatus for industrial manufacture had also still to be designed. The new explosive was called blasting gelatine and was launched in Sweden under the product name of “Extradynamit”. It was shockproof and friction-proof and could be used for blasting under water. Alfred Nobel could accept that dynamite was no more than a mixture, but he regarded the blasting gelatine patent as unassailable: this was a new chemical substance which had been produced by means of a unique chemical process.

The fourth of Nobel’s most important inventions was ballistite, a smokeless gunpowder with a nitroglycerine base which he developed at his laboratory in Sevrans near Paris and patented in 1887. Ballistite was far more complex than any of Nobel’s previous inventions and its development had required many years of systematic research. It was made of roughly equal parts of nitroglycerine and collodion cotton with the addition of 10 % camphor. His contemporaries regarded the invention as remarkable: the idea of combining two substances, nitroglycerine and gun cotton, each highly explosive in its own right, in a new kind of gunpowder which was not highly explosive but which

on ignition burned with near-mathematical precision in regular concentric layers. The surprise of the experts was not lessened when it became known that the new gunpowder could be rolled between steam rollers and pressed while hot into sticks or tubes. The result was a product that would revolutionize military explosives engineering. Ballistite (or “Nobelkrut” as it came to be known in Sweden) was a smokeless substitute for black powder. In England a few competitors managed to patent a similar product and Alfred Nobel engaged in fruitless litigation in an attempt to stop this infringement. Under the name of cordite their product came to be much better known than Nobel’s own ballistite.

Alfred Nobel ran many other research projects, particularly during his final years. Most of these involved explosives and various types of weapon, but there were also experiments with artificial silk, artificial rubber, varnish and electrolysis. Some were as fanciful and unrealistic as his father’s had been. In the 1890s he also financed the work of other inventors, for example that of the brothers Birger (1872–1948) and Fredrik (1875–1964) Ljungström who invented the “Svea velocipede”. Together with the artillery captain Vilhelm Unge (1845–1915), he did experiments on rockets in Stockholm and San Remo, and together with the engineer Rudolf Lilljequist (1855–1930), he founded Elektrokemiska AB in Bengtsfors in 1895.

Alfred Nobel had little time for orders and titles. He made fun of all the world’s stars and medals, “whether worn on the chest, the stomach or the back”, and asked to “be spared gongs and such metal ware”. What he did attach great value to, on the other

hand, was his being elected a member of the Royal Swedish Academy of Sciences in 1884, and being awarded an honorary doctorate, Doctor of Philosophy honoris causa, at the University of Uppsala in 1893.

The reason that he valued these distinctions higher than any others was probably that he saw them as confirmation of how he regarded himself and his own work: as an independent researcher, a scientist who was driven by his own curiosity and search for knowledge – rather than as the bold entrepreneur and shrewd industrialist that he also was, as someone who had built up and continued to manage a large multinational industrial empire. In these sentiments Alfred Nobel echoed the old distinction between science and technology, where science and the scientist were seen as more prestigious than technology and the engineer.

The origin of this distinction was partly social: science was for a long time a pursuit reserved for the well-to-do, the pastime of a gentleman of leisure, whereas technology was a profession, an occupation whereby one earned one's living. Another reason for the distinction was cognitive: science was seen as a prerequisite for technology, and engineering was regarded as the rather simple application of this knowledge. However strong this sentiment was, it had not always been true. In fact it was not until the second half of the century that we can find any examples at all of new technologies that are the result of scientific discoveries, or of that industry owes anything to science. The discovery of synthetic dyestuffs in the new laboratories of the German chemical industry in the 1850s and the ensuing industrial development are usually mentioned as one of the

first examples of that new technologies now began to emerge as a result of the application of scientific discoveries.

Much of Alfred Nobel's early work could be described as systematic experimentation in an age-old tradition of practical day-to-day improvements and trial-and-error: the habitual craft of the engineer. But things changed, as mentioned, during the second half of the nineteenth century. New chemical industries emerged, and many of these had laboratories. We should, however, be careful with the meaning of the word "laboratory". It is all too easy to visualize a clean, well equipped sanctum, where serious men in white coats and horn-rimmed glasses peer into the mysteries of nature and the fundamental structure of matter. A "laboratory" in those early days of the chemical industry was more often than not a rather simple affair which undertook the continuous quality control of raw materials and finished products. We should not mix the prosaic daily analyses in these primitive laboratories of the early process industry with the considerably more uncommon occurrence of development work based on scientific research.

However Alfred Nobel had an evidently well equipped laboratory for experiments on explosives built in Bofors just before his death (it was completed in 1895). Five research assistants were engaged, with the young Ragnar Sohlman (1870–1948) in charge. It was Nobel's intention to spend the winter in San Remo and there prepare his experiments with new explosives and weapons and then to carry them out on a larger scale on the extensive Bofors firing ranges in the forests of Värmland.

Laboratories like this for the testing and refinement of products became normal in the chemical industry at the end of the nineteenth century. And that Nobel, like others in the industry, could now employ trained chemists in his laboratory was the result of the establishment of a higher engineering education in the second half of the century. Alfred Nobel's membership of the Royal Swedish Academy of Sciences in 1884 and his honorary degree from Uppsala University in 1893 may be seen as an expression of this new status of technology in the late nineteenth century.

## *THE ENTREPRENEUR*

Alfred Nobel began his career as an entrepreneur by trying to make nitroglycerine a commercial product. The very first manufacture of Nobel's blasting oil took place with only a few employees in a shed at Heleneborg, a dilapidated residence on Södermalm in Stockholm, where Nobel's destitute father and his family were lodging. While being used for this purpose in September 1864 the whole shed blew up and Alfred Nobel's younger brother Emil and four other people were killed.

For all its tragedy the accident – to which the press of the day devoted a great deal of attention – was a more convincing demonstration than all the test explosions. As the explosive effect of nitroglycerine was many times greater than that of gunpowder this meant fewer drill holes per unit blasted, which saved both time and work: until the turn of the century drilling was manual (i.e. with sledgehammer and chisel). Now the orders began to come in. Only a month later, in October 1864, the Swedish State Railways Board decided to use “Nobel's patent blasting oil” in the excavation of the new railway tunnel under Södermalm, the link between the northern Swedish railway network and the southern.

By this time Alfred Nobel had also succeeded in making contact with a wealthy

investor, the Stockholm merchant J.V. Smitt, who thus made “one of the most advantageous investments that this successful businessman had made”. On 22 October 1864 “Nitroglycerin AB” was founded, the first company of its kind in the world, to “utilize the patent issued by the Royal College of Commerce on 15 July to the engineer Alfred Nobel for the preparation and use of nitroglycerine”. (His father, Immanuel Nobel, appears to have taken the accident and the loss of Emil harder than Alfred. While Alfred was busy establishing the company his father suffered a stroke on 6 October, four weeks after the accident, from which he never recovered. He died eight years later, in 1872, on the anniversary of the Heleneborg disaster.)

Six months later, in March 1865, a factory was built at Vinterviken, outside the then Stockholm City boundary (the building is today known as “Skulpturens hus”). At the same time Alfred Nobel left Sweden to establish himself as an entrepreneur on the Continent. The big buyers of explosives were on the Continent and in the USA: in mining, railway construction, road-building, tunnelling, docks and canals. Owing to the restrictions placed on the transport of nitroglycerine, exporting from Sweden was no way to meet the demand, and he was driven by the entrepreneur’s natural wish to start manufacturing on the most rapidly growing markets.

Only a week after the 32-year-old Alfred Nobel arrived in Hamburg he had premises and equipment arranged and was only waiting for the sulphuric and nitric acid and the glycerine he had ordered in order to be able to begin producing about 100 kg a day. In the autumn of 1865, a year after the accident, his German company had become



more firmly established. He had found three partners and sponsors, acquired an office in Hamburg, registered the name "Alfred Nobel & Co.", and been granted a licence to erect a factory at Krümmel near Hamburg.

Alfred Nobel's brisk progress in Hamburg illustrates one of his qualities as an entrepreneur: his ability, in every new city, every new country, quickly to gain a foothold on the market. He found local backers and partners with political influence and with their assistance he quickly found a suitable secluded spot for the new plant and obtained the necessary licences. With their capital the company could also build and equip the new factory, buy raw materials and employ workmen. He always looked for partners from the country concerned, refrained from using banks, and avoided making any personal investment other than the initial capital.

At the same time, as early as April 1865, Nobel started travelling round Germany and giving demonstration blasts in the mining districts and the major cities to convince people of the explosive effect of nitroglycerine and (as he believed) its safety. This illustrates another of Alfred Nobel's qualities as an entrepreneur: his ability to take the bull by the horns, to seek out the market personally and, using a marked talent for the theatrical, to stage dramatic demonstrations with well thought out scenography. This is witnessed, for example, by his visit to the USA in 1866 to defend his claim for a patent and to persuade people of the safety of nitroglycerine after the many tragic explosions that had recently occurred. First he wrote newspaper articles, then he arranged a public demonstration in a quarry between 83rd Street West and 8th and 9th Avenues in Upper

Manhattan. He poured nitroglycerine onto a rock, applied a match and showed that the fluid burned without exploding. Then he threw a container with nitroglycerine from a high cliff into the quarry without anything happening. (Nobel was not at this time aware of the unreliability of nitroglycerine; he did not know that it could be chemically unstable.)

Similar performances, but now involving dynamite, took place a few years later in various parts of Great Britain. A box of dynamite was placed on a fire and burned without exploding, another box was thrown off a cliff, and the final item was an impressive test blast in solid rock. He was always careful to invite the press to these performances. Alfred Nobel was a conscious showman, a skilful impresario – contemporary as he was with the well-known American showman P. T. Barnum (1810–1891).

Alfred Nobel went to the USA in 1866 to do what he had done in Germany. Here too he soon found partners and sponsors and formed a company, “US Blasting Oil”. But he and his company encountered a series of difficulties, and he left the USA embittered in the autumn of 1866, never to return. Tore Browaldh has stated that Nobel did not appreciate that the financial and social environment in the USA was very much tougher and more demanding than that of Europe. “After him,” says Browaldh, “hundreds of thousands of optimistic entrepreneurs from Europe have made the same costly mistakes.”

In 1868 Alfred Nobel went to the United Kingdom with a chest full of dynamite, saying that England was “a jewel worth the rest of the world. A dynamite company

there would have the entire Empire as its market". Here, too, he ran into various difficulties, however, and it was three years before he and a group of Glasgow businessmen could establish "The British Dynamite Co." at an isolated site on the sand dunes on the Atlantic coast at Ardeer, south of Glasgow. (The Francophile Nobel always showed a lukewarm interest in English life and visited London only reluctantly.)

In France it was not the size of the market that led Nobel to start operations but the price situation, because the price of gunpowder here was three times what it was in Germany. In 1871 he and his local partner had opened a factory at Paulilles, close to the Spanish border, but at about the same time a law was passed in France giving the state a monopoly of dynamite manufacture. The factory at Paulilles was instructed to stop producing, but Nobel and his partner were not prepared to give up so easily, particularly as the factory had begun to show a good profit. Nobel wrote: "The Government's fussing goes on, but it is not stopping us. They will have to back down." Two years later the law was amended, and manufacture by private individuals became legal on payment of excise duty to the state.

During the same period he also established factories in Spain (1871), Italy (1873) and Switzerland (1873). In Switzerland, in particular, there was a lucrative market in the recently commenced works for the Gotthard Line and the St. Gotthard Tunnel. (This was excavated from both directions over a period of seven years, and when the two teams met in 1880 they had used a million kilograms of dynamite.) In the early 1870s dynamite was beginning to make its breakthrough and demand rose rapidly as the pace

of industrialization accelerated: new railways, canals and docks were built and mining increased.

Two of Alfred Nobel's entrepreneurial qualities have been mentioned: his ability to set up operations quickly on new markets and his ability to seek out the market and give persuasive theatrical demonstrations. To this should be added another not unimportant quality: his caution in his transactions. He was always at great pains to avoid personal liability for the activities of his various companies other than his original investment (which was usually limited to his patents). Nearly half of his fortune was invested in securities giving what were, for the time, low returns. With his father's two bankruptcies fresh in mind Alfred Nobel was a great deal more prudent in financial matters, and he was less willing to take risks in business.

It may be pointed out that for all his caution Alfred Nobel could make mistakes. In the early 1880s he sold parts of his large holding of shares in dynamite companies and invested instead in his brothers' oil company in Russia, which had cash problems at the time. Nobel later became very annoyed that the company did so badly that he could neither obtain repayment nor draw any worthwhile dividend on his shares. He remained sceptical about his brothers' oil adventures in Baku, and he never visited the place; "the waterless, dusty, oil-spattered desert holds little appeal for me". But of the estate that he left, totalling over SEK 33 million, the largest individual item, accounting for nearly a quarter, was his shares worth SEK 7.5 million in "Bröderna Nobels Naftablag" in Russia.

As an entrepreneur we can allow Alfred Nobel to draw his own portrait, for he once described the qualities he most valued in his French partner, Paul Barbe, and they are words which could equally well apply to himself:

*“[He] has a sharp technical grasp, is an excellent merchant, a shrewd money man, knows how to use people and extract from them all the individual work of which they are capable. His own capacity for business and work is incredible.”*

It is possible that Alfred Nobel's qualities as an entrepreneur are shown best of all in his support for other entrepreneurs. These were not actually inventors, but entrepreneurs in whose boldness and love of adventure he recognized features of himself and to whom he therefore gave financial support. One of them was the unfortunate North Pole explorer and chief engineer at the Swedish Patent Office, Salomon August Andrée (1854–1897). Nobel was fascinated by Andrée's technical solution to the problem of giving the balloon a direction different from that of the wind: in trials using sails and trail ropes a deviation of almost 20° had been achieved. (However when starting from Spitzbergen on 11 July 1897 a mishap occurred: most of the trail ropes were fouled and were left behind at the launching site.) The last message from Andrée's expedition was the carrier pigeon released at 1.08 p.m. on 13 July from a point north of Dane Island at a latitude of 82° North. That was Alfred Nobel – always the cautious entrepreneur – who had managed to persuade Andrée to bring some carrier pigeons. (The carrier pigeon which brought this last message may be seen today, stuffed, in the Swedish Museum of Natural History.)

Another entrepreneur whom Nobel recognized as a kindred spirit was the explorer Sven Hedin (1865–1952). While Nobel had been searching out and conquering new markets for his inventions, Sven Hedin crossed, mapped and described then unknown parts of Asia in a number of well-publicized expeditions. Like Nobel, Hedin was a capable impresario, and the widely read accounts of his travels had made him something of a popular hero. When Nobel sent Hedin 2000 kronor in 1893 in support of his next expedition to explore the “desolate mountains of Tibet”, Hedin wrote by way of thanks that this sum might not perhaps mean so very much to Nobel, but to him it meant “fifteen healthy camels”.

Alfred Nobel, S. A. Andrée and Sven Hedin – they all exemplify various aspects of the entrepreneur as a hero in the late nineteenth century.



*Some of the “fifteen healthy camels” that Sven Hedin bought in 1893 for his expedition to Tibet. (Drawing by Sven Hedin in idem, En färd genom Asien 1893–97, Vol. 1 (Stockholm, 1898), p. 489)*



*The carrier pigeon which brought the last message from S.A. Andrée’s North Pole Expedition. (Med Örnen mot polen (Stockholm, 1930), p. 106)*

## THE INDUSTRIALIST

Alfred Nobel had founded his international industrial empire during the years 1865–1873, between the ages of thirty-two and forty. In 1873 he was a partner in sixteen dynamite factories in fourteen countries. They had been built at a time of transition with regard to corporate form, and several of them were restructured in the 1870s as limited liability companies. Many of them were in razor-keen competition not only with other manufacturers – which



*Alfred Nobel in his forties. (The Nobel Foundation)*

were now numerous – but also with other Nobel companies. Prices and profits fell dramatically in the 1880s. An “entente” was clearly a necessity, and Nobel decided to try to amalgamate the various dynamite companies.

After several years of intensive negotiation the result was two holding companies: the “Nobel Dynamite Trust Co.” was formed for the British and German Nobel companies in 1886, and “Société Central de Dynamite” (or the “Latin Trust”) for the companies in Switzerland, Italy, France and Spain in 1887.

Thus, the first truly multinational companies in economic history – companies owning or controlling manufacturing facilities outside the country in which they have their head office – are associated with Nobel. Tore Browaldh has said that Nobel’s company ventures were in some respects more multinational than many of the multinational companies of today.

Before Nobel created his international trust he had himself been the international institution that kept the many individual companies together. It should be pointed out that he did this not only by personal ownership and by being a member of most of the company boards, but also purely physically: both by constantly travelling to visit these companies all over Europe and by extensive correspondence.

Yes, Nobel himself was indeed the entire company management and he tried first and foremost to keep in touch with his factories by letter. He spent several hours at his desk every day, attending to his correspondence: “Yesterday’s post contained 57 letters and 10 telegrams,” he recorded one day in 1893. He could write twenty or thirty letters



every day “with equal correctness and elegance” in five different languages: Swedish, Russian, German, French and English. (A couple of thousand of Alfred Nobel’s business letters have survived.) When he was travelling by train he sat in the compartment with a portable copying machine on his knee.

Why didn’t he even have a secretary to help him? He once wrote that his work consisted primarily of “technical matters, contracts, patent arrangements and legal business that are of such a nature that one cannot harness others to the task”, and on another occasion: “I cannot of course leave important business letters unanswered and a secretary who can help me is definitely not easy to find. Writing technically complex and other letters in five languages is no easy task.” When he finally engaged a secretary in 1895, the year before his death, he required her to be able to take shorthand and type perfectly in Swedish, French, English and German.

But he could not control his factories by letter alone, and this meant that he travelled by train from Paris to his plants at Ardeer, Turin, Paulilles, Vienna, Hamburg and Stockholm. Trains were not fast (a good express had an average speed of 70 km/h), so it also meant many nights in hotels. He often came home from his long journeys exhausted in body and soul.

Panegyric depictions of late nineteenth-century industrialists often portray the person in question (whoever he may be) as a pioneer in his concern for the well-being of his workmen: one who took the initiative in (or at least at some time thought about) introducing improvements such as shorter hours, holidays, free medical care and pen-

sions. (We should remember that working about twelve hours a day, six days a week, was the norm in nineteenth-century factories, and that the use of young children was not uncommon.)

Such things are said of Nobel, too, although we have no reason to assume that he was ahead of his time in his attitude to his employees. Two factors make it unlikely: his upbringing in Russia and his shyness. When he was growing up in St. Petersburg in the 1840s and 1850s serfdom still existed. This medieval survival of feudal Europe was not abolished in Russia until 1863. The idea that society might have a duty to care for those who failed in life was to Nobel an alien one. (But on the other hand dispensing charity was something that he found natural, and he devoted a large part of his time to helping people with his money.) In addition there was Nobel's shyness. As managing director he did not merely avoid conflict with his employees – he avoided any contact with them at all and is said to have preferred to visit his factories on Sundays.

When Nobel wrote that he was “a social democrat through and through, but a modest one”, we should therefore take this with a pinch of salt (not least because he was opposed to universal suffrage). His young employee Ragnar Sohlman, who was probably the person who knew him best, said that Nobel was wholly out of sympathy with social democracy in thought, word and deed:

“He was hardly even a democrat. He had much goodwill for and considerate interest in the workers in his factories, but there was never time for any personal contact. He was a very generous master to his servants but he was a stickler for etiquette

and personal closeness was inconceivable, even when, ill and suffering, he felt the lack of it.”

If there was one thing that Alfred Nobel detested, it was government edicts and other obstacles to free enterprise. “One becomes a revolutionary when one looks at all the mildewed, ill-conceived and abortive laws,” he could burst out. This was an underlying theme of the only literary work he published, “Nemesis”, a four-act tragedy that was published privately and, as it happened, posthumously in Paris. (His relatives bought up the entire edition and burned it, with the exception of three copies. Such a poor play, they thought, did not flatter the memory of such an important man.) The drama was a protest against the oppressiveness of society and a defence of the individual’s freedom to obtain justice for himself.

His distaste for regulations also found expression in a profound dislike of lawyers, whom he called “formalistic parasites”. (However it should be mentioned that there were other groups, too, who did not escape his criticism: academics, for example, could be dismissed as “miserable faculty asses”.) But his lack of faith in lawyers was the main reason for the frequent imitation of his patents, because he never engaged lawyers when seeking patents, attending to all the applications himself. It is significant that when, after thirty years as an international businessman in Europe, he started to make arrangements for the management of his enormous fortune after his death, he did not turn to lawyers, nor to any of his many foreign business partners. Instead he chose as his

executors two Swedish engineers, Ragnar Sohlman and Rudolf Lilljequist, both graduates of the Royal Institute of Technology in Stockholm. They had a tough job and it was five years before Nobel's will could be executed and the first Nobel prizes awarded. To a large extent this was because Nobel had not employed legal experts when he wrote his will.

Summing up Alfred Nobel as an industrialist, we may say that he had initiative, he was focused on change and he was persistent. The last quality is not the least important, because Nobel possessed the necessary psychological and physical stamina – even if the frantic pace of his life was to wear him down and ultimately cause his premature death – to cope with the constant attempts at illegal competition, infringement of patents, deception and pure fraud, while yet maintaining a detached day-to-day control of his many companies in matters great and small.

## SOURCES OF CREATIVITY

In many of his letters Alfred Nobel speaks of being haunted by dread, of having been visited by “the spirits of Nifelhem”. (In Nordic mythology *Niflheimr* was the world of cold, north of the huge abyss of *Ginungagap*.) There is no doubt that Nobel was a deeply depressive person, particularly during the last two decades of his life. He described himself as “a worthless instrument of melancholy, alone in the world and with thoughts more gloomy than anyone can imagine”.

One reason was the loneliness of the childless bachelor – but it was a loneliness

*Alfred Nobel in his late fifties. This is reportedly the last photo of him. (The Nobel Foundation)*



of his own choice, and underneath it there was a deeper insight into the meaninglessness of existence. His was a dark philosophy; he was a misanthropist who could write: “It appears pathetic to wish to be anyone or anything in the motley collection of 1 400 million two-legged tailless apes which are running around on our orbiting terrestrial projectile.” When the “spirits of Nifelhem” attacked him, work was his only escape.

Although he could sit at his desk or in business meetings for fifteen or twenty hours at a time and seldom went to bed before midnight, Alfred Nobel’s health was not of the best. He had been frail and sickly from birth. Like his brothers, he complained constantly of colds, chest pain, rheumatism and insomnia. He suffered from a persistent and sometimes unbearable headache. A letter to his mistress, Sofie Hess, written from a hotel room somewhere in Europe, is stained by nose-bleeding from sheer exhaustion. In 1882 he consulted a famous doctor in Amsterdam for his migraine. The doctor explained that he was suffering from a chronic muscular inflammation, not a localized one – all the muscles were affected. His heart also began to give trouble: he suffered from angina pectoris and was prescribed nitroglycerine – undeniably an irony of fate. He particularly disliked Stockholm, which he visited as seldom as possible. He found its climate far too raw and damp; it was bad for his migraine and his rheumatism, while the food was too heavy for his stomach.

Why did he subject himself to all this? Time and again he writes that his only wish is to leave business life and devote himself to what he considers his true calling, i.e. “to science”. But why didn’t he do so? Much has been written about the solitary bachelor

Alfred Nobel and his unhappy love affairs, and an equal amount on the paradox of Nobel, the manufacturer of explosives, who supported the struggle for peace and disarmament. But the real riddle about Alfred Nobel is this: Why did he not retire from business life in the 1870s and devote himself to the science that he regarded as his true calling? There was certainly no financial obstacle.

He himself once offered an explanation: “You get into a certain sphere of activity and if you then have a trace of that distorted quality known as sense of duty, you toil until you drop.” But that is not the full answer, because he himself had taken the initiative in forming this “sphere of activity”, and he was always looking to expand it. No, the answer is perhaps that for a person afflicted by dread, by an insight into the meaningless of life, the only solution is to take refuge in hectic activity and to make “duty” a guiding light. Perhaps this is one of the true sources of entrepreneurship?

But Alfred Nobel could also – like many other depressive individuals before and since – take refuge in creative activity: in his own experiments and inspirations, in his clumsy efforts as a dramatist, and in his support for other creative enthusiasts. It was only in these moments of creative work that he put the “spirits of Nifelhem” to flight for a while.

Finally, on 10 December 1896, what Nobel had most feared happened: he died alone, in the company only of a few paid servants. He once wrote that he could not imagine a worse old age than one spent with a retainer in whose eyes he could always read the question “How much has he left me?” And this is just what happened to him.

(His servant in San Remo, Auguste Oswald, need not to have worried. He and his wife Alphonse received a generous annuity.) The young minister at the Swedish Church in Paris, the future archbishop and Peace Prize Laureate Nathan Söderblom (1866–1931), went to San Remo and officiated at the simple act of mourning beside the coffin placed in the “Villa Nobel”. In his oration Söderblom said that “he died without the warming hearth of home, without the hand of a son or a wife on his chilling brow”.

When the storm surrounding the much discussed will had finally abated, when the assets had been realized and transferred to Sweden, when all the relatives and other objectors (including Oscar II) had been placated, when the prize-awarding institutions had been persuaded to accept the task, only then could the first Nobel Prizes be awarded on 10 December 1901, the anniversary of Nobel’s death.

The true meaning of Alfred Nobel’s will was perhaps this: it was intended to emphasize the importance of creative work as the only activity capable of giving real happiness and dispelling the existential fears, “the spirits of Nifelhem”. This reminder of the pleasure of creative work which has been perpetuated – perhaps immortalized – by Nobel’s will is the true gift to humanity of the engineer Alfred Nobel.



## REFERENCES

Bergengren, Erik, *Alfred Nobel* (Uppsala: Gebers, 1960). English edition published as *Alfred Nobel: The Man and His Work* (Edinburgh: Thomas Nelson & Sons, 1962).

Browaldh, Tore, "Alfred Nobel som multinationell företagare", in: *Nobel och hans tid: Fem essayer*, ed. Per Sörbom (Stockholm: Atlantis, 1983), pp. 47–69.

Derry, T.K. & Williams, Trevor I., *A Short History of Technology* (Oxford: Oxford University Press, 1960).

Eriksson, Gunnar, *Kartläggarna: Naturvetenskapens tillväxt och tillämpningar i det industriella genombrottets Sverige 1870–1914*, Umeå Studies in the Humanities 15 (Umeå, 1978).

Eriksson, Gunnar, "Alfred Nobel som en företrädare för 'la belle époque'", in: *Nobel och hans tid: Fem essayer*, ed. Per Sörbom (Stockholm: Atlantis, 1983), pp. 9–24.

Fant, Kenne, *Alfred Bernhard Nobel* (1991; Stockholm: Norstedts, 1995 2<sup>nd</sup> ed.). English edition published as *Alfred Nobel* (New York: Arcade, 1993).

Frängsmyr, Tore, *Alfred Nobel* (Stockholm: Swedish Institute, 1996).

Hult, Jan, et al., *Svensk teknikhistoria* (Hedemora: Gidlunds, 1989).

Jangfeldt, Bengt, *Svenska vägar till S:t Petersburg: Kapitel ur historien om svenskarna vid Nevans stränder* (Stockholm: Wahlström & Widstrand, 1998).

Lundström, Ragnhild, *Alfred Nobel som internationell företagare: Den nobelska sprängämnesindustrin 1864–1886*, Uppsala Studies in Economic History 10 (Uppsala, 1974).

Lundström, Ragnhild, “Nobel, Alfred Bernhard”, *Svenskt Biografiskt Lexikon*, Vol. 28 (Stockholm: Norstedts, 1990), pp. 97–109.

McGrath, J., “Explosives”, in: *A History of Technology*, eds. Charles Singer et al., Vol. V (Oxford: Oxford University Press, 1958), pp. 284–298.

*Människor, miljöer och kreativitet: Nobelpriset 100 år* (Catalogue of the Centennial Exhibition of the Nobel Prize 1901–2001), ed. Ulf Larsson (Stockholm: Atlantis, 2001), esp. pp. 15–25. English edition published as *Cultures of Creativity: The Centennial Exhibition of the Nobel Prize* (Canton, Mass.: Science History Publications, 2001).

Nauckhoff, Sigurd, “Sobrerros nitroglycerin och Nobels sprängolja”, *Daedalus* (Yearbook of the Swedish *Tekniska Museet*), Vol. 18 (1948), pp. 89–141.

Sandblom, Philip, *Creativity and Disease: How Illness Affects Literature, Art and Music* (New York & London: Marion Boyars, 1999 12<sup>th</sup> ed.).

Schück, Henrik & Sohlman, Ragnar, *Alfred Nobel och hans släkt* (Uppsala: Almqvist & Wiksells, 1926).

*Science, Technology and Society in the Time of Alfred Nobel*, eds. Carl Gustaf Bernhard et al., Nobel Symposium 52 (Oxford: Pergamon Press, 1982).

Sohlman, Ragnar, *Ett testamente: Hur Alfred Nobels dröm blev verklighet* (1950; Stockholm: Atlantis, 2001 rev. ed.). English edition published as *The Legacy of Alfred Nobel: The Story Behind the Nobel Prizes* (London: Bodley Head, 1983).

- Steckzén, Birger, *Bofors: En kanonindustris historia* (Stockholm, 1946).
- Strandh, Sigvard, *Alfred Nobel: Forskaren, verket, samtiden* (Stockholm: Natur & Kultur, 1983).
- Tjerneld, Staffan, *Nobel: En biografi* (Stockholm: Bonniers, 1972).
- Tägil, Sven, "Krig och fred i Alfred Nobels föreställningsvärld", in: *Nobel och hans tid: Fem essayer*, ed. Per Sörbom (Stockholm: Atlantis, 1983), pp. 25–46.
- [www.nobel.se/nobel/alfred-nobel/index.html](http://www.nobel.se/nobel/alfred-nobel/index.html)



Cover illustration: It is significant that the only existing portrait of Alfred Nobel was painted posthumously. Nobel, shy and busy as he was, had neither the inclination nor the time to sit for a portrait.

Oil painting by Emil Österman 1915.

(The Nobel Foundation)



KUNGL. INGENJÖRSVETENSKAPSAKADEMIEN  
Royal Swedish Academy of Engineering Sciences